



United States Department of Agriculture
Forest Service



United States Department of Interior
Bureau of Land Management

La Garita Hills Restoration Project

Draft Environmental Impact Statement

*Saguache Ranger District, Rio Grande National Forest,
San Luis Valley Field Office, Bureau of Land Management*

September 2016

Saguache County, Colorado



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Common 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
BLM – Bureau of Land Management	IRA – inventoried roadless area
BpS – Biophysical Setting	LTA – landtype association
BMPs – best management practices	LAU – lynx analysis unit
CCF – hundreds of cubic feet	MAP – forest service management area prescription
CEQ – Council on Environmental Quality	MBF – thousand board feet
CFR – Code of Federal Regulations	MIS – management indicator species
CPW – Colorado Parks and Wildlife	MMBF – million board feet
CRA – Colorado Roadless Area	NEPA – National Environmental Policy Act
CWD - coarse woody debris	NFMA – National Forest Management Act
CWPP – Community Wildfire Protection Plan	NFSR – National Forest System Road
DAU – data analysis unit (big game)	PDC – project design criteria
DBH – diameter at breast height	PFC – properly functioning condition
DSD – detrimental soil disturbance	RGNF – Rio Grande National Forest
DEIS – draft environmental impact statement	ROD – record of decision
DHC – dense horizontal cover	ROS – recreation opportunity spectrum
DN – decision notice	RNA – research natural area
DSD – detrimental soil disturbance	SHPO – State Historic Preservation Office
EA – environmental assessment	SISS –stand initiation structural stage
EIS – environmental impact statement	SRI - soil resource inventory
FAR –functioning at risk	SRLA – Southern Rockies Lynx Amendment
FEIS – final environmental impact statement	TES – threatened, endangered, and sensitive species
FS - forest service	WIZ – water influence zone
FSDMP – forest soil disturbance monitoring	WUI – wildland urban interface
FSH – Forest Service handbook	
FVS – forest vegetation simulator	

**La Garita Hills Restoration Project
Draft Environmental Impact Statement
Saguache County, Colorado**

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This document is available on the internet at:

<http://www.fs.usda.gov/projects/riogrande/landmanagement/projects>

ABSTRACT: This draft environmental impact statement evaluates the potential effects of the short-term benefits of salvage harvest of stands killed by spruce beetle while they have economic value; the desire for long-term regeneration in spruce beetle affected stands; the implementation of fuel reduction treatments adjacent to developed private lands; and the need, in drier vegetation zones, to increase landscape resiliency and sustainability by reducing conifer density, diversifying stand structure and increasing landscape patchiness to reduce the potential for uncharacteristically large intense or severe wildfires and to meet other resource objectives. The analysis discloses the direct, indirect, and cumulative effects of implementing a variety of commercial and non-commercial management activities to meet the purpose and need and move toward desired conditions on both Forest Service and Bureau of Land Management administered lands in the La Garita Hills analysis 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 and the BLM *San Luis Field Office Management Plan* (December 1991), final environmental impact statement, and record of decision.

Opportunity to comment

Specific, written comments stating concerns, issues, or suggestions related to the alternatives or any other information presented in this draft environmental impact statement will be used to guide the development of the final environmental impact statement and records of decision. The responsible official for each agency will sign a separate record of decision. The comment period on the draft environmental impact statement will extend for 45 days from the publication of the legal notice in the *Federal Register* (expected September 23, 2016).

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-saguache@fs.fed.us

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Summary

Background and Project Purpose

The proposed La Garita Hills Restoration Project is located on the Rio Grande National Forest, Saguache Ranger District, and Bureau of Land Management (BLM), San Luis Field Office lands, south and west of the town of Saguache, Saguache County Colorado. The project analysis area includes approximately 179,054 total acres of federally managed lands, of which about 145,746 acres are National Forest System lands and 33,308 acres are managed by the BLM.

Forest vegetation varies with elevation, with the piñon-juniper vegetation zone at the lowest elevations and the Engelmann spruce-subalpine fir vegetation zone at the highest elevations. The majority of forested acres are described as mixed conifer, which includes Douglas-fir growing in combination with most other tree species present. This vegetation zone is a complex transition zone between ponderosa pine and spruce-fir, with species composition varying by elevation, aspect, topography, and often past disturbance. Aspen is present as a seral species throughout much of the analysis area with the largest clones are found in the cool-moist mixed conifer and spruce-fir vegetation zones. Until the increased insect activity over the last several years, lack of disturbance resulted in aspen declining in dominance throughout the analysis area due to conifer increases.

The analysis area is in the rain shadow of the surrounding high mountains. Lower elevations receive approximately eight to ten inches of precipitation and the highest elevations receive a maximum of twenty to twenty-five inches of precipitation annually, mostly in the form of snow. These naturally drier conditions, along with recent droughts, have continued to stress forest and rangeland vegetation, further affecting productivity and health.

Private lands are located mostly on the east side of the analysis area in the lower elevation vegetation zones. The wildland urban interface is characterized as low density intermix, since the density of houses and other structures is relatively low. Some adjacent homes are year-round residences, and others are summer homes. The analysis area is used most by local residents for firewood collection, dispersed camping, and during the fall big game hunting season when visitation and use is heaviest. Use of developed trails and recreation camping and picnicking facilities, all on national forest, is relatively low.

The regional drought through the early to mid-2000s increased the levels of forest insect activity substantially. Across the Rio Grande National Forest, spruce beetles have killed the majority of mature Engelmann spruce. In the analysis area, most mature Engelmann spruce have been killed in the past two to four years, rapidly reducing stand complexity and the number of live trees in vegetation zones with a substantial Engelmann spruce component (approximately twenty-five percent of the forested acres). In lower elevation vegetation zones, Douglas-fir beetle and western spruce budworm activity are having the greatest impacts on forested stands.

The combination of drought, naturally dry conditions, increasing conifer tree densities, and loss of patchiness, especially in the drier vegetation zones, is increasing the susceptibility of stands to insect outbreaks and increasing the potential for uncharacteristically large, intense, or severe wildfires. If average temperatures continue to increase or droughts become more frequent in response to the changing climate, these conditions would become increasingly unsustainable.

Based on the resource conditions described above, the purpose and need for this project was developed by comparing objectives and desired conditions described in the agency land management

plans relating to forest and grassland health and function, habitat needs for a variety of key wildlife and plant species, along with considering the current, generally dry conditions and expected future conditions resulting from potential climate changes. Where agency land management plan direction was silent, outdated, or not applicable, the best available science and local knowledge was used. To move toward desired conditions, the Rio Grande National Forest and San Luis Valley Field Office propose the adaptive actions listed below.

In stands heavily impacted by spruce beetles or other insects or diseases in the spruce-fir or spruce-mixed conifer vegetation zones (approximately 25 percent of forested acres, located primarily on national forest system lands), there is a need to:

- Salvage dead or dying trees on a portion of the lands identified as suitable for timber production in the Forest Plan, while these trees have economic value;
- In spruce-mixed conifer stands, in addition to salvaging dead and dying trees, harvest prescriptions would be used to ensure healthy trees of an appropriate variety of species are retained to meet long-term sustainability objectives;
- Following harvest, accelerate forest regeneration of this changed portion of the landscape by planting conifer seedlings and/or facilitating aspen regeneration, as needed to meet future objectives; and
- Preemptively cut and remove the increasing number of dead and dying trees to protect existing infrastructure, increase firefighter safety, and reduce the potential for future high severity wildfires that could adversely affect watershed conditions.

In other vegetation zones, in order to increase landscape resiliency and sustainably, there is a need to:

- In conifer stands, appropriately reduce average stand density, maintain or improve stand health, and increase or maintain tree species diversity;
- In upland sites, increase landscape structural stage and seral diversity to meet a variety of resource objectives including providing or improving habitat for a variety of native wildlife and plant species over the long-term;
- Maintain surface fuel loadings at levels and distributions that would reduce the probability of uncharacteristically intense or severe wildfire behavior;
- Maintain or increase landscape diversity and patchiness by both thinning selected conifer stands and reducing conifer encroachment into selected upland meadows; and
- Maintain healthy aspen and willows in riparian zones by reducing conifer encroachment in selected riparian areas and planting willow, in selected areas.

To meet other management objectives, there is a need to:

- Treat vegetation in the vicinity of private lands (the wildland urban interface) to increase defensible space and reduce potential wildfire behavior, and improve firefighter safety during suppression efforts;
- Relocate or re-align specific sections of National Forest System Roads to protect or improve watershed and aquatic health; and
- Promote economic sustainability for local communities, including the forest product industry.

Management activities would occur over a ten- to fifteen-year time span.

Areas of Controversy

No major areas of controversy were identified during scoping.

Issues raised by Agencies and Public

Public comments on the proposed action and any potential concerns were solicited during two scoping periods. Letters were mailed to over ninety addresses, a public meeting was held, and the notice of intent was published in the *Federal Register* in October 2014. Comments were received from adjacent landowners, permittees, tribal representatives, local State and Federal agency representatives, interested individuals, and organizations.

Concerns identified during scoping included the potential effects of proposed activities on Canada lynx habitat, big game winter range, watershed health, soils, air quality, residual live trees, and adjacent local residences. Concerns were also expressed about the risk of prescribed fire escape.

These preliminary issues were evaluated to determine whether they were already resolved or could be resolved through land use designations; implementation of Forest Plan standards and guidelines, best management practices, project design criteria; through processes or analyses routinely conducted by the interdisciplinary team; or whether they were beyond the scope of the project.

Forest Plan requirements do not apply to BLM lands. However, for the purpose of this project, BLM is adopting the intent of the resource protection measures identified, as applicable to activities proposed on BLM lands, unless otherwise in conflict with their *San Luis Valley Resource Management Plan*. All concerns that fell within these categories were considered resolved. Concerns that would need to be addressed through spatial location of activities or that would drive (or partially drive) an alternative were considered unresolved and were developed into issues.

Issues to be Resolved

Unresolved concerns were developed into two issues for this analysis: effects on soils and watersheds and effects on Canada lynx habitat. These issues led to the development of three alternatives to the proposed action: alternative 1 – no action, alternative 3, and alternative 4. Alternative 2 is the proposed action and is considered the preferred alternative.

Alternatives and Major Conclusions

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. This alternative assumes no additional management activities would occur outside of those currently authorized.

The no action alternative would likely have the fewest short-term effects for most resources; however, there could be long-term effects. High levels of tree mortality in the mature Engelmann spruce stands has reduced habitat quality for Canada lynx in some stands. Loss of cone bearing trees in these stands will also effect red squirrel populations and use, a major secondary prey for lynx. In the drier vegetation zones, high stand densities and decreasing patchiness across the landscape are resulting in high levels of insect activity and increasing the potential for uncharacteristically large or intense

wildfires that could adversely affect wildlife habitat for some species, watershed conditions, soil properties and aquatic habitats.

Under alternative 1, fuel loading would continue to increase as snags and dead trees fall, adding to high severity wildfire potential in the long-term and increasing the potential to damage infrastructure in the areas most affected by spruce beetles along with increasing risks to firefighters and visitors. In the wildland-urban interface, landscape patchiness would continue to decrease and fuel loadings would continue to increase which would limit options for wildfire suppression and increase risk to firefighters, when a wildfire occurs.

The relatively slow rate of forest stand recovery in stands most affected by spruce beetles could be detrimental to some resources. This alternative would not benefit the local forest products industry. It would not relocate poorly located road segments, diversify vegetation, or help improve watershed conditions. Conversely, lack of additional management activities would also reduce the potential for watershed disturbance or increased in soil erosion resulting from re-opening and using closed system roads and old, non-system roads, or construction of any new temporary road segments in support of timber harvest activities. There would also be less potential for increases in weeds or invasive species away from open roads. There would also be no additional effects on lynx habitat.

Activities Common to all Action Alternatives

Each action alternative was designed to be viable, consistent with the direction of both land management plans, and capable of moving resources toward desired conditions, at least to some degree. The action alternatives propose varying acres of commercial and non-commercial vegetation treatment activities that would be implemented adaptively to move toward desired conditions.

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, the silviculture-prescribed fire guidelines, monitoring elements, and adaptive management triggers (see appendix D) would be used to minimize adverse effects and protect resources.

Proposed activities would be implemented within the areas as shown on the alternative maps (chapter 2). Potential management activities include the following:

- Commercial timber harvests including salvage and other silvicultural systems using ground-based equipment on lands identified as suitable for timber harvest in the land management plans;
- Tree and willow regeneration including both tree and willow planting and natural regeneration;
- Thinning non-commercial conifer trees using chainsaws or masticators;
- Prescribed burning, including broadcast burning (outside of lynx habitat) and pile burning;
- Cutting encroaching conifers out of selected upland meadows using chainsaws or masticators to maintain landscape patchiness;
- Cutting conifers out of selected riparian areas using chainsaws in order to favor willows and aspen; and
- Relocating or re-aligning up to ten miles of National Forest System road segments to improve watershed condition, reduce road maintenance needs, and/or reduce sedimentation. These

segments include, but would not be limited to, National Forest System Roads 673, 708, and 720.

There would be no changes to the existing transportation system.

- Roads currently closed to public travel would remain closed;
- No new permanent system roads would be constructed under any action alternative, but temporary roads would be needed for commercial timber harvest activities;
- All temporary roads and old relocated road segments would be closed and rehabilitated; road closure methods would be determined based on site conditions but could include gates, boulders, berms, down trees, fences, and/or recontouring.

The action alternatives could have some short-term disturbance effects to soils, vegetative ground cover, traffic levels, and scenic quality during timber harvest or prescribed broadcast burning activities. Since activities would not generally occur over large areas at the same time, effects would be localized. Season of management activity could also affect the level of disturbance. Visitors could be most affected during the fall hunting season, while wildlife may be most affected during the spring when they may have young.

Alternative 2 – Proposed Action (*preferred alternative*)

Under alternative 2, up to 56,390 acres of commercial timber harvest could occur to meet the following objectives:

- Salvage harvest to recover economic value from dead and dying spruce killed by spruce beetles on up to 20,805 acres;
- Sanitation/salvage harvest on up to 10,060 acres to recover economic value from dead and dying trees and to reduce levels of insect and disease activity; and
- Intermediate and intermediate-sanitation/salvage harvest to reduce stand density, improve stand health and growth, recover economic value, and meet a variety of resource objectives on up to 25,525 acres.

In the drier forest vegetation zones (primarily in non-lynx habitat), up to 64,725 acres of non-commercial treatments could include the following activities to meet the following objectives:

- Thin non-commercial sized trees (timber stand improvement- pre-commercial thinning) to reduce stand density, improve species composition or tree quality on up to 915 acres;
- Use prescribed, low severity, broadcast burning with or without mechanized thinning of non-commercial sized trees (pre-commercial thinning), as needed, to reduce stand density, improve species composition, reduce natural or activity fuels, increase canopy base height, improve wildlife habitat, and or re-invigorate grasses, forbs, or shrubs on up to 24,355 acres;
- Use prescribed, low severity, broadcast burning to meet objectives such as reduce fuel loading, decrease conifer seedlings, increase canopy base height, site preparation for natural regeneration, , improved wildlife habitat, or re-invigorate grasses forbs, or shrubs on up to 22,075 acres;
- Use prescribed, mixed-severity, broadcast burning to meet objectives similar to other prescribed burning, but also that could include reducing a portion of the overstory canopy on up to 7,910 acres;

- Cut encroaching conifers out of upland meadows on up to 8,700 acres to maintain landscape patchiness; and
- Use chainsaws to cut encroaching conifers out of riparian areas to increase or maintain willows and aspen on up to 770 acres.

Since alternative 2 proposes the most acres of commercial timber harvest using ground-based logging equipment, it would have the greatest potential adverse effects on soil productivity and watershed health and the greatest soil erosion potential. Additional monitoring and evaluation would be required in actual harvest units to ensure soil erosion is minimized, especially on sensitive soils, and soil productivity is maintained. Additional monitoring would be particularly important for seven of the HUC 6 watersheds that may reach the fifteen percent disturbance levels of concern, if all harvest acres are implemented.

Since Alternative 2 has the most acres proposed for a variety of management activities in lynx habitat, it would be expected to have the highest potential for negative effects on lynx habitat. The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 2 would authorize salvage on the greatest number of acres in the spruce-fir/spruce-mixed conifer vegetation zones and would also authorize harvest of the most acres in the lower quality Douglas-fir/mixed conifer or aspen mix vegetation zones. This alternative would have the highest potential for incidental impacts to dense horizontal cover and would most likely convert the most acres to temporarily unsuitable habitat (stand initiation structural stage). Under the sideboard caps developed for this alternative, non-commercial treatment activities that result in the reduction of seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at 800 total acres, which is less than proposed for alternative 3 and more than alternative 4.

All effects would be consistent with the Programmatic Biological Opinion completed for the 2008 *Southern Rockies Lynx Amendment*. As applicable, the documents included in appendix D (forest plan standards and guidelines, project design criteria, pre-implementation checklist process, and the silviculture-prescribed fire guidelines) 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. These guiding documents will ensure adverse impacts to lynx habitats are avoided or minimized and to ensure effects remain within approved levels throughout the life of this analysis.

Alternative 3

Under alternative 3, up to 18,155 acres of commercial timber harvest could occur to meet the following objectives:

- Salvage harvest within up to 300 feet of open roads and infrastructure in areas killed by spruce beetles to protect infrastructure and reduce risks to visitors on up to 4,890 acres; and
- Intermediate harvests to reduce stand density, improve stand health and growth, and meet a variety of resource objectives on up to 13,265 acres;

In the drier forest vegetation zones (primarily in non-lynx habitat), up to 70,025 acres of non-commercial treatments could be used to with similar objectives as described for alternative 2:

- Thin non-commercial sized to on up to 645 acres;

- Prescribed, low-severity, broadcast burning with or without mechanized timber stand improvement thinning of non-commercial sized trees (pre-commercial thinning) on up to 26,750 acres.
- Use prescribed, low-severity, broadcast burning on up to 25,195 acres.
- Use prescribed, mixed-severity, broadcast burning on up to 8,140 acres;
- Cut encroaching conifers out of upland meadows on up to 8,865 acres; and
- Use chainsaws to cut encroaching conifers out of riparian areas to increase on up to 680 acres.

Since alternative 3 proposes the fewest acres of commercial timber harvest, it would have the least potential for adverse effects on soil productivity and watershed health, and the least soil erosion potential. Monitoring and evaluation would be required in actual harvest units to ensure soil erosion is minimized and soil productivity is maintained, especially on sensitive soils. This would be particularly important for the one HUC 6 watershed that may reach the fifteen percent disturbance level of concern if all harvest acres were implemented.

Since alternative 3 has the fewest proposed management activities in lynx habitat, it would be expected to have the fewest negative effects on lynx habitat. The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 3 would authorize salvage on the fewest number of acres in spruce-fir/spruce-mix, focusing on areas within three hundred feet of open roads and other improvements. Alternative 3 would also authorize harvest on the fewest acres overall in the lower quality mixed conifer or aspen mix vegetation zones. This alternative would have the least potential incidental impacts to dense horizontal cover and would most likely convert the fewest acres to temporarily unsuitable habitat (stand initiation structural stage). Under the sideboard caps developed for this alternative, non-commercial treatment activities that result in the reduction of seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at the maximum permitted 997 total acres, which would be more than 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 (forest plan standards and guidelines, project design criteria, pre-implementation checklist process, and the silviculture-prescribed fire guidelines) 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. These guiding documents will ensure adverse impacts to lynx habitats are avoided or minimized and to ensure effects remain within approved levels throughout the life of this analysis.

Alternative 4

Under alternative 4, up to 37,795 acres of commercial timber harvest could occur to meet the same objectives as described under alternative 2:

- Salvage harvest on up to 17,055 acres;
- Sanitation/salvage harvest on up to 6,830 acres; and
- Intermediate and/or intermediate-sanitation salvage harvest on up to 13,910 acres.

In the drier forest vegetation zones (primarily in non-lynx habitat), up to 45,060 acres of non-commercial treatments could be used to with similar objectives as described for alternative 2:

- Thin non-commercial sized trees on up to 335 acres;
- Prescribed, low-severity, broadcast burning with or without mechanized timber stand improvement thinning of non-commercial sized trees (pre-commercial thinning) on up to 21,785 acres;
- Prescribed, low-severity, broadcast burning on up to 14,765 acres;
- Cut encroaching conifers out of upland meadows on up to 7,425 acres; and
- Use chainsaws to cut encroaching conifers out of riparian areas on up to 750 acres.

Alternative 4 proposes fewer commercial timber harvest acres, so it would have less potential for adverse effects on soil productivity and watershed health and less soil erosion potential on sensitive soils compared to alternative 2. Monitoring and evaluation would be required in actual harvest units to ensure soil erosion is minimized and soil productivity is maintained. This would be particularly important for three hydrologic unit code (HUC) 6 watersheds that may reach the fifteen percent disturbance levels of concern, if all harvest acres were implemented.

Since alternative 4 has an intermediate number of acres proposed for management activities in lynx habitat, it would be expected to have an intermediate level of effects compared to alternatives 2 and 3. The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 4 would authorize salvage on fewer acres in the spruce-fir/spruce-mixed conifer vegetation zones and would also authorize harvest on fewer acres in the lower quality Douglas-fir/mixed conifer or aspen mix vegetation zones compared to alternative 2. This alternative would have less potential for incidental impacts to dense horizontal cover and would be expected to convert fewer acres to temporarily unsuitable habitat (stand initiation structural stage), compared to alternative 2. Under the sideboard caps developed for this alternative, non-commercial treatment activities that result in the reduction of seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at 500 total acres, which is less than proposed for alternatives 2 and 3.

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 (forest plan standards and guidelines, project design criteria, pre-implementation checklist process, and the silviculture-prescribed fire guidelines) 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. These guiding documents will ensure adverse impacts to lynx habitats are avoided or minimized and to ensure effects remain within approved levels throughout the life of this analysis.

Decision Framework

The Forest Service (lead agency) and BLM (cooperating agency) have prepared this environmental impact statement in compliance with the National Environmental Policy Act and other relevant federal and state laws and regulations.

Given the purpose and need and the environmental effects disclosed for each of the alternatives and other considerations, the responsible official for each agency will decide whether to authorize some level of action on all, part, or none of the analysis area. The decisions will be documented in two separate records of decision based on the effects disclosed in this combined analysis.

The La Garita Hills Restoration Project is not a Healthy Forest Restoration Act project and the Forest Service portion of this project is subject to the objection process pursuant to 36 CFR 218, subparts A and B following the preparation of the final environmental impact statement and draft record of decision.

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Chapter 1. Purpose of and Need for Action

1.1 Introduction

The Forest Service (lead agency) and Bureau of Land Management (cooperating agency) have 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.

Since the analysis area includes federal lands managed by the Rio Grande National Forest (Forest Service) and BLM's San Luis Valley Field Office (BLM), the analyses were combined, to the extent feasible, with separate records of decisions expected. Where Forest Service and BLM analysis procedures or terminology differed, Forest Service terminology was generally used to discuss similar concepts.

The document is organized into four chapters:

- **Chapter 1. Purpose and Need for Action:** It also provides 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, and the 1991 *San Luis Field Office Resource Management Plan* (referred to as the land management plans in the rest of this document) along with other agency guiding strategies and direction.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a more detailed description of the agencies' proposed action as well as alternatives for achieving the stated purpose. These alternatives were developed based on key issues raised by the public. Finally, this section provides a summary table of the environmental consequences associated with each alternative and a comparison of the alternatives in relation to the issues.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide additional information related to the analysis. Appendix D includes relevant forest plan standards and guidelines, project design criteria, resource pre-implementation checklists, key resource monitoring elements, silviculture-prescribed fire guidelines, and the adaptive management triggers summary needed to guide project implementation.

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

1.2 Project Location and Background

The proposed La Garita Hills Restoration Project is located on the Rio Grande National Forest, Saguache Ranger District (Forest Service) and the San Luis Field Office lands managed by the Bureau of Land Management (BLM). The project area is south and west of the town of Saguache, in Saguache County, Colorado¹ and on the northwestern edge of the rural San Luis Valley (see figure 1).

The valley floor is primarily in private ownership and used for crop production, livestock grazing, or both. The surrounding foothills and mountains are generally managed by federal land management agencies and with some areas managed by the Colorado State Land Board. The project area includes approximately 179,054 acres of federally managed lands of which approximately 145,746 acres are national forest system lands and 33,308 acres are managed by BLM.

Private lands are located mostly on the east side of the project area in the lower elevation vegetation zones. The wildland urban interface is characterized as low density intermix, since the density of houses and other structures is relatively low. Some adjacent homes are year-round residences; others are summer homes. The area is used most heavily by local residents for firewood collection, dispersed camping, and during the fall big game hunting seasons when visitation and use is heaviest. Use of developed trails and recreation camping or picnicking facilities, located on national forest system lands, is currently relatively low.

The project area is in the rain shadow of the surrounding high mountains with lower elevations receiving approximately eight to ten inches of precipitation and the highest elevations receiving a maximum twenty to twenty-five inches of precipitation annually, mostly in the form of snow. Summer monsoon moisture may also contribute to available moisture but is less reliable in this area than further south or in areas closer to the Continental Divide. The naturally drier conditions and the recent droughts have continued to stress forest and rangeland vegetation, further limiting productivity and health.

Forest vegetation varies with elevation, with the piñon-juniper vegetation zone at the lowest elevations and Engelmann spruce-subalpine fir vegetation zone at the highest elevations. The majority of forested acres are described as mixed conifer which includes Douglas-fir growing with other tree species. This vegetation zone is a complex transition zone between ponderosa pine and spruce-fir, with species composition varying by elevation, aspect, topography, and often past disturbance. Aspen is present as a seral species throughout much of the montane and higher portions of the analysis area with the largest clones in the mid to upper vegetation zones. Lack of recent disturbance, until the increased insect activity over the last few years, has resulted in aspen declining in dominance in the analysis area due to the increases in conifers.

The regional drought through the early to mid-2000s increased the levels of forest insect and disease activity substantially. Across the Rio Grande National Forest, spruce beetles have killed the majority of mature Engelmann spruce. In the project area, most mature Engelmann spruce has been killed in the past two to four years. This has reduced stand complexity and the number of live trees in

¹ The legal description of the analysis area includes all or part of: T.42N, R.3 E, Sections 2, 3, and 10; T.42N, R 4, Sections 1 through 4, 9 through 16; T 42N, R 5E, Sections 1 through 26; T 42N, R 6E., Sections 1 through 9, 18, 19 and 30; T 43N, R 3E, Sections 1 through 5, 8 through 16, 21 through 28, 33 through 36; T 43N, R 4E, Sections 1 through 30, 32 through 36; T 43N, R 5E, Sections 1 through 36; T 43N, R 6E, Sections 1 through 35; T43N, R 7E, Sections 3 through 10, 17 through 20, 29 and 30; T.44N, R 3E, Sections 25 through 27, 33 through 36; T.44N, R 4E, Sections 13through 36; T.44N, R 5E, Sections 1 through 5, 8 through 36; T 44N, R 6E, Sections 1 through 36; T 44N, R 7E, Sections 6, 7, 13 through 21, 28 through 34; T.45N, R 5E, Sections 32 through 36, New Mexico P.M.

vegetation zones with an Engelmann spruce component (approximately twenty-five percent of the forested acres). In lower elevation vegetation zones, Douglas-fir beetle and western spruce budworm activity is having the greatest impact on forested stands. The combination of drought, naturally dry conditions, increasing conifer tree densities, and loss of patchiness in the drier vegetation zones, is increasing the susceptibility of stands to insect outbreaks and increasing the potential for uncharacteristically large, intense, or severe wildfires. If average temperatures continue to increase or droughts become more frequent in response to changing climate, these stands would become increasingly unsustainable.

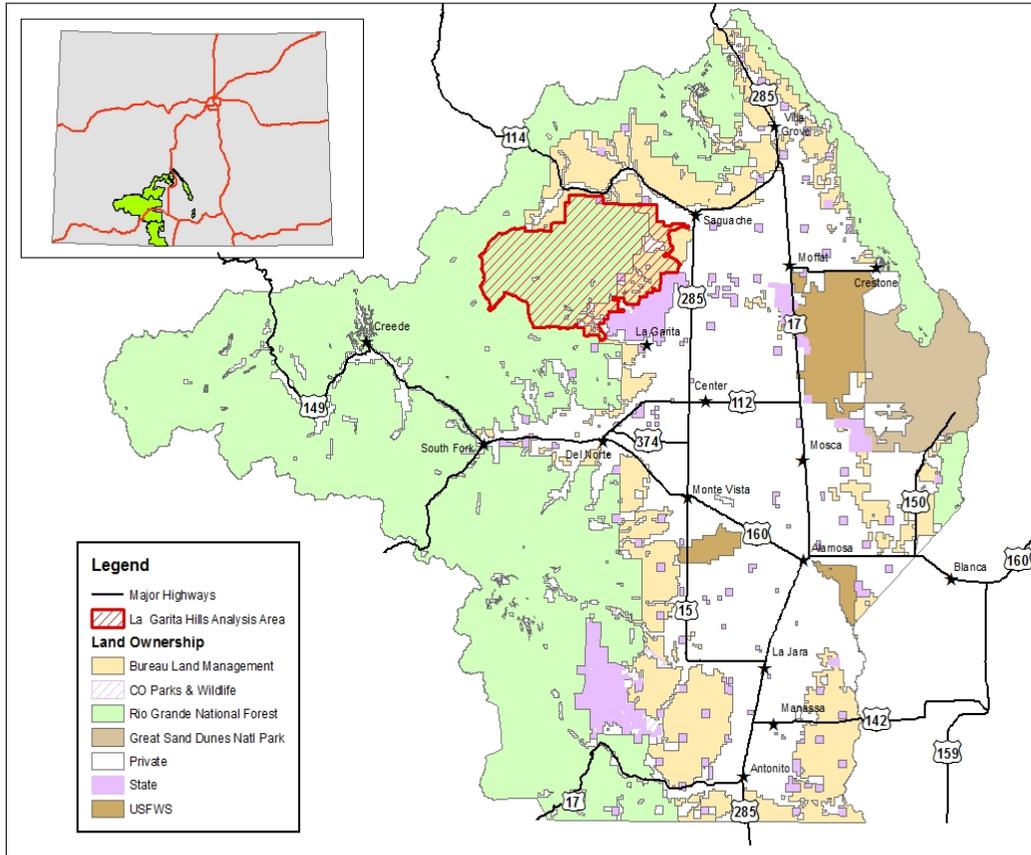


Figure 1. Vicinity map, La Garita Hills Project analysis area.

1.3 Purpose and Need for Action

Based on the resource conditions described above, the purpose and need for this project was developed by comparing objectives and desired conditions described in the agency land management plans relating to forest and grassland health and function, habitat needs for a variety of key wildlife and plant species, along with considering the current, generally dry conditions and expected future conditions resulting from potential climate changes. Where agency land management plan direction was silent, outdated, or not applicable, the best available science and local knowledge was used.

In stands heavily impacted by spruce beetles or other insects or diseases in the spruce-fir or spruce-mixed conifer vegetation zones (approximately 25 percent of forested acres, located primarily on national forest system lands), there is a need to:

- Salvage dead or dying trees on a portion of the lands identified as suitable for timber production in the Forest Plan while these trees have economic value;
- In spruce-mixed conifer stands, in addition to salvaging dead and dying trees, use harvest prescriptions to ensure that healthy trees of an appropriate variety of species are retained to meet long-term sustainability objectives;
- Following harvest, accelerate forest regeneration of this changed portion of the landscape by planting conifer seedlings, facilitating aspen regeneration, or both, as needed to meet future objectives; and
- Preemptively cut and remove the increasing number of dead and dying trees to protect existing infrastructure, increase firefighter safety, and reduce the potential for future high severity wildfires that could adversely affect watershed conditions.

In other vegetation zones in order to increase landscape resiliency and sustainably there is a need to:

- In conifer stands, appropriately reduce average stand density, maintain or improve stand health, and increase or maintain tree species diversity;
- In upland sites, increase landscape structural stage and seral diversity to meet a variety of resource objectives including providing or improving habitat for a variety of native wildlife and plant species over the long-term;
- Maintain surface fuel loadings at levels and distributions that would reduce the probability of uncharacteristically intense or severe wildfire behavior;
- Maintain or increase landscape diversity and patchiness by both thinning selected conifer stands and reducing conifer encroachment into selected upland meadows; and
- Maintain healthy aspen and willows in riparian zones by reducing conifer encroachment in selected riparian areas and planting willow, in selected areas.

To meet other management objectives, there is a need to:

- Treat vegetation in the vicinity of private lands (the wildland urban interface) to increase defensible space and reduce potential wildfire behavior, and improve firefighter safety during suppression efforts;
- Relocate or re-align specific sections of National Forest System Roads to protect or improve watershed and aquatic health; and
- Promote economic sustainability for local communities, including the forest product industry.

1.4 Land Management Plans and Other Direction

All land management decisions are governed by laws and policy which direct or provide bounds for the 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:

National Cohesive Wildland Fire Management Strategy

The National Cohesive Wildland Fire Management Strategy was finalized in 2014 (<http://www.forestsandrangelands.gov/strategy/>). This national strategy adopted a vision statement:

“To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire”.

This strategy provides guidelines to achieve national goals for managing vegetation and fuels to protect homes, communities, and other values at risk. The guidelines are designed to be tailored to meet local conditions. The primary national goals and guiding principles relating to the La Garita Hills project are reducing risk to firefighters and the public and actively managing the landscape to make it more resilient to disturbance, in accordance with management objectives. The project area includes relatively large blocks of federally managed lands with a multi-use emphasis where a variety of management tools could be considered to move the landscape toward desired conditions that would be resilient to disturbances and sustainable over time.

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

San Luis Field Office Resource Management Plan

Guidance for managing BLM lands is provided in the San Luis Field Office area Management Plan (December 1991). It can be viewed online at: http://www.blm.gov/co/st/en/BLM_Programs/land_use_planning/rmp/archived/san_luis.html

Lands managed by the San Luis Valley Field Office are divided into ten geographic reference areas. The resource management plan gives management guidance both common to all lands and also to each geographic reference area. The La Garita Hills project responds to many of the objectives described in the resource management plan and would move the project area toward desired conditions described in that plan. This environmental impact statement is tiered to the San Luis Resource Area Management Plan final environmental impact statement. All proposed activities would be consistent with resource management plan direction.

Management direction for the individual geographic reference areas are displayed by resource or resource uses and by one of the following:

- Resource condition objective: The desired state (condition) BLM would like to achieve for environmental values and social/economic conditions (resource) affected by BLM management activities and resource conditions (objectives) in a specific geographic location;
- Land use allocation: The allowable, limited, or excluded uses (allocations) for a specific geographic location or area and the terms and conditions of such use; or
- Management action: The specific actions or direction BLM will take to achieve resource condition objective or land use allocation decisions (Resource management plan 1991 pg. 7).

The BLM portion of this analysis area is included entirely in the San Luis Area #1 geographic reference area. The following are the specific resource directions that relate to this project:

Vegetation

Resource Condition Objectives

1-4: Maintain the present good to excellent range condition; move toward good condition (late seral stage) on the fair to poor condition range based on site potential. Specific desired plant communities will be described in activity plans, if necessary.

1-5: Allow vegetative manipulation such as mechanical, chemical, or fire practices to aid in accomplishing the overall objective and the desired plant communities described in activity plans.

Management Actions

1-6: Continue the ecological site inventory to provide data for existing ecological status and trend and aid in developing vegetative objectives and desired plant community descriptions for activity plans.

Forest and Woodland Management

Resource Condition Objectives

1-15: Meet crucial thermal and cover requirements for wildlife during harvest of productive forest lands and operable woodlands.

1-16: Allow small timber operations (i.e., 80 acres or less) during the winter months provided there will be only minimal impacts to wintering big game herds. The impact analysis for proposed timber sales will consider not only BLM-administered lands, but also adjacent USFS lands with approved prescriptions in the Rio Grande Forest Management Plan.

1-17: Harvest 185 million board feet (MBF) (5,769 acres of operable commercial forest lands) annually during the life of the plan. Thirty-four acres of Commercial Forest Lands (CFLs) will be replaced annually through regeneration harvest. Harvest 477 cords of fuelwood (11,992 acres of productive operable woodlands) during the life of the plan or 53 acres annually.

Land Use Allocation

1-9: Allow harvesting in any area consistent with activity plans and RMP decisions.

Rio Grande National Forest Land Resource Management Plan

This proposal responds to 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. Objectives are “concise projections of measurable, time-specific intended outcomes.” The objectives for the Forest Plan were the means of measuring progress toward achieving or maintaining desired conditions. This draft environmental impact statement is tiered to the Forest Plan final environmental impact statement (1996). There are numerous Forest Plan desired conditions and objectives related to this project analysis and proposed management activities, these are listed in appendix C.2.

Any regulated timber harvest activities would occur only on lands classified as tentatively suitable for timber production, per the timber suitability amendment to the Forest Plan (3/2/2000) and verified prior to project implementation.

Relevant forest-wide standards and guidelines applicable to all project activities proposed for the project on national forest system lands are included in appendix D.1. Each Forest Plan management area may also have additional specific standards or guidelines; these were not listed but can be viewed online. All proposed activities on the Rio Grande National Forest would be consistent with the Forest Plan, as amended.

The Forest Plan can be viewed online at:

<http://www.fs.usda.gov/main/riogrande/landmanagement/planning>

Management Area Direction – Land Management Plans

The Forest Plan designated areas to be managed for a particular emphasis or theme known as management area prescriptions. Each management area prescription includes a description of the theme and physical setting, along with a description of the desired future conditions. The analysis area includes eight management area prescriptions, as described in table 1. Approved management strategies for the BLM lands in this analysis area were similar to the management area prescription 5.11, so they were included in that designation. Figure 2 shows the spatial distribution of the management area prescriptions along with developed recreation sites, private structures, and the area identified as the wildland-urban interface for this project.

Table 1. Management area prescriptions in the La Garita Hills project area.

Management Area Prescription	Management Area Prescription Theme Description	Acres	% of Federal Acres
1.5 – Eligible Wild Rivers	Wild Rivers and adjacent areas are managed to protect and perpetuate eligible river segments.	1,095	<1
3.1 - Special Interest Area – Big Springs	Manage to protect or enhance unique characteristics.	65	<1
3.3 – Backcountry ²	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.	19,735	11
5.11 ^A – General Forest and Intermingled ¹ Rangelands ¹	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.	80,605	45

Management Area Prescription	Management Area Prescription Theme Description	Acres	% of Federal Acres
5.13 – Forest Products ¹	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.	45,350	25
5.41 – Deer and Elk Winter Range ¹	Managed to supply adequate amounts of quality forage, cover, and solitude for deer, elk, and other species while on winter range.	24,075	13
5.42 – Bighorn Sheep Area	Managed to maintain or improve bighorn sheep habitat.	4	<1
6.6 – Grassland Resource Production	Managed to produce forage for livestock, wildlife, and/or recreational stock.	8,125	4
Total Federal Acres		179,054	
Private Land		7,517	
State Land		1,221	
Total Analysis Area Acres		187,792	

^A Includes approximately 33,308 acres of BLM managed land;

¹ These management area prescriptions are part of the suitable timber base, Forest Plan;

² Many of the MAP 3.3 Backcountry areas are now managed under the Colorado Roadless Rule.

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*).

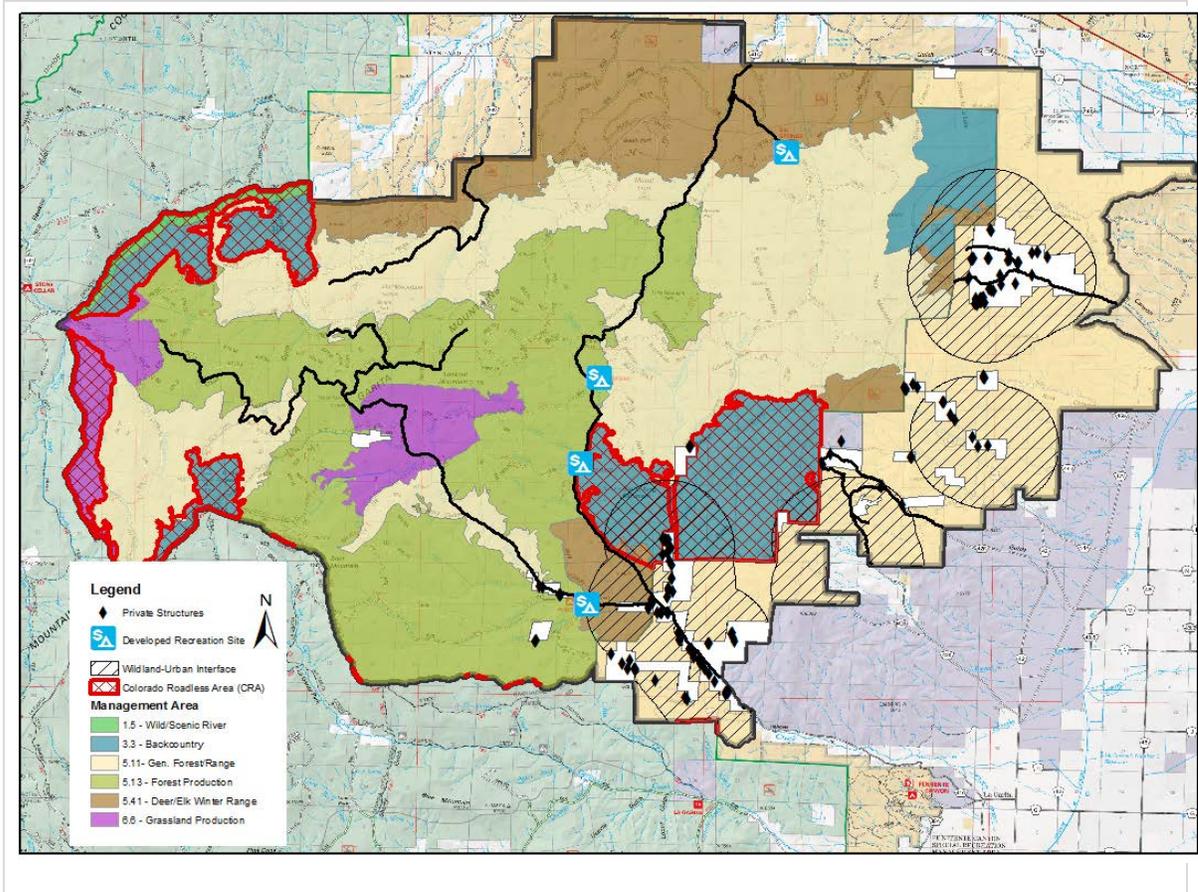


Figure 2. Management area prescriptions, developed recreation sites, and wildland urban interface areas in the project area.

1.5 Proposed Action

The Forest Service and BLM developed the proposed action (alternative 2) to meet the purpose and need and move toward desired conditions. This alternative could implement management activities on up to 121,115 acres with up to 93,810 acres on forest service lands and 27,305 acres on BLM lands to meet objectives described in the purpose and need. There would be no changes to the existing permanent road system and all roads currently closed to public travel would remain closed.

Up to approximately 56,390 acres could include commercial timber harvests, as appropriate, to meet landscape objectives. All commercial 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, tree planting may be required to meet stocking objectives, primarily in the spruce-beetle-impacted stands where seed production is greatly reduced. Regeneration harvests may also be needed in other vegetation zones to meet long-term forest sustainability objectives. Commercial harvests could occur in all forested vegetation zones except piñon-juniper. Up to approximately 55,780 acres of commercial harvest would be on national forest system lands and 610 acres would be on BLM lands. Up to about 2,260 acres of landings would be needed across commercial harvest acres. Landings, skid trails, and old temporary road prisms from previous harvests would be re-used as much as possible to minimize additional disturbance.

Up to approximately 64,725 acres of vegetation treatments would be focused on non-commercial treatments as needed to restore or maintain desirable stand structure, increase stand resiliency, and improve landscape patchiness and seral diversity to meet a variety of resource objectives as described in the purpose and need. Activities could include thinning smaller diameter trees, implementing prescribed broadcast burns, and reducing conifer encroachment in selected meadows and along selected riparian reaches. Willows may be planted in suitable riparian areas. Tree thinning could be done by hand (chainsaws) or with a mechanized masticator. Heavy equipment would only be used on slopes less than forty percent and outside of specified water influence zones and riparian areas.

Prescribed broadcast burning could also be used to reduce slash in some upland vegetation zones, primarily outside of suitable lynx habitat, or to meet specific silvicultural, wildlife habitat, or fuels objectives.

These activities could occur in all vegetation zones, Up to approximately 38,030 acres would be on national forest system lands and 26,695 acres would be on BLM lands.

This alternative would also relocate or re-align up to ten miles of national forest system road segments to improve watershed and aquatic conditions.

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 an area.

1.6 Decision Framework

Given the purpose and need, the responsible officials 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 (see appendix D) provide sufficient protection to minimize or eliminate adverse effects?

The La Garita Hills Restoration Project is not a Healthy Forest Restoration Act project and the Forest Service portion of this 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. After which, the BLM will issue a record of decision for activities approved on BLM lands. 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. Each record of decision will explain the rationale for the decision and disclose how the decision responds to the issues and moves toward desired conditions.

1.7 Public Involvement

The notice of intent to prepare an environmental impact statement was published in the Federal Register on October 17, 2014. The notice of intent asked for public comment on the proposal prior to November 17, 2014. In addition, as part of the public involvement process, a scoping notice was published in the *Valley Courier*, the newspaper of record on October 18, 2014; a scoping letter and updated scoping package were also mailed to ninety-five addresses. Eight comment letters were received, three of which were requests to stay on the mailing list for the project; the remaining five letters had one or more comments that needed to be considered.

The proposed project was originally scoped in May of 2013 in preparation for completing an environmental assessment. That scoping letter was mailed to approximately ninety-nine individuals, organizations, government agencies, and tribal contacts. A public meeting was held at the Saguache Ranger District Office on May 23, 2013. Twenty-seven letters or comment forms were received in response to scoping in 2013. Of those, two requested removal from the contact list, eleven had no comments but asked to be kept on the mailing list, five were supportive or had no concerns, and nine had potential issues or concerns that may need to be addressed or considered. The project has also been listed on the Rio Grande National Forest schedule of proposed actions since July 2013.

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

1.8 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 is intended to ensure all key issues are identified and all relevant issues are appropriately addressed in the analysis. Issues were separated into two groups: key and non-key. The issue analysis process is documented and is part of the project record. Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-key issues were identified as follows:

- Outside the scope of the proposed action;
- Already decided by law, regulation, land management plan, or other higher level decision;
- Irrelevant to the decision to be made;
- Conjectural and not supported by scientific or factual evidence; or
- Concerns that the interdisciplinary team felt would be 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 identified two key issues and their measurement indicators for the analysis. Issue statements and indicators selected were used to develop additional action alternatives, focus the analysis, and compare potential effects of each alternative.

Issue 1: Effects on Soil and Watersheds

The indicators for issue 1 are as follows:

- Total acres treated;
- Percent area surface disturbance by watershed;
- Miles of old non-system roads re-opened;
- Miles of road maintenance or reconstruction;
- Increase in connected disturbed area; and
- Acres of activities on sensitive soils.

Issue 2: Effects on Canada Lynx Habitat

The indicators for issue 2 are as follows:

- Change in acres of suitable to temporarily unsuitable lynx habitat in the Carnero and Four-Mile to La Garita (Four Mile) lynx analysis units; and
- Acres treated that contribute to the exemptions and exceptions in Southern Rockies Lynx Amendment.

1.9 Other Related Efforts

There are no other known projects or efforts currently underway that would affect the proposed actions or the decision to be made.

2.0 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, improve habitat for some species of terrestrial or aquatic wildlife species, and improve watershed condition, especially in the Middle Fork Carnero priority watershed. 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:

- Complete additional road maintenance on several roads to reduce erosion and improve watershed condition (see the *Hydrology* section);
- Increasing aspen and willow regeneration in Carnero watersheds to improve beaver habitat;
- Reduce the potential for uncharacteristically large or high severity wildfires that could adversely Rio Grande cutthroat trout and other wildlife habitats (see Fisheries and Wildlife sections);
- Continue to implement Rio Grande cutthroat trout habitat restoration (see the *Fisheries* section);
- Activities to treat conifer encroachment in riparian areas, meadows, and to reduce conifer density, diversifying forest structural or compositional in dry mixed conifer and ponderosa pine could improve habitat for several management indicator and migratory bird species (see the *Wildlife* section) over the mid to long term.

Chapter 2. Alternatives, Including the Proposed Action

2.1 Introduction

This chapter describes and compares the alternatives considered for the La Garita Hills Restoration Project. It includes a description and map of each action alternative considered in detail. This section also compares the environmental effects of each alternative (see chapter 3) and identifies the differences between them. This provided a basis for choice among options by the responsible officials and the public.

2.2 Alternatives Considered in Detail

The Forest Service and BLM developed four alternatives, including the no action and proposed action, in response to issues raised by the public. Alternatives considered but dropped from detailed study are also discussed briefly in section 2.4. Collectively, these alternatives represent a reasonable range of alternatives given the site-specific situation, purpose and need, and issues for this project. Table 2 compares the four alternatives by their effects to resources. For the action alternatives (alternatives 2, 3, and 4), definitions for each described treatment type can be found in appendix A and additional descriptions of actions that could be implemented under different stand conditions can be found in the *Silviculture-Prescribed Fire Guidelines* in appendix D.5.

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 analysis 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.

Under the no action alternative, natural processes would continue. In spruce-beetle or other insect-impacted areas, no salvage of dead or dying trees would occur beyond those areas open to permitted firewood cutting. Effects on wildlife habitat would be variable. Species that benefit from increased snags would have habitat increase, those that rely on mature, late succession forest structure may have reduced habitats. Red squirrel populations are expected to decrease due to the loss of mature cone bearing Engelmann spruce. Seedlings would not be planted to reforest under-stocked stands or to improve stand species composition though aspen sprouting is expected to increase. Over time, tons per acre of large diameter fuels would continue to increase as trees die and fall. Hazard tree removal to protect infrastructure would be done as part of maintenance activities by road crews, recreation facility managers, livestock permittees, or others on an ongoing basis. System roads would be maintained as funding allowed which would likely delay road maintenance needs that could improve watershed condition or aquatic habitats.

In other vegetation zones, no additional thinning or prescribed burning activities would be implemented to reduce stand density, promote forest health and resiliency, or address the discrepancies in vegetation structural stages, species composition, or seral stages across the landscape. Wildlife habitat improvement projects would not occur. Wildland urban interface fuels reduction treatments near private lands would not occur and as conifer density continues to increase, the potential for an uncharacteristically large or intense wildfire also increases over time which could have adverse effects to soils, watersheds, and several terrestrial and aquatic wildlife species. Declines in landscape patchiness and early seral species in riparian areas would continue as conifer encroachment into meadows and riparian continues.

Conversely, lack of additional management activities would also reduce the potential for watershed disturbance or increase in soil erosion resulting from re-opening and using closed system roads and old, non-system roads, or construction of new temporary road segments in support of timber harvest activities. There would also be less potential for increases in weeds or invasive species away from open roads. There would also be no additional effects on lynx habitat.

Activities Common to all Action Alternatives

Each action alternative was designed to be viable, consistent with land management plan direction, meets the purpose and need and is capable of moving resources toward desired conditions, at least to some degree. The action alternatives propose varying acres of commercial and non-commercial treatment activities to adaptively move toward desired conditions that would occur within the defined areas as shown on the alternative maps (larger scale maps are available on the project webpage: <http://www.fs.usda.gov/projects/riogrande/landmanagement/projects>).

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, the silviculture-prescribed fire guidelines, monitoring elements, and adaptive management triggers (see appendix D) would be used to minimize adverse effects and protect resources, including limiting effects on suitable lynx habitat (see silviculture-prescribed fire guidelines appendix D.5).

Common management activities include:

- Commercial timber harvests including salvage and other silvicultural treatments using ground-based equipment on lands identified as suitable for timber harvest in the land management plans; 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;
- Tree and willow regeneration including both tree and willow planting and natural regeneration;
- Thinning non-commercial sized conifer trees using chainsaws or masticators (in lynx habitat prescriptions would be modified to retain understory cover for hares);
- Prescribed burning, including broadcast burning (generally outside of suitable lynx habitat) and pile burning to reduce activity slash or meet other objectives;
- Cutting encroaching conifers out of selected upland meadows using chainsaws or masticators to maintain landscape patchiness;
- Using chainsaws to cut conifers out of selected riparian areas in order to favor willows and aspen; and

- Relocate or re-align up to ten miles of national forest system road segments to improve watershed condition, reduce road maintenance needs, and/or reduce sedimentation. These segments include, but would not be limited to, National Forest System Roads 673, 708, and 720.

There would be no changes to the existing transportation system.

- Roads currently closed to public travel would remain closed;
- No new permanent system roads would be constructed under any action alternative, but temporary roads would be needed for commercial timber harvest activities;
- All temporary roads and old relocated road segments would be closed and rehabilitated; road closure methods would be determined based on site conditions but could include gates, boulders, berms, down trees, fences, and/or recontouring.

Activities would occur over a ten to fifteen year time frame.

Alternative 2 - Proposed Action (*preferred alternative*)

Figure 3 shows the proposed treatment activity areas and road system needed for hauling timber products under alternative 2. This alternative could implement management activities on up to 121,115 acres with up to 93,810 acres on forest service lands and 27,305 acres on BLM lands.

Up to approximately 56,390 acres could include commercial timber harvests, as needed, to meet landscape objectives. Up to approximately 55,780 acres of commercial harvest would be on national forest system lands and 610 acres would be on BLM lands. Up to about 2,260 acres of landings would be needed across commercial harvest acres. Landings, skid trails, and old temporary road prisms from previous harvests would be re-used as much as possible to minimize additional disturbance.

For alternative 2, commercial harvest treatments by vegetation zone, potential treatment acres, and land management agency are described below:

Salvage harvest (regeneration): Harvest dead and dying spruce trees greater than approximately 8 inches in diameter at breast height in spruce-beetle-affected stands to recover economic value and protect infrastructure.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir	20,320	0	20,320
aspen mix	485	0	485

Sanitation/salvage harvest:² Intermediate harvest to improve stand health by reducing the spread or levels of insects or diseases and to harvest dead and dying trees to recover economic value and protect infrastructure.

² To move toward desired conditions, there is a need to improve structural stage or seral stage distribution in some watersheds by increasing the acres in the seedling/sapling stage, primarily in aspen and Douglas-fir/mixed conifer areas. A regeneration harvest may be implemented in a portion of these proposed harvest areas. See the Silviculture-Prescribed Fire Guidelines, appendix D.5 for additional information.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-mixed conifer	10,010	0	10,010
Douglas-fir/mixed conifer	50	0	50

Intermediate sanitation/salvage harvest: ² Selectively harvest trees in a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives including salvage of dead and dying trees to recover economic value in stands with insect activity.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	11,005	0	11,005

Intermediate harvest: ² Selectively harvest trees across a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	2,060	0	2,060
Douglas-fir/mixed conifer	10,850	65	10,915
ponderosa pine	1,000	545	1,545

Up to approximately 64,725 acres of vegetation treatments would be focused on non-commercial treatments needed to restore or maintain desirable stand structure, increase stand resiliency, and improve landscape patchiness and seral diversity to meet a variety of resource objectives. Activities could include thinning smaller diameter trees, implementing prescribed broadcast burns to meet a variety of objectives, and reducing conifer encroachment in selected meadows and along selected riparian reaches. Heavy equipment would only be used on slopes less than forty percent and outside of specified water influence zones. These activities could occur in all vegetation zones. Up to approximately 38,030 acres would be on National Forest System lands and 26,695 acres would be on BLM lands.

Prescribed broadcast burning could also be used to reduce slash in some vegetation zones or to meet specific silvicultural, wildlife habitat, or fuels objectives.

For alternative 2, non-commercial treatments by vegetation zone, potential treatment acres, and land management agency are described below.

Timber stand improvement: Thin selected trees generally less than 8 to 9 inches maximum diameter at breast height to meet stand objectives. Objectives may include improving species composition and tree quality, and reducing the number of trees per acre to meet forest health or wildlife habitat objectives. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	210	35	245
Douglas-fir/mixed conifer	305	0	305
ponderosa pine	365	0	365

Timber stand improvement/prescribed broadcast burn – low severity: Use prescribed burning alone or in conjunction with timber stand improvement thinning to maintain selected stands in an open, low density condition to meet objectives. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-mixed conifer	50	0	50
aspen mix	350	270	620
Douglas-fir/mixed conifer	4,090	1,125	5,215
ponderosa pine	3,385	3,140	6,525
piñon-juniper	315	11,050	11,365
mountain shrub	0	580	580

Prescribed broadcast burning – low severity: In selected stands with poor access or where mechanical treatments are not consistent with land management plans, prescribed broadcast burning could be used to meet a variety of objectives, depending on the area. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir/spruce-mixed conifer	295	0	295
aspen mix	130	15	145
Douglas-fir/mixed conifer	1,745	180	1,925
ponderosa pine	1,500	1,475	2,975
piñon-juniper	995	4,305	5,300
mountain shrub	40	520	560
meadows	7,355	3,520	10,875

Prescribed broadcast burning – mixed-severity: In selected stands with limited access or where mechanical treatments are not consistent with land management plans, mixed severity broadcast burning would be used to meet a variety of objectives, depending on the area. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, increasing aspen, and/or re-invigorating shrubs, grasses, and forbs.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir/spruce mix conifer	445	0	445
aspen mix	1,795	0	1,795
Douglas-fir/mixed conifer	5,425	190	5,615
meadows	55	0	55

Reduce conifer encroachment: To maintain landscape diversity in upland meadows, use hand felling or a masticator to cut conifer trees encroaching into meadow openings. Along selected streams in riparian areas, use hand felling to cut selected conifer trees. Slash treatment would be lop and scatter.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
meadows	8,410	290	8,700
riparian areas	770	0	770

Alternative 3

Proposed potential treatment activity areas and road system needed for hauling timber products under this alternative are shown in Figure 4. Under this alternative, up to 88,750 acres of vegetation management treatment activities could be implemented to meet project objectives with up 57,270 acres on forest service lands and 31,030 acres on BLM lands.

Up to approximately 18,155 acres could include commercial timber harvests as needed to meet landscape objectives. Commercial salvage harvest in spruce-beetle-impacted areas would be limited to a corridor within 300 feet on each side of open roads or other existing infrastructure. Up to approximately 17,515 acres of commercial harvest would be on national forest system lands and 640 acres would be on BLM lands.

No reforestation efforts would be implemented in spruce-beetle-impacted areas to meet desired stocking objectives in the spruce beetle affected vegetation zones, though it is likely aspen sprouting will occur in many areas. Up to about 740 acres of landings would be needed across commercial harvest acres. Landings, skid trails, or temporary roads from previous harvests would be re-used as much as possible to minimize additional disturbance.

Under alternative 3, commercial harvest treatments by vegetation zone, potential treatment acres, and land management agency are described below:

Salvage harvest (regeneration): Harvest dead and dying spruce trees in spruce-beetle-affected stands to protect infrastructure and maintain public safety along open roads.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir	2,780	0	2,780
aspen mix	1,135	30	1,165
spruce- mixed conifer	945	0	945

Sanitation/salvage harvest:³ Intermediate harvest to both improve stand health by reducing the level of or the spread of insects or diseases and to harvest dead and dying trees to recover economic value and protect infrastructure.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-mixed conifer	0	0	0
Douglas-fir/mixed conifer	0	0	0

Intermediate sanitation/salvage harvest:³ Selectively harvest trees in a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives including salvage of dead and dying trees to recover economic value in stands with insect or disease activity. Slash treatment in these stands could also include broadcast burning where approved.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	0	0	0

Intermediate harvest:³ Selectively harvest trees in a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives. Slash treatment in these stands could also include broadcast burning where approved.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	850	0	850
Douglas-fir/mixed conifer	10,805	65	10,870
ponderosa pine	1,000	545	1,545

Up to approximately 70,275 acres of vegetation treatments would be focused on non-commercial treatments needed to restore or maintain desirable stand structure, increase stand resiliency, and improve landscape patchiness and seral diversity. Activities could include thinning smaller diameter trees, implementing prescribed broadcast burns to meet a variety of objectives, and reducing conifer encroachment in selected meadows and along selected riparian reaches. Heavy equipment would only be used on slopes less than forty percent and outside of specified water influence zones. These activities could occur in all vegetation zones. Approximately 39,885 would be on national forest system lands and 30,390 would be on BLM lands.

Prescribed broadcast burning could also be used to reduce slash in some vegetation zones or to meet specific silvicultural, wildlife habitat, or fuels objectives where approved.

For alternative 3, non-commercial treatments by vegetation zone, potential treatment acres, and land management agency are described below:

Timber stand improvement: Thin selected trees generally less than 8 to 9 inches maximum diameter at breast height to meet stand objectives. Objectives could include reducing natural or

³ To move toward desired conditions, there is a need to improve structural stage or seral stage distribution in some watersheds by increasing the acres in the seedling/sapling stage, primarily in aspen and Douglas-fir/mixed conifer areas, a regeneration harvest may be implemented in a portion of these proposed harvest areas. See silviculture-prescribed fire guidelines, appendix D.5 for additional information.

activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	25	0	25
Douglas-fir/mixed conifer	305	0	305
ponderosa pine	315	0	315

Timber stand improvement/prescribed broadcast burn – low severity: Use prescribed burning alone or in conjunction with timber stand improvement thinning to maintain selected stands in an open, low density condition to meet objectives. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce- mixed conifer	50	0	50
aspen mix	205	255	460
Douglas-fir/mixed conifer	5,625	1,350	6,975
ponderosa pine	3,475	3,265	6,740
piñon-juniper	640	11,305	11,945
mountain shrub	0	580	580

Prescribed broadcast burning – low severity: In selected stands with poor access or where mechanical treatments are not consistent with land management plans, prescribed broadcast burning could be used to meet a variety of objectives, depending on the area. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, increasing aspen, and/or re-invigorating shrubs, grasses, and forbs.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir/ spruce-mixed conifer	310	0	310
aspen mix	130	15	145
Douglas-fir/mixed conifer	1,860	325	2,185
ponderosa pine	1,525	1,525	3,050
piñon-juniper	1,535	5,015	6,550
mountain shrub	40	520	560
meadows	7,205	5,190	12,395

Prescribed broadcast burning – mixed-severity: In selected stands with limited access or where mechanical treatments are not consistent with land management plans, broadcast burning would be

used to meet a variety of objectives, depending on the area. Objectives could include reducing natural fuel loading, decreasing the number of conifer seedlings, site preparation for natural regeneration, increasing canopy base height, decreasing canopy cover in a portion of the mid to overstory tree canopy, increasing snag numbers, improving wildlife habitat, increasing aspen, and/or re-invigorating shrubs, grasses, and forbs.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir/ spruce-mixed conifer	415	0	415
aspen mix	1,480	140	1,620
Douglas-fir/mixed conifer	5,610	495	6,105
meadows	0	0	0

Reduce conifer encroachment: To maintain landscape diversity in upland meadows, use hand felling or a masticator to cut conifer trees encroaching into meadow openings. Along selected streams in riparian areas, use hand felling to cut selected conifer trees. Slash treatment would be lop and scatter.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
meadows	8,455	410	8,865
riparian areas	680	0	680

Alternative 4

Proposed potential treatment activity areas and road system needed for hauling timber products under this alternative are shown in Figure 5. Under this alternative, up to 85,855 acres of vegetation management treatment activities could be implemented to meet project objectives with up 58,505 acres on forest service lands and 24,350 acres on BLM lands.

Up to approximately 37,795 acres could include commercial timber harvests as needed to meet landscape objectives. All commercial timber harvest would be conducted with ground-based equipment on slopes less than forty percent. Up to approximately 37,185 acres of commercial harvest would be on national forest system lands and 610 acres would be on BLM lands. Up to about 1,515 acres of landings would be needed across commercial harvest acres. Landings, skid trails, and temporary road prisms from previous harvests would be re-used as much as possible to minimize additional disturbance.

For alternative 4, commercial harvest treatments by vegetation zone, potential treatment acres, and land management agency are described below:

Salvage harvest (regeneration): Harvest dead and dying spruce trees in spruce beetle affected stands to recover economic value and protect infrastructure.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir	16,845	0	16,845
aspen mix	210	0	210

Sanitation/salvage harvest: ⁴ Intermediate harvest to both improve stand health by reducing the spread of insects or diseases and to harvest dead and dying trees to recover economic value and protect infrastructure.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-mixed conifer	6,780	0	6,780
Douglas-fir/mixed conifer	50	0	50

Intermediate sanitation/salvage harvest: ⁴ Selectively harvest trees in a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives including salvage of dead and dying trees to recover economic value in stands with insect activity. Slash treatment in these stands could also include broadcast burning in stands where approved.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	5,205	0	5,205

Intermediate harvest: ⁴ Selectively harvest trees in a range of diameter classes, depending on stand conditions, to reduce overall stand density and improve stand growth and health to meet a variety of resource objectives. Slash treatment in these stands could also include broadcast burning in stands where approved.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	1,775	0	1,775
Douglas-fir/mixed conifer	5,770	65	5,835
ponderosa pine	550	545	1,095

Up to approximately 45,060 acres of vegetation treatments would be focused on non-commercial treatments needed to restore or maintain desirable stand structure, increase stand resiliency, and improve landscape patchiness and seral diversity. Activities could include thinning smaller diameter trees, implementing prescribed broadcast burns to meet a variety of objectives, and reducing conifer encroachment in selected meadows and along selected riparian reaches. Heavy equipment would only be used on slopes less than forty percent and outside of specified water influence zones. Approximately 21,320 acres would be on national forest system lands and 23,740 acres would be on BLM lands.

Prescribed broadcast burning could also be used to reduce slash in some vegetation zones or to meet specific silvicultural wildlife habitat, or fuels objectives, as approved.

For alternative 4, non-commercial treatments by vegetation zone, potential treatment acres, and land management agency are described below:

Timber stand improvement: Thin selected trees generally less than 8 to 9 inches maximum diameter at breast height to meet stand objectives. Objectives may include improving species

⁴ To move toward desired conditions, there is a need to improve structural stage or seral stage distribution in some watersheds by increasing the acres in the seedling/sapling stage, primarily in aspen and Douglas-fir/mixed conifer areas, a regeneration harvest may be implemented in a portion of these proposed harvest areas. See Silviculture-Prescribed Fire Guidelines, appendix D.5 for additional information.

composition and tree quality, improving wildlife habitat, and reducing the number of trees per acre to meet forest health objectives. Thinning could be by mastication or hand felling with chainsaws. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
aspen mix	25	0	25
Douglas-fir/mixed conifer	205	0	205
ponderosa pine	105	0	105

Timber stand improvement/ prescribed broadcast burn – low severity: Use prescribed burning alone or in conjunction with timber stand improvement thinning to maintain selected stands in an open, low density condition to meet objectives. Objectives could include reducing natural or activity fuels, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs. Thinning could be by mastication or hand felling with chainsaws. Slash treatment following hand thinning would primarily be lop and scatter. Hand piling and burning could be used infrequently to meet specific objectives.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-mixed conifer	50	0	50
aspen mix	340	265	605
Douglas-fir/mixed conifer	4,000	1,130	5,130
ponderosa pine	3,375	3,130	6,505
piñon-juniper	285	8,650	8,935
mountain shrub	0	560	560

Prescribed broadcast burning – low severity: In selected stands with poor access or where mechanical treatments are not consistent with land management plans, prescribed broadcast burning could be used to meet a variety of objectives, depending on the area. Objectives could include reducing natural fuel loading, decreasing the number of conifer seedlings, site preparation for natural regeneration, increasing canopy base height, improving wildlife habitat, and/or re-invigorating shrubs, grasses, and forbs.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-fir/ spruce-mixed conifer	30	0	30
aspen mix	135	15	150
Douglas-fir/mixed conifer	1,195	175	1,370
ponderosa pine	405	1,475	1,880
piñon-juniper	995	4,305	5,300
mountain shrub	15	520	535
meadows	2,275	3,225	5,500

Prescribed broadcast burning – mixed-severity burn: This activity is not proposed under this alternative.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
spruce-spruce mix conifer	0	0	0
aspen mix	0	0	0
Douglas-fir/mixed conifer	0	0	0
meadows	0	0	0

Reduce conifer encroachment: To maintain landscape diversity in grass meadows, use hand felling or a masticator to cut conifer trees encroaching into meadow openings. Along selected streams in riparian areas, use hand felling to cut selected conifer trees. Slash treatment would be lop and scatter.

Vegetation Zone	Forest Service acres	BLM acres	Total acres
meadows	7,135	290	7,425
riparian areas	750	0	750

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 likely 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 specific projects.

Elements of this adaptive strategy will include the iterative and integrated use of: forest plan standards and guidelines (appendix D.1) project design criteria (appendix D.2), the pre-implementation checklists (appendix D.4), key resource monitoring requirements (appendix D.6), the adaptive actions outlined in appendix D.7, and the silviculture-prescribed fire guidelines (appendix D.5).

Land management agencies use many measures to reduce or prevent negative impacts to the environment in the planning and implementation of management activities. The application of these measures begins at the project planning and design phase. On National Forest System lands, Forest Plan standards and guidelines and best management practices as incorporated in the Region 2 Watershed Conservation Practices Handbook (FSH 2509.25), are the first protection measures to be applied. Both of these sources are incorporated by reference. Relevant forest plan standards and guidelines are included in appendix D.1. Though Forest Plan requirements do not apply to BLM-managed lands, BLM is adopting the intent of the resource protection measures identified, as applicable to activities proposed on BLM lands, unless otherwise in conflict with the San Luis Valley Resource Management Plan.

In addition, other project design criteria have been included to reduce potential adverse effects. The project design criteria included in appendix D.2 have been found to be effective in reducing potential adverse impacts. Each project design criteria action would apply to all management activities, as appropriate.

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 specific 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 resource-specific pre-implementation checklists in appendix D.4 are considered draft and may be updated through the life of the project as part of the adaptive implementation and iterative learning process.

The *Silviculture-Prescribed Fire Guidelines* (appendix D.5) will be used as a summary guide for desired landscape conditions and provide sideboards for the silvicultural and prescribed burning options analyzed for each vegetation zone, including sideboards what silviculture activities are being proposed and their relationship to suitable lynx habitat. It was assumed that information in the vegetation layer would continue to be updated, which may result in some stands being re-classified into a different vegetation zone based on field sampled data; the guidelines identified would apply to each proposed treatment unit, as it is field verified.

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 appendix D.6.

Appendix D.7 lists the identified checkpoints and the primary adaptive strategies that would occur when specific conditions or situations are reached. These conditions focus both on key resources and the need to move toward desired conditions. The likelihood of a particular trigger situation being reached would vary by the Selected Alternative.

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).

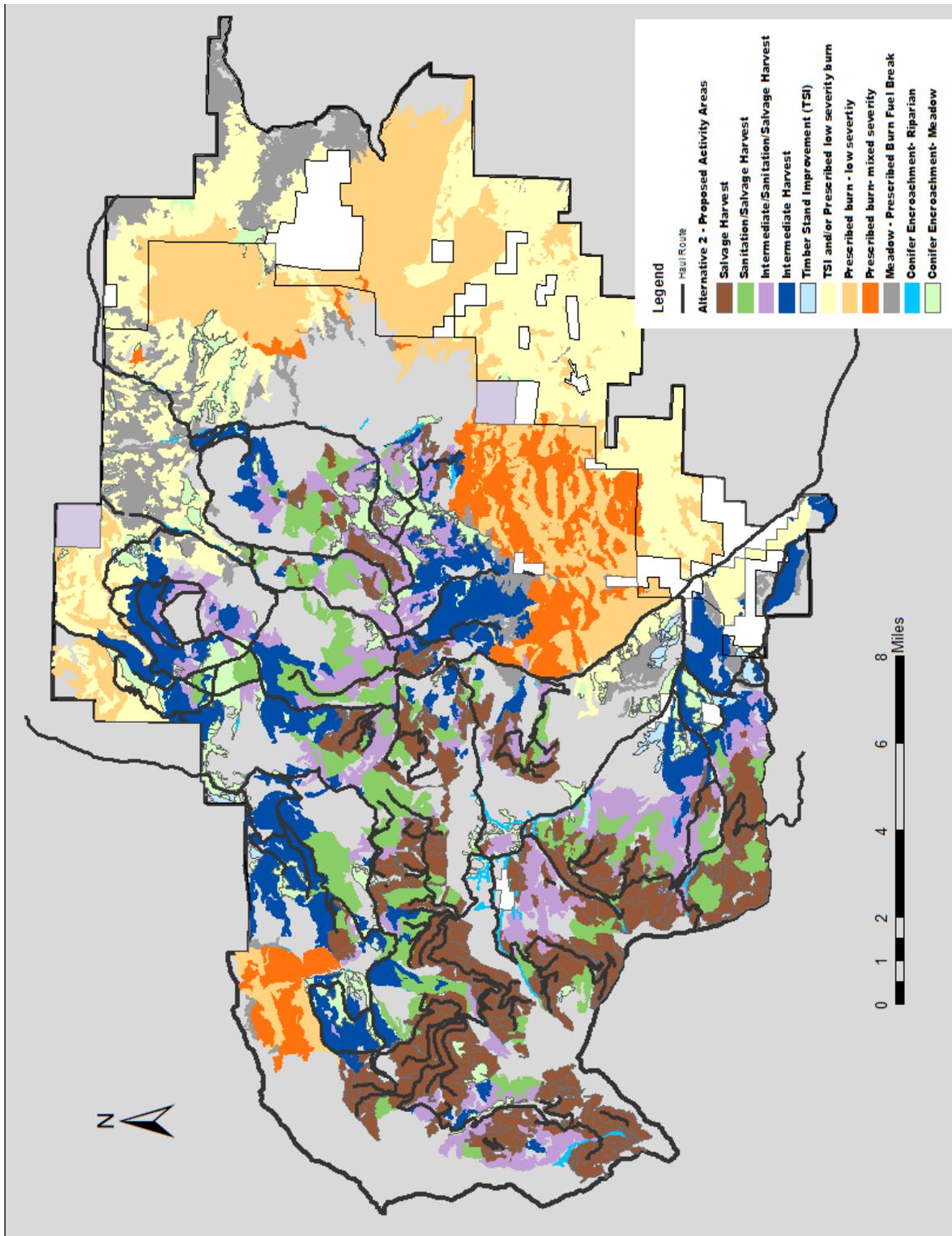


Figure 3. Proposed treatment activity areas, alternative 2.

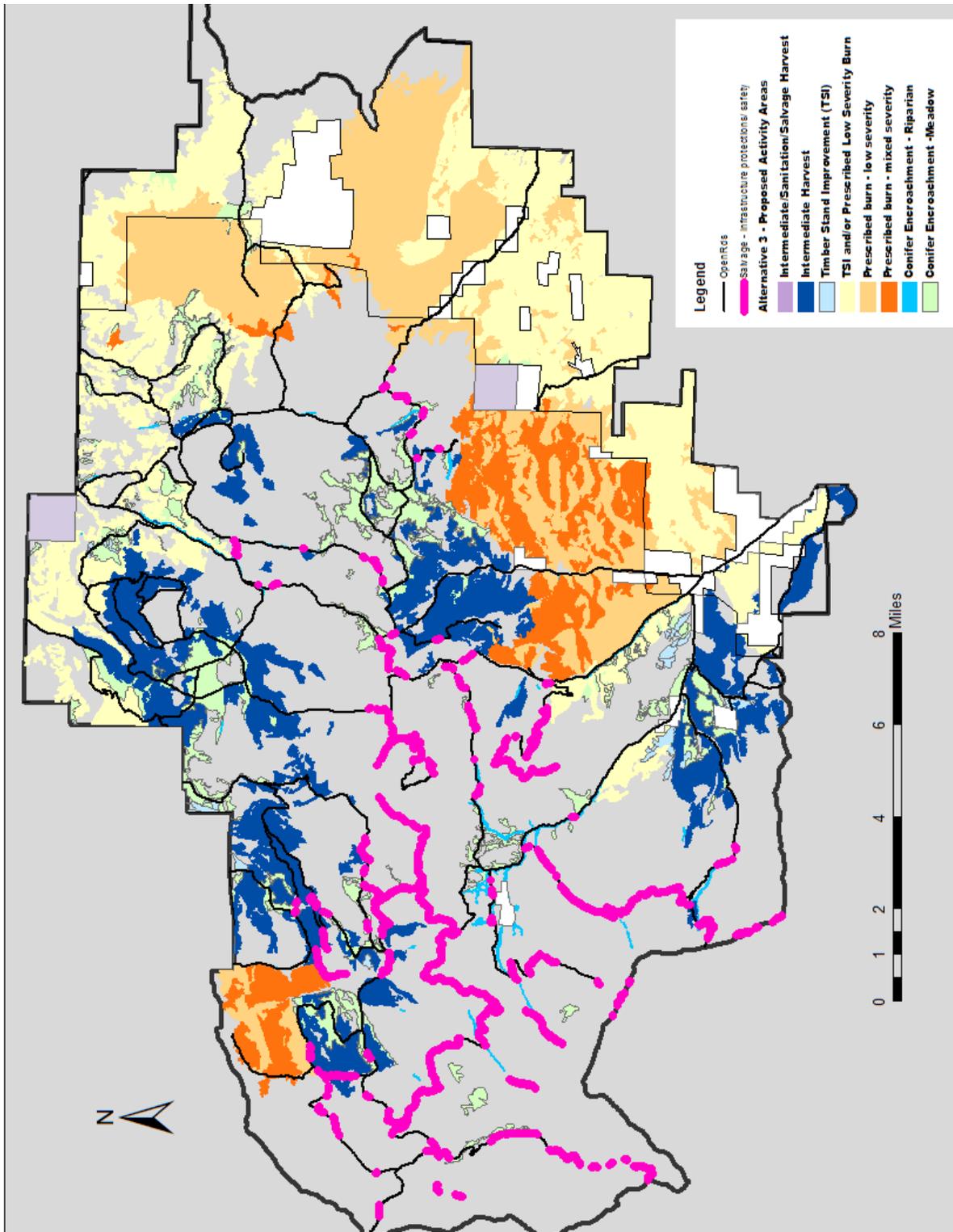


Figure 4. Proposed treatment activity areas, alternative 3.

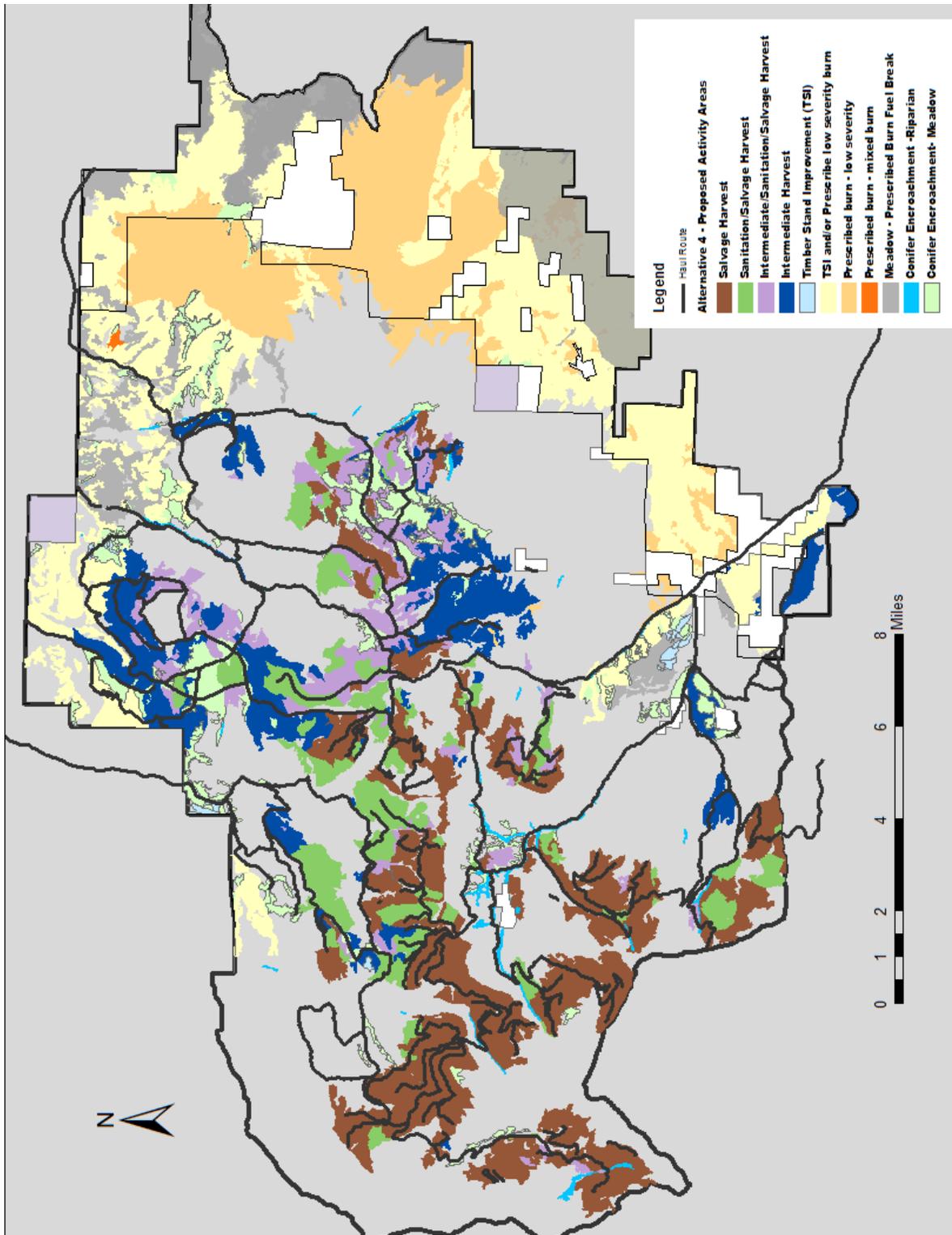


Figure 5. Proposed treatment activity areas, alternative 4.

2.3 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. Some of these alternatives may have been outside the scope of this project, duplicative of the alternatives considered in detail, determined to be components that would cause unnecessary environmental harm, or would not meet the purpose and need. Three other alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

- **Only remove hazard trees to protect infrastructure** – This alternative would not meet the purpose and need or other project objectives such as improving landscape resiliency and diversity in other vegetation types or increasing defensible space and reducing potential fire behavior near developed private lands adjacent to public land.
- **Mechanical treatments only in wildland urban interface areas with no temporary roads** – This alternative would not meet the purpose and need or other project objectives such as the recovery of economic value from dead and dying trees or improving landscape resiliency or diversity in the drier forest vegetation types.
- **Conduct restoration activities on up to 90,000 acres.** This alternative was the proposed action described in the Notice of Intent to prepare an EIS published in October 2014. As the analysis of the proposed action proceeded, it was determined that to more fully meet the purpose and need for improving or restoring forest and rangeland health, activities may need to occur on additional acres.

2.4 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. The table includes a comparison of how each alternative addressed the issues and resource indicators identified in chapter 1. A brief summary of the effects as related to each issue is also included below.

Table 2. Comparison of potential treatment activities by alternative and resource area.

Resource and Unit of Measure	Alt 1, No Action	Alt 2, Proposed Action	Alt 3	Alt 4
Forested acres not considered for any activity	134,272	34,697	68,602	66,087
Non-forested acres not considered for any activity	44,774 ^c	23,234	21,694	30,004
Spruce Beetle Recovery Focus				
Percent spruce-fir/ spruce-mixed conifer vegetation zones salvaged	3 – 4 (firewood)	73	13	56
Estimated acres planted	0	2,500	0	1,910

Resource and Unit of Measure	Alt 1, No Action	Alt 2, Proposed Action	Alt 3	Alt 4
Acres stocking met by advance or natural conifer regeneration	Natural recovery	18,520	3,665	14,330
Acres of aspen sprouting	Natural recovery	9,845	1,725	7,645
Acres salvage/sanitation - hazard tree treatment, infrastructure protection, improve firefighter safety	Minimum to protect infrastructure	30,865	5,390	23,885
Landscape Resiliency, Sustainability, Diversity Focus				
Acres commercial thinning to reduce density, diversify stands	0	25,525	13,265	13,910
Potential to increase landscape structural or seral diversity	None	Very high	High	High
Acres non-commercial thinning and/or prescribed burning	0	55,255	60,730	36,885
Acres conifer meadow encroachment reduced	0	8,700	8,865	7,425
Acres conifer riparian encroachment reduced	0	770	680	750
Wildland Urban Interface (WUI)				
Potential acres treated	0	23,035	25,795	21,524
Likelyl to meet WUI objectives	No	Yes	Yes	Partially
Provide Forest Products to Industry and Local Users				
Sawtimber volume (ccf)	0	225,000 to 450,000	62,000 to 124,000	183,000 to 365,000
Volume other products (ccf)	1,000/yr	100,000 to 149,000	20,500 to 41,000	61,000 to 121,000
Road System (miles)¹				
Open roads used and maintained	30.0 ^b	208.6	108.8	201.1
Closed National Forest System Roads maintained	0	76.2	11.6	74.0
Old non-system (temporary) roads re-used	0	52.2	24.0	47.2
Watershed Condition¹				
Number of HUC 6 watersheds with potential to reach 15% disturbance level of concern	0	7	1	3
Number of HUC 7 sub-watersheds of concern with potential to reach 10% disturbance level	0	3	0	2
Potential to temporarily increase connected disturbed area - road-stream crossings	No change	Highest potential	Moderate potential	Moderate to high potential
Potential to improve Middle Fork Carnero priority watershed	None	High	Moderate	High
Soil Resources (acres)¹				

Resource and Unit of Measure	Alt 1, No Action	Alt 2, Proposed Action	Alt 3	Alt 4
Timber harvests – high erosion potential soils	0	27,465	8,100+	17,610
Prescribed broadcast burns – high erosion potential soils	0	23,215	18,830	12,850
Wildlife and Fisheries				
<u>Federally listed threatened, endangered, proposed species</u> <i>Southwestern willow flycatcher</i> <i>Wolverine</i>	Southwest willow flycatcher – No effect Wolverine – No effect	Southwest willow flycatcher – may affect, not likely to adversely affect; Wolverine – no jeopardy	Southwest willow flycatcher – may affect, not likely to adversely affect; Wolverine – no jeopardy	Southwest willow flycatcher – may affect, not likely to adversely affect; Wolverine – no jeopardy;
<i>Canada lynx – BLM (LCAS)^d</i>	Lynx – No effect	May affect; not likely to adversely affect;	May affect; not likely to adversely affect;	May affect; not likely to adversely affect;
<i>Canada lynx – FS (SRLA)^e</i>	Lynx – No effect	May affect; likely to adversely affect;	May affect; likely to adversely affect	May affect; likely to adversely affect
Lynx - Forest-wide caps - Acres contributed to SRLA exemptions & exceptions ¹	VEG S5 -7,284 ac VEG S6-2,879 ac <i>Remaining as of 7/2016</i>	VEG S5 – 6,484 VEG S6 – 2,629	VEG S5 -6,287 VEG S6 – 2,829	VEG S5 -6,784 VEG S6 – 2,729
Maximum potential suitable lynx habitat acres treated that would contribute to SRLA exemptions & exceptions ¹	Spruce beetle salvage – 0; Intermediate mixed conifer harvests – 0; Noncommercial activities - 0	Spruce beetle salvage – 19,893; Intermediate mixed conifer harvests – 30,492; TSI/Prescribed burning – 10,572	Spruce beetle salvage – 4,080; Intermediate mixed conifer harvests – 11,626; TSI/Prescribed burning – 9,971	Spruce beetle salvage – 16,442; Intermediate mixed conifer harvests – 17,179; TSI/Prescribed burning – 2,785
Lynx analysis unit (LAU) caps - Acres contributed to SRLA exemptions & exceptions	VEG S5 - 39	VEG S5 – 800	VEG S5 - 997	VEG S5 - 500
<i>Carnero LAU - lynx habitat</i>				
% salvage harvest – spruce/fir	0	10	3	10
% harvest mixed conifer/aspens	0	23	14	29
Acres in stand initiation structural stage	VEG S1- 2,423 VEG S2 – 0	VEG S1- 10,836 VEG S2 – 6,718	VEG S1- 10,836 VEG S2 – 6,718	VEG S1- 10,836 VEG S2 – 6,718
<i>Four Mile LAU – lynx habitat</i>				
% salvage harvest – spruce/fir	0	26	5	21
% harvest mixed conifer/aspens	0	26	9	7
Acres in stand initiation structural stage	VEG S1- 10,526 VEG S2 – 0	VEG S1- 6,906 VEG S2 – 8,617	VEG S1- 6,906 VEG S2 – 8,617	VEG S1- 6,906 VEG S2 – 8,617
<u>Sensitive wildlife species</u> <i>FS - 20 species – habitat present</i> <i>BLM -3 species – habitat present</i>	23 species - No Impact.	8 species – No impact; 15 species - May Impact individuals, but not affect population viability	18 species – No impact; 5 species - May Impact individuals, but not affect population viability	8 species – No impact; 15 species - May Impact individuals, but not affect population viability

Resource and Unit of Measure	Alt 1, No Action	Alt 2, Proposed Action	Alt 3	Alt 4
<p><u>Management indicator species</u> <i>FS only – 8 terrestrial species</i> <i>Birds – 6 species</i> <i>Mammals – elk & deer</i> <i>Fish – RG cutthroat or proxies</i> – see sensitive species</p>	Birds, mammals, trout - No discernible change in populations at Forest level	Birds, elk & deer – short term displacement; some habitat improvement for deer & 5 birds All - No discernible change in populations at forest level	Birds, elk & deer –short term displacement; some habitat improvement for deer & 5 birds All - No discernible change in populations at forest level	Birds, elk & deer –short term displacement; some habitat improvement for deer & 5 birds All - No discernible change in populations at forest level
<p><u>Neotropical migratory land birds</u> – 4 species may be affected</p>	No effects	All - May impact individuals but no likely to result in loss of viability	All - May impact individuals but no likely to result in loss of viability	All - May impact individuals but no likely to result in loss of viability
Stream and Aquatic Habitat				
Potential risk to stream channel stability and riparian health	Low	Moderate	Low	Moderate
Scenic Resources				
Effect on scenic resources	No effect	Most activities - short-term; Salvage- longer-term	Most activities - short-term; Salvage- less effects	Most activities - short-term; Salvage- longer-term
Sensitive Plant Species				
Sensitive plant species- FS -11 species & BLM - 3 species with potential habitat	No impacts	No impact to 4 species; 12 species -may adversely impact Individuals, no trend toward loss of viability	No impact to 4 species; 12 species -may adversely impact Individuals, but no trend toward loss of viability	No impact to 4 species; 12 species -may adversely impact Individuals, no trend toward loss of viability
Rangeland Resources and Noxious Weeds/Invasive Plants				
Rangeland management operations	Short-term – no impact; Long-term – declining range health; most down and dead trees	Short-term – some impact; Long-term – improved range health	Short-term – some impact; Long-term – mixed more dead and down trees	Short-term – some impact; Long-term – improved range health
Risk of noxious weed/ invasive plant establishment / expansion	Low	Moderate	Low - moderate	Moderate
Recreation				
Recreational impacts – developed	No effect	Occasional	Low	Occasional
Recreational impacts – dispersed	Some effect – falling and down trees in spruce	Some effects in activity areas	Some effects in activity areas	Some effects in activity areas
Economics				
Net present value	-\$390,515	-\$6,030,155	-\$6,064,153	-\$5,512,283
Benefit/cost ratio	0	0.25	0.07	0.23
Potential to benefit local economies	No potential	Most potential	Some potential	Intermediate potential

Resource and Unit of Measure	Alt 1, No Action	Alt 2, Proposed Action	Alt 3	Alt 4
Heritage Resources				
Potential risk to identified and unidentified cultural resources	Increased risk if large wildfire occurred	Low to moderate due to mitigation	Low to moderate due to mitigation	Low to moderate due to mitigation
Air Quality				
Impacts to local air quality	No effect	Minor – localized, short term	Minor – localized, short-term	Minor – localized, short-term
<p>^a Firewood cutting of standing dead trees is permitted within three hundred feet of open roads. A value of one hundred fifty feet was used to estimate acres affected, since many areas are not accessible due to topography and not all acres adjacent to open roads are forested.</p> <p>^b Roads 41G, 671.1A,675,676,690.2A,710, and 730 are maintained annually in cooperation with Saguache County; other open roads are usually maintained at seven-year intervals;</p> <p>^c Includes riparian acres typed as non-forest.</p> <p>^d Management of lynx habitat on BLM lands follows the <i>Lynx Conservation Assessment and Strategy</i> (2013) recommendations/requirements</p> <p>^e Management of lynx habitat on FS lands is under the 2008 Southern Rockies Lynx Amendment which amended the Forest Plan</p> <p>¹These values were used as resource indicators for issue statements.</p>				

The section below compares each alternative in light of the issue statements. The two issues identified for this project are:

Issue 1: Effects on soils and watersheds

Issue 2: Effects on Canada lynx habitat.

As required, the no action alternative was evaluated as a basis of comparison the effects of the proposed action and other alternatives. The key issues developed in response to scoping were used to develop alternatives 3 and 4. Alternative 3 was primarily developed in response to issue 2 and proposed reducing timber harvest in most high quality and lower quality lynx habitat except within three hundred feet of open roads or to protect other infrastructure. Alternative 3 also responded to issue 1, since it reduced timber harvest acres in lynx habitat. Alternative 4 was also developed to address both issues, but to a lesser extent than alternative 3. Alternative 4 offered opportunities to meet more of the purpose and need, across the analysis area by focusing proposed activities in areas that had been previously harvested and also dropped proposed mixed severity prescribed burns in the Colorado Roadless Areas, including wildland-urban interface zone adjacent to the private land on the southeasterly corner of the analysis area.

Alternative 1- No Action

Issue 1: Effects on soils and watersheds –Alternative 1 would best meet this issue, at least in the short term. No additional ground-disturbing activity would occur. Any areas with compacted soils that may be affecting site productivity would continue to improve slowly over time.

The effects of spruce mortality could alter water flows in the watersheds with a high proportion of Engelmann spruce, but since overall stream health is good and stream banks are generally stable, though there are small stream segments that exhibit bank alteration, hummocking in wet areas, or sedimentation from adjacent roads (see Hydrology and Fisheries sections). Where stream banks and riparian areas are heathy, watersheds would not likely be greatly impacted. However, most perennial streams and riparian areas are considered to be in fair to good condition with an upward improving

trend in most areas which would increase the likelihood of fewer adverse effects in high spruce mortality areas. Reduction in transpiration due to spruce mortality could potentially increase water quantity in some watersheds with a high proportion of mature Engelmann spruce in heavy precipitation years; standing live or dead and down trees would continue to intercept precipitation; growth of understory vegetation would increase as water and light increases. Due to funding limitations, road maintenance would occur infrequently on most roads unless a major problem occurred, which would limit the amount of attention that could be devoted to correcting existing erosion problems.

Opportunities to complete road maintenance activities needed to improve watershed condition in the Middle Fork Carnero would occur when additional funds become available. No additional vegetation management activities would be implemented to increase aspen in this watershed; however, there might be some increases due to the reduction in canopy cover due to the spruce mortality. No additional connected disturbed area would be added to any of the watersheds. As trees fall and fuel loading increases in high spruce mortality areas, the potential for a future large, high-severity wildfire would increase, particularly since the fire would likely occur during dry conditions.

In other vegetation zones, increasing tree densities and ladder fuels would continue to increase the potential for an uncharacteristically large wildfire. A large fire burning at high severity or high intensity would likely be detrimental to both soils and watershed condition.

Issue 2: Effects on Canada lynx habitat – In spruce beetle affected stands, the bark beetle mortality has shifted an estimated 6.2 and 18.1 percent of the Carnero and Four Mile lynx analysis unit habitat into the temporarily unsuitable stand initiation structural stage condition. 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 on soil and watersheds – Alternative 2 would allow the most acres of disturbance considering all management activities on soils with high erosion potential. On national forest system lands, a high percentage of the proposed timber harvest units are on soils with a high erosion potential. However, best management practices and other project design criteria are effective and would minimize adverse effects during project implementation. Mechanized equipment would be limited to slopes less than forty percent and project design criteria such as skid trail spacing, returning slash to bare soil areas, if needed, would reduce the potential for adverse effects on all soils. If winter logging is used in some areas, disturbance would be less. Increases in compaction would be minimized by re-using skid trails, landings, and old temporary road prisms from previous harvests, where possible. Where necessary, subsoiling would be implemented following harvest to ensure Forest Plan standards are met. Unharvested acres would have similar effects as alternative 1.

On BLM lands, a portion of low severity prescribed broadcast burning (with or without timber stand improvement activities) could occur on erosive soils, though these activities would be of highest concerns on slopes greater than forty percent. Any mechanize thinning would be limited to slopes less than forty percent, which would minimize erosion potential. Hand thinning and low severity

prescribed burning could occur on steeper slopes. Since low severity burn prescriptions would not greatly affect underground plant structures and the soil surface organic matter would remain in place, the rapid recover of grasses and forbs should limit erosion potential along with any thinning slash that is left on the surface of the sites.

Activities associated with commercial timber harvests (skid trails, landings and burning large slash piles, use of system roads currently closed to motorized travel, construction or re-construction of temporary roads) have the greatest potential to increase watershed disturbance. To represent maximum possible disturbance levels, it was assumed that all acres proposed for commercial timber harvest would be logged and operations would occur during summer. Based on this maximum disturbance analysis, for alternative 2, potential watershed disturbance levels⁵ would remain well below the fifteen percent concern level in eleven of the eighteen HUC 6 watersheds in the analysis area. In the other seven HUC 6 watersheds, disturbance levels could potentially exceed the fifteen percent and the ten percent in the three HUC 7 sub-watersheds of concern (all on national forest system lands). However, the project pre-implementation process (Best Management Practices included as forest plan standards, project design criteria, the pre-implementation checklist, and the adaptive management triggers outlined in appendix D) would reduce the total acres that could be affected by timber harvest activities and would effectively ensure equivalent roaded area (ERA) is managed stay within concern levels and that individual riparian areas and streams are protected.

Even though this alternative would have a high potential to approach or reach disturbance concern levels in eleven of eighteen HUC 6 watersheds and in the three HUC 7 sub-watersheds of concern, since overall stream condition is good, it is expected that most proposed project activities could still be implemented in these watersheds, though additional field surveys, reviews, and monitoring would be needed as implementation proceeds in these watersheds to ensure overall stream and watershed health is protected. It was assumed this alternative would also have the highest potential to temporarily increase connected disturbed areas since it has the largest number of acres proposed for commercial timber harvest. Effects in unharvested acres would have similar to alternative 1.

This alternative would require the maintenance or reconstruction of the most miles of open road to facilitate hauling of commercial timber products. Road work can increase disturbance, but project design criteria and best management practices that protect the water influence zone and maintain infiltration buffers reduce adverse effects to water quality. This alternative would have a high potential to fix identified problems on several roads that could help improve watershed condition for the Middle Fork Carnero priority watershed.

The relocation/realignment of up to ten miles of road segments and rehabilitation of the old road segments would increase disturbance area. However, since the existing road segments are poorly located and often adversely affect streams or wet areas, relocating the road segments would improve conditions in the long-term (more than five years). Best management practices and rapid revegetation would minimize erosion and reduce any short or long-term adverse effects to stream condition.

⁵ Watershed disturbance levels were calculated using the equivalent roaded area method described in the Rio Grande National Forest land management plan. This method adds up acreage of surface disturbance and converts the disturbance to a "road equivalent" value. Roads are considered the most impactful management activity since they eliminate all vegetation and severely effect soil properties. As related to proposed activities for this analysis, timber harvest and associated activities are assigned a proportional rating depending on the type of harvest based on standardized values that convert activities, such as timber landings, and other harvest activities to equivalent roaded areas. This process makes it possible to compare different types of disturbances equally and to determine a disturbance level across an entire watershed.

Issue 2: Effects on Canada lynx habitat – Since Alternative 2 has the most acres proposed for a variety of management activities in lynx habitat, it would be expected to have the most potential effects on lynx habitat. Under the sideboard cap of a maximum of 250 acres of incidental impact to VEG S6 acres developed for this alternative, it 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 both lynx analysis units.

The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 2 would salvage the greatest number of acres in spruce-fir. This alternative could salvage up to 10 and 26 percent of the spruce-fir/spruce-mixed conifer vegetation zones in the Carnero and Four Mile lynx analysis units, respectively. Timber harvest activities in the lower quality aspen and Douglas-fir/mixed conifer lynx habitat could affect up to about 23 and 26 percent of the Carnero and Four Mile lynx analysis units, respectively. This alternative also proposes the largest acres of non-commercial (timber stand improvement and/or prescribed burning, riparian conifer encroachment reduction) activities in lynx habitat. These activities could be implemented on about 19 and 4 percent of the Carnero and Four Mile lynx analysis units, respectively. However, under the sideboard caps developed for this alternative, activities reducing seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at 800 total acres, which is less than proposed for alternative 3 and more than alternative 4 (see chapter 3, wildlife, Canada lynx subsection).

Though this alternative may negatively affect lynx habitat on the most acres, all effects would 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, 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-prescribed fire 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 analysis area.

Alternative 3

Issue 1: Effects on soil and watersheds – Alternative 3 would allow approximately forty-seven percent fewer acres of treatment activities on soils with a high erosion potential, compared to alternative 2. As with alternative 2, on national forest system lands, a high percentage of the timber harvest units are on soils with a high erosion potential, but the elimination of salvage and sanitation/salvage harvest treatments, except within three hundred feet of open roads or infrastructure would decrease potential effects on any soils with high erosion potential with a major spruce component. As described under alternative 2, best management practices and other project design criteria would minimize adverse effects during project implementation on soils with a high erosion potential by limiting mechanized equipment to slopes less than forty percent and project design criteria such as wide skid trail spacing, returning slash to bare soil areas, if needed, would reduce the potential for adverse effects on soils. If winter logging was implemented in some areas, soil disturbance would be less. Increases in soil compaction would be minimized by re-using skid trails, landings, and temporary road prisms from previous harvests where possible. Where necessary, subsoiling would be implemented following harvest to ensure Forest Plan standards are met. This

alternative would be most similar to alternative 1 in the spruce and spruce-mixed conifer vegetation zones and similar to alternative 2 in the drier vegetation zones.

Activities on BLM lands are in similar areas as alternative 2 but on about nineteen percent fewer acres. As described for alternative 2, effects of activities that would be of highest concerns on slopes greater than forty percent which would be limited by project design criteria. Effects of low severity prescribed burning or hand thinning that could occur on steeper slopes on soils with high erosion potential would be minimal.

This alternative would have the least potential to reach concern levels in any of the watersheds or sub-watershed of concern. As with alternative 2, to represent maximum possible disturbance levels for watersheds, it was assumed that all acres proposed for commercial timber harvest would be logged and operations would occur during summer. Based on this maximum disturbance analysis, for alternative 3, potential watershed disturbance levels would remain below the fifteen percent concern level in seventeen of the eighteen HUC (hydrologic unit code) 6 watersheds and below ten percent in all three HUC 7 sub-watersheds of concern (all on national forest system lands).

In the North Fork Carnero HUC 6 watershed, disturbance levels could potentially exceed fifteen percent disturbance based on the assumptions used. However, the project pre-implementation process (best management practices included as forest plan standards, project design criteria, the pre-implementation checklist, and the adaptive management triggers outlined in appendix D) would reduce the total acres that could be affected by timber harvest activities and would effectively ensure equivalent roaded area (ERA) is managed stay within concern levels for this watershed and that individual riparian areas and streams are protected. Since overall stream condition is good, it is expected that most proposed project activities could still be implemented in this watershed, though additional field surveys, reviews, and monitoring would be needed as implementation proceeds in to ensure overall stream and watershed health is protected. It was assumed this alternative would have a moderate potential to temporarily increase connected disturbed area, since it has the fewest number of acres proposed for commercial timber harvest.

This alternative would require the maintenance or reconstruction of the fewest miles of open road to facilitate hauling of commercial timber products and would not contribute to fixing identified problems on several roads that could help improve watershed condition for the Middle Fork Carnero priority watershed.

The relocation of up to ten miles of road segments and rehabilitation of the old road segments would increase disturbance area and would be the same as described for alternative 2.

Issue 2: Effects on Canada lynx habitat – Since alternative 3 has the fewest acres proposed for a variety of management activities in lynx habitat, it would be expected to have the least potential effects on lynx habitat. Under the sideboard cap of a maximum of 50 acres of incidental impact to VEG S6 acres developed for this alternative, it could have the least incidental impacts to dense horizontal cover (VEG S6) and would likely convert the most fewest acres to temporarily unsuitable habitat (stand initiation structural stage) for each lynx analysis unit (see Wildlife, Canada lynx section, chapter 3).

The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 3 would salvage the fewest number of acres in spruce-fir, focusing on areas within three hundred feet of open roads and other improvements. This alternative could salvage up to about 3 and 5 percent of the spruce-fir/spruce-mixed conifer vegetation zones in the Carnero and Four Mile lynx analysis units, respectively.

Timber harvest activities in the lower quality aspen mix and Douglas-fir/mixed conifer lynx habitat could affect up to about 14 and 9 percent of the Carnero and Four Mile lynx analysis units, respectively. This alternative also proposes fewer acres of non-commercial (timber stand improvement and/or prescribed burning, riparian conifer reduction) activities in lynx habitat, compared to alternative 2. These activities could be implemented on about 18 and 3 percent of the Carnero and Four Mile lynx analysis units, respectively. Under the sideboard caps developed for this alternative, activities reducing seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at the maximum permitted 997 total acres, which would be more than alternative 2 (see chapter 3, wildlife, Canada lynx subsection).

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-prescribed fire 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 analysis area.

Alternative 4

Issue 1: Effects on soil and watersheds – Alternative 4 could allow an intermediate number of acres of disturbance considering all management activities (approximately forty percent fewer acres than alternative 2) on soils with high erosion potential. As with alternative 2, best management practices and other project design criteria would minimize adverse effects to soils during project implementation by limiting mechanized equipment use to slopes less than forty percent and maximizing skid trail spacing. Returning slash to bare soil areas, if needed, would reduce the potential for adverse effects on soils. If winter logging was used in some areas, soil disturbance would be less. Compaction would be minimized by re-using skid trails and landings from previous harvests where possible. Where necessary, subsoiling would be implemented following harvest to ensure forest plan standards are met.

On BLM lands, alternative 4 would allow the fewest acres of low severity prescribed burning (with or without timber stand improvements) on soils with high erosion potential, so it would have the least potential for additional erosion. As with the other alternatives, any mechanized thinning would be limited to slopes less than forty percent which would minimize erosion potential. Effects of low severity prescribed burning that could occur on steeper slopes would be minimal.

Compared to alternative 2, this alternative has the potential to reach concern levels on fewer HUC 6 watershed or the HUC 7 sub-watersheds of concern. As with the other action alternatives, to represent maximum possible watershed disturbance levels, it was assumed that all acres proposed for commercial timber harvest would be logged and operations would occur during summer. Based on this maximum disturbance analysis, for alternative 4, potential watershed disturbance levels would remain well below the fifteen percent concern level in fifteen of the eighteen HUC 6 watersheds in the analysis area. In the other three HUC 6 watersheds, based on the assumptions used, disturbance levels could potentially exceed the fifteen percent and the ten percent in the two of the three HUC 7 sub-watersheds of concern (all on national forest system lands). However, the project pre-implementation process (best management practices included as forest plan standards, project design criteria, the pre-implementation checklist, and the adaptive management triggers outlined in

appendix D) would reduce the total acres that could be affected by timber harvest activities and would effectively ensure equivalent roaded area (ERA) is managed stay within concern levels and that individual riparian areas and streams are protected.

Even though this alternative would have a high potential to approach or reach disturbance concern levels in three of eighteen HUC 6 watersheds and in two of the HUC 7 sub-watersheds of concern, since overall stream condition is good, it is expected that most proposed project activities could still be implemented in these watersheds, though additional field surveys, reviews, and monitoring would be needed as implementation proceeds, especially in these watersheds to ensure overall stream and watershed health is protected. It was assumed this alternative would have moderate to high potential to temporarily increase the connected disturbed area; though, it has fewer acres proposed for commercial timber harvest than alternative 2. Effects in unharvested acres would have similar to alternative 1.

This alternative would require the maintenance and reconstruction of slightly fewer miles of open road to facilitate hauling of commercial timber products, compared to alternative 2. Road work could increase disturbance, but project design criteria and best management practices that protect the water influence zone and maintain infiltration buffers would reduce adverse effects to streams. Additional focus on these roads could provide opportunities to fix identified problems. As with alternative 2, this alternative would have a high potential to fix identified problems on several roads which could help improve watershed condition for the Middle Fork Carnero priority watershed.

The relocation of up to ten miles road segments and rehabilitation of the old road segments would increase disturbance area and would be the same as described for alternative 2.

Issue 2: Effects on Canada lynx habitat – Because alternative 4 has an intermediate number of acres proposed for a variety of management activities in lynx habitat, it would also be expected to have an intermediate level of potential effects on lynx habitat compared to alternatives 2 and 3. Under the sideboard cap of a maximum of 150 acres of incidental impact to VEG S6 acres developed for this alternative, it could have an intermediate amounts of incidental impacts to dense horizontal cover (VEG S6) and would likely convert fewer acres than alternative 2 to temporarily unsuitable habitat (stand initiation structural stage) for each lynx analysis unit.

The spruce-fir vegetation zone is considered the highest quality lynx habitat available with aspen and moist Douglas-fir/mixed conifer a lower quality habitat. Alternative 4 would salvage fewer acres in spruce-fir/spruce-mix conifer, compared to alternative 2. This alternative could salvage up to about 10 and 21 percent of the spruce-fir vegetation zone in the Carnero and Four Mile lynx analysis units, respectively. Timber harvest activities in the lower quality aspen and Douglas-fir/mixed conifer lynx habitat could affect up to about 29 and 7 percent of the Carnero and Four Mile lynx analysis units, respectively. This alternative also proposes the largest acres of non-commercial (timber stand improvement and/or prescribed burning, riparian conifer reduction) activities in lynx habitat. These activities could be implemented on about 5 and 1 percent of the Carnero and Four Mile lynx analysis units, respectively. However, under the sideboard caps developed for this alternative, activities reducing seedlings or saplings that provide winter hare habitat (VEG S5) would be capped at 500 total acres, which is less than alternatives 2 and 3 (see chapter 3, wildlife, Canada lynx subsection).

This alternative would be expected to negatively affect lynx habitat on fewer acres than alternative 2. 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-Prescribed Fire 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 analysis area.

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the existing conditions and the potential effects associated with implementation of the alternatives. It also presents a brief summary of the scientific and analytical basis for comparison of alternatives presented in chapter 2. Each resource discussion addresses the following components: scope of the analysis, existing condition, direct and indirect effects by alternative, and cumulative effects. Full specialist reports for each resource are located in the project file. The project design criteria listed in appendix D.2 were included in the consideration of effects for the action alternatives.

Based on Council for Environmental Quality definitions (40 CFR part 1508), direct effects are caused by the action and occurring at the same time and place. Indirect effects are caused by the action but are later in time or further removed in distance, but they 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 space and time (considering the duration of effects) for a particular resource for there to be potential cumulative effects.

A list of terms and definitions used in the analysis and a list of common acronyms is located inside the front cover of this document.

The analysis area is located on National Forest System and BLM lands. All proposed activities would be consistent with land management plans for both agencies. The transportation system in the La Garita Hills analysis area was constructed over time to allow access for range management, timber harvest, private land access, and recreation use which includes hunting, camping, off-highway vehicle use, horseback riding, and other activities. Past management activities have occurred on many of the acres proposed for additional management, effects of these activities were incorporated into existing conditions. The map showing locations of known past disturbances is located in appendix C.1.

3.2 Background and Ecological Context

Very few comprehensive site-specific studies or local research regarding reference conditions or plant associations have been done on the forests and woodlands located on the eastern, rain shadow side of the San Juan Mountains. Most research data has been collected in Arizona, New Mexico, the Front Range of Colorado, or in the San Juan Mountains west of the continental divide. Therefore, most published descriptions of forests ecosystems and their disturbance regimes may not truly describe local conditions. Local conditions are likely represented by intermediate values between areas north and south or west of this area. As with other forested sites in the Rocky Mountains, prior to Euro-American settlement, wind, fires and insect and disease activities had the most effect on forest vegetation structure, patterns, and composition (Peet 1981).

Descriptions of the vegetation zones and their disturbance regimes are based on the best scientific information available, local knowledge, and hypotheses on how local conditions may be different than other described areas.

Rain Shadow/Climate

Elevation within the analysis area ranges from approximately 7,700 to 12,900 feet with mean elevation of approximately 9,700 feet. Elevation generally increases across the analysis area from northeast to southwest.

Most of the area receives limited precipitation due to the rain shadow caused by the surrounding high mountains that capture most of the moisture. These dry conditions stress forest and rangeland vegetation in most years. Lower elevations receive approximately eight to ten inches of precipitation annually. Higher elevations receive approximately twenty to twenty-five inches of precipitation annually, mostly in the form of snow. Summer monsoon moisture may also contribute to available moisture, but is less reliable on the Saguache District than further south or areas closer to the continental divide. Average high temperature from May – October, is 72.2 degrees Fahrenheit, and the average low is 38.5 (observations taken at 7,700 feet). The dry, cool conditions provide a short growing season that limits site productivity and fuel accumulations.

Fire Regimes

Fire regimes across the analysis area are variable according to the vegetation zone. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but including the influence of aboriginal burning (Agee 1993, Brown 1995). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of overstory replacement) of the fire on the dominant overstory vegetation. Table 3 shows the established fire regimes along with how the analysis area vegetation zones fit into these regimes. Additional information of the estimated patch sizes of disturbances are described under each vegetation type.

Table 3. Vegetation zones and corresponding fire regimes.

Fire Regime	Average Fire Frequency	Fire Severity	Vegetation Zones
I	0-35	Low to mixed severity; surface fires most common with less than 75% of the dominant overstory vegetation replaced	Ponderosa pine, Douglas-fir/ mixed conifer (warm dry)
II	0-35	High severity; stand replacement with greater than 75 percent of the dominant overstory vegetation replaced	Douglas-fir/ mixed conifer (warm dry)
III	35-100+	Mixed severity; less than 75 percent of the dominant overstory vegetation replaced	Aspen- mix, Douglas-fir/mixed conifer (cool-moist, cool-dry), spruce-fir
IV	35-100+	High severity; stand replacement with greater than 75 percent of the dominant overstory vegetation replaced	Spruce-fir; spruce-mixed conifer, mountain shrub, persistent piñon-juniper woodlands
V	200+	High severity; stand replacement.	Spruce-fir, spruce-mixed conifer

To help verify fire regimes, a local fire return interval study was initiated in and around the analysis area. Based on this initial data, lower elevation sites in ponderosa dominant stands had an average fire return interval of thirty years. Higher elevation sites in Douglas-fir/mixed conifer had an average fire return interval of forty-five years. Prior to modern fire suppression, the average fire return interval was thirty years in the lower elevation sites and eighty years in the higher elevation sites.

Vegetation

Vegetation or cover types in the La Garita Hills analysis area include bare ground, rock, water, riparian, grasslands, mountain shrub lands, piñon-juniper, ponderosa pine, aspen mix, Douglas-fir/mixed conifer, spruce-mixed conifer, and spruce-fir (table 4). Vegetation cover types in riparian areas vary from grasses, sedges, and shrubs to variable amounts of tree cover and different tree species. Dominant life form varies with elevation, with piñon-juniper at the lowest elevations and Engelmann spruce-subalpine fir at the highest elevations. Figure 6 shows the distribution of the vegetation types across the analysis area.

There is a mix of moderate to steep mountain slopes with moderate to gentle rolling hills. Vegetation is a mix of open grass and shrub areas intermixed with moderately closed to closed canopy forests and woodlands. Vegetation type and density often vary by aspect, especially at lower elevations. Aspen is moderately common in some vegetation zones, but is declining in dominance due to lack of recent disturbance.

Table 4. La Garita Hills analysis area vegetation zones or cover types (FSVeg database).

Vegetation zone/cover type	Elevation range	Federal Acres	% of federal acres
Grasslands	Any	39,349	22
Mountain shrub	8,000-9,000	1,554	1
Piñon-juniper	8,000-9,000	17,036	10
Ponderosa pine	8,000-9,500	13,416	8
Douglas fir -mixed conifer	8,000-10,500+	35,411	20
Aspen-mix	8,000-11,600	25,706	14
Spruce-mixed conifer	9,000-12,000	16,341	9
Engelmann spruce-subalpine fir	9,000-12,500+	26,111	15
Riparian	Any	3,568	2
Bare ground	Any	553	<1
Water	Any	8	<1
Total	--	179,054	100

Non-forested areas- Non-forested areas, dominated by grasses, forbs, and low shrubs, are scattered across the analysis area and, as currently mapped, include almost nine hundred openings ranging in size from less than six acres to over sixteen hundred acres. These openings are found across all elevations and are important to landscape diversity and are part of the character of the area. Conifer encroachment into these areas is most obvious in the smaller openings surrounded by conifer seed sources and along the edges of openings where young conifers are becoming established into formerly grassland areas. As this process continues, it is slowly contributing to the loss of landscape diversity.

Mountain shrubs- This description is focused on shrubs growing where prescribed broadcast burning is proposed which includes primarily lower elevation, upland openings located along the east and southeast portions of the analysis area that are dominated by a variety of mountain shrubs. Non-forested sites dominated by mountain shrub species are uncommon though mountain shrubs are part of most vegetation communities. The species of shrubs varies depending on elevation. The most common mountain shrubs in the lower elevations include: wax current (*Ribes cereum*), golden current (*Ribes aureum*), low sage (*Artemisia arbuscula*), fringed sage (*A. frigida*) true mountain mahogany (*Cercocarpus montanus*), skunk bush (*Rhus trilobata*), yucca (*Yucca glauca*), snowberry

(*Symphoricarpus spp.*), Utah shadbush (*Amelachier utahensis*), rabbitbrush (*Chrysothamnus, spp.*), and chokecherry (*Prunus virginiana*). Most of these shrubs are considered fire tolerant in that they will re-sprout in varying degrees following fires. Most can be top-killed by more intense fires but will re-sprout from root crowns or other underground structures. The low sages and wax current do not re-sprout and would reestablish by seed; areas where the low sages grow often have few fine fuels to carry fire, so fire effects would tend to be variable and patchy at best.

Fire disturbance regimes in mountain shrub communities are thought to be mostly stand replacement at 20-50 year intervals at a scale of hundreds of acres (LANDFIRE BsP 2810860 2007).

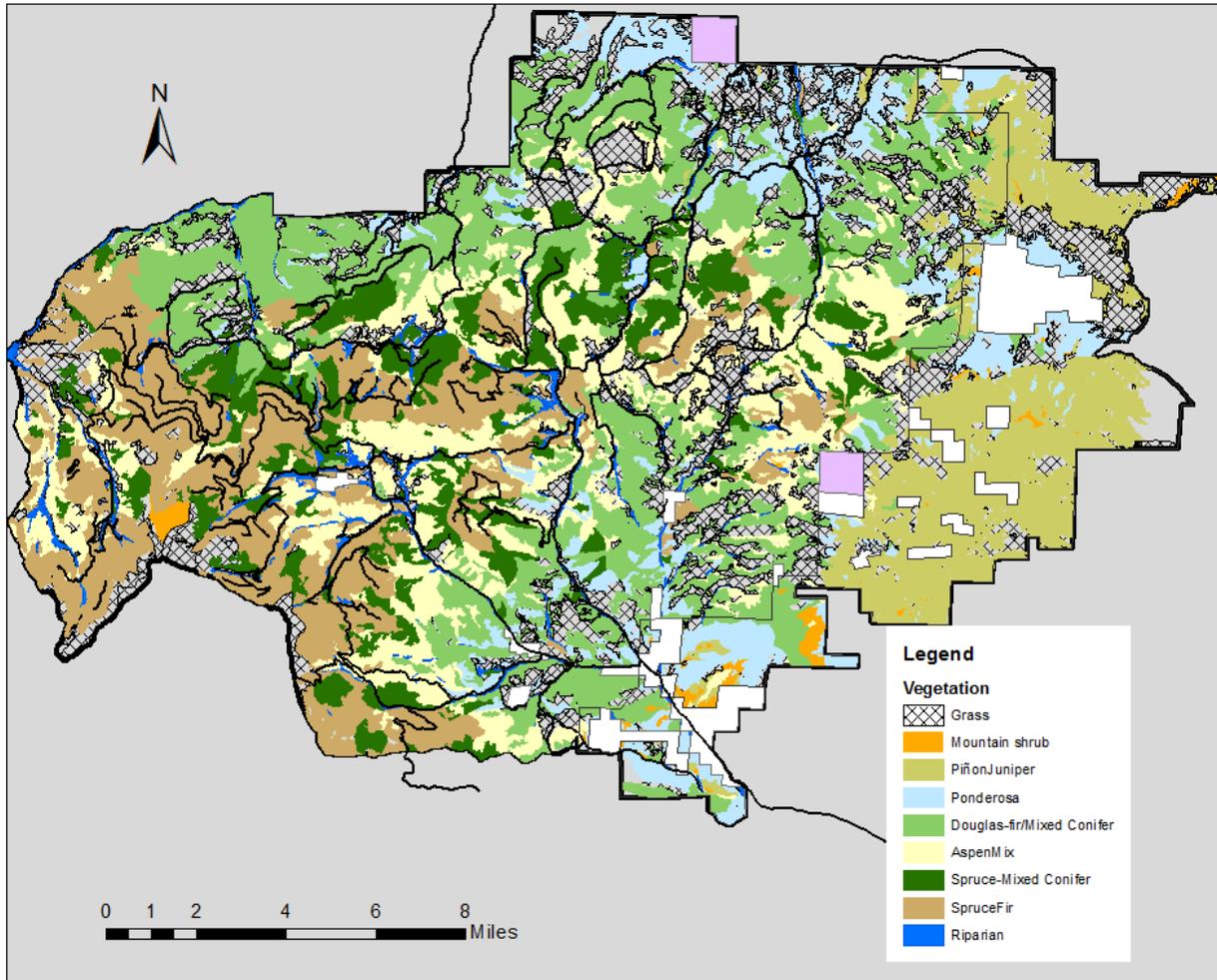


Figure 6. Vegetation zones across the analysis area.

Piñon-juniper-Two needle piñon (*Pinus edulis*) and Rocky Mountain juniper (*Juniperus scopulorum*) woodlands were shaped by variation in structure and composition related to gradients of elevation, substrate, and topography, as well as by disturbance processes. Based on canopy structure, understory, and historical disturbance regimes, there are three general types of piñon-juniper stands: persistent piñon-juniper woodlands, piñon-juniper savannas, and wooded shrub lands (Romme et al. 2009). Local piñon-juniper stands likely fall into combinations of persistent piñon-juniper woodlands with open to moderately closed canopies and minimal understory vegetation, along with some more

open savannas with herbaceous understories (P. Minnow pers comm 2015). Local piñon-juniper stands are also broken up by large rock outcrops which would have also reduced extent of past fires.

Researchers have a high confidence that past fire behavior in persistent piñon-juniper woodlands was infrequent and stand replacing; there is low confidence in the understanding of past fire behavior in piñon-juniper savannas (ibid 2009). Patch sizes of disturbances likely ranged from tens to hundreds of acres (LANDFIRE BpS 281059, 2007).

Ponderosa pine- Relatively pure ponderosa pine (*Pinus ponderosa* var. *scopulorum*) is only found in a narrow elevation band between piñon-juniper and warm-dry mixed conifer. Fire frequency in this local type was likely influenced by fires in surrounding vegetation types. As a result of fire suppression and past grazing, many of today's ponderosa pine forests may differ substantially from reference conditions, with generally higher tree densities and basal areas, less herbaceous ground cover, and a more homogeneous structure (both within and between stands). Past logging has also likely reduced the number of larger, mature ponderosa pine trees and may have increase the dominance of Douglas-fir in the transition zone.

Though there was likely considerable variability, studies in ponderosa pine on the adjacent San Juan National Forest seem to indicate a historical mixed severity fire regime with fire intervals of 6 to 47 years, stands with 4 to 40 trees per acre, with a distinctly clumped pattern (clumps were variable in size); canopy closures were two thirds to three-fourths open (Romme et al. 2009). A major difference between the San Juan sites and local conditions is absence of oak brush (*Quercus gambelli*) growing in association with ponderosa pine. Though oak brush does not burn frequently (Simonin 2000), when a fire occurred, the tall shrub could add to fire behavior and likely reduce the number of pine in the overstory. Stand basal area on the Uncompahgre Plateau (Grand Mesa, Uncompahgre, Gunnison National Forest) was estimated to range from 20 to 90 square feet per acre historically (Binkley et al. 2008). Ponderosa pine sites in the analysis area receive less moisture so sustainable densities would likely be on the lower end of this range.

Past fire regimes in ponderosa pine in the southern Front Range of Colorado, also located in the rain shadow, are also considered mixed severity, but with a 40 to 100 year fire frequency range as described in the *Southern Rocky Mountain Ponderosa Pine Woodland model* (LANDFIRE 2007).

Douglas-fir/mixed-conifer- Mixed conifer sites represent a complex transition zone between ponderosa pine and higher elevation spruce-fir sites. The mixed conifer zone is the largest vegetation zone in the analysis area. Disturbance history in mixed conifer forests are the least studied and understood, since this type contains elements of ponderosa pine and spruce-fir and is strongly influenced by elevation and topographical gradients (Romme 2009). The common species for all stands in this zone is Douglas-fir (*Pseudotsuga menziesii*); the presence of other species varies by elevation, aspect, topography, and likely past disturbances. The type has been subdivided into the following local types to help describe the variability: warm-dry, cool-moist and cool-dry.

Warm-dry mixed conifer stands have ponderosa pine included in the top three dominant species. A similar type has also been identified on the San Juan National Forest as discussed by Romme (2009). Fire disturbance history is thought to have included low to moderate severity fires of unknown patch size (likely relatively large) with a fire interval of 3 to 73 years. Some fires may have been relatively small, (maximum of approximately 150 acres) stand replacing events under more extreme conditions. These stands consisted of relatively open, large ponderosa pine, Douglas-fir, and white fir; higher canopy closures likely occurred on northerly aspects with more open conditions on southerly aspects. Local differences from the San Juan include the lack of white fir (*Abies concolor*)

on the Saguache Ranger District and lack of Gambel oak (the nearest Gambel oak is located north of project area near Poncha Pass). Trees per acre, basal area, canopy closures would have been likely within a similar range to the adjacent ponderosa pine stands (Kolb et al. 2012).

A local cool-dry mixed conifer component is also present in the project area due to the relatively dry, but high-elevation conditions. This type consists mainly of Douglas-fir, limber pine (*Pinus flexilis*), bristlecone pine (*Pinus aristata*), and may contain incidental amounts of pinon or juniper. Blue spruce (*Picea pungens*) or aspen may be present, but usually not in large amounts. The cool-dry mixed conifer component generally occurs on southerly aspects at elevations above 9,500 feet.

This type has not been described in other nearby forests, but it *may* have similarities with conditions described in the LANDFIRE “*Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland*” model (2007), except tree ages may not be extremely old, though little local tree age data has been collected. However, one study done on the forest on western spruce budworm indicated that the effect of persistent budworm activity may allow some stands to persist for long periods of time (Ryerson et al 2003). In this type, fires would have been of low frequency, mixed severity, and relatively small, except under extreme dry and windy conditions, when larger, stand-replacing events could occur. These stands would generally have an open (less than 40 percent) canopy closure, but still have a relatively sparse understory.

Cool-moist mixed conifer sites do not include ponderosa pine, but usually have more Douglas-fir, aspen and/or blue spruce and may include varying amounts of subalpine fir or Engelmann spruce. For this analysis, much of this type was included in the spruce-mixed conifer type. Cool-moist and cool-dry mixed conifer stands are mapped as lynx habitat.

Aspen mix- In the analysis area, though pure aspen (*Populus tremuloides*) stands are infrequent, aspen is found to some extent in many stands and in all vegetation types; though in the lower elevations, clones are smaller and are generally found in relatively cool and moist microsites such as drainages or steeper north or northeast aspects. Larger aspen clones are found in the cool-moist Douglas-fir/mixed conifer local type and spruce-fir vegetation types.

Due to the high elevation of the Forest and the analysis area, aspen is considered seral to conifers in the montane and subalpine, so its relative abundance is inversely correlated with the increase in conifer dominance occurring from natural successional processes that happen during long periods without major stand disturbance (Smith and Smith 2005). Where aspen has been growing in association with conifers in timber harvest or prescribed burn areas, aspen suckering has generally occurred to some level, but there have been limited recent attempts to specifically regenerate aspen on the Saguache Ranger District. Following disturbance, there has been low to moderate ungulate browsing on the aspen suckers based on field observations and reforestation exams. (M. Nelson pers. comm. 2015).

Spruce-mixed conifer - Cool-moist mixed conifer sites represent the gradient between mixed conifer and spruce-fir. Stand densities would be higher than lower elevations due to increased moisture and would have tended to be a mix of even and all-aged (uneven-aged) conditions, depending on past disturbances.

Moist mixed conifer (and spruce-fir in the analysis area) is probably best described by the *Rocky Mountain Subalpine Dry-Mesic spruce-fir Forest and Woodland models* (LANDFIRE 2007). Insect outbreaks and long interval (150 to 300 years) stand-replacing fires are the major disturbances. Occasional moderately long-interval (50 to 100 years) mixed-severity fires may also occur. Mixed severity fires, would create patches of mortality, creating a mosaic of stand conditions. Disturbance

patch sizes could vary, but mostly be in the hundreds of acres with occasional disturbances in the thousands of acres. Smaller disturbances, less than 10 acres, were more common.

Spruce-fir - Engelmann spruce (*Picea engelmannii*)-subalpine fir (*Abies lasiocarpa*) forest is the coldest and wettest forest type and occurs at the highest elevations in the analysis area. Major disturbance factors in this type have been spruce bark beetles and fires. Fires are usually very small or large, infrequent (150 to 300 years) stand replacement events that occur under extreme conditions. Infrequent, mixed severity fires may also have played a role. The large fire events could cover hundreds to thousands of acres (LANDFIRE 2007)

A study on the San Juan National Forest estimated that the fire return interval in their study area was approximately 300 years (Romme et al. 2009). That study also estimated the variety of structural stages present: 11 percent of the area would have been 0 to 50 years old; 26 percent 50-100 years old; 5 percent 100 to 150 years old; and 58 percent greater than 150 years old. These ages roughly correspond to the Vegetative Structural Stages (VSS) of seedling/sapling (VSS 1 and 2), young forest (VSS 3), mid-aged (VSS 4), and mature and old (VSS 5 and 6) used for comparison values in this analysis.

Riparian areas - in the analysis area are relatively narrow. Based on the forest vegetation data layer, most riparian acres have a tree component. Seventy-eight percent of riparian acres are classified as herbaceous, fifteen percent as dominated by willows or other shrubs, five percent are dominated by aspen, and about two percent are dominated by conifers. While the precision on the data is low, the mix of species in each cover type indicates conifers are often part of the aspen or aspen/willow vegetation types. This has been confirmed by field observations. It is desirable to maintain a diverse mix of species in these highly productive areas with sufficient aspen and willows to support beaver populations over time in suitable areas.

Noxious weeds - An inventory of noxious plant species has been completed and is ongoing within the analysis area. Noxious plants documented in the analysis area include: Canada thistle (*Cirsium arvense*), perennial pepperweed (also known as tall whitetop) (*Lepidium latifolium*), black henbane (*Hyoscyamus niger*), Russian knapweed (*Acroptilon repens*), downy brome (also known as cheatgrass) (*Bromus tectorum*), hoary cress (also known as whitetop) (*Cardaria draba*), oxeye daisy (*Chrysanthemum leucanthemum*), chamomile (*Anthemis arvensis*), field bindweed (*Convolvulus arvensis*), and musk thistle (*Cardus nutans*). The majority of the known noxious plant occurrences are located in disturbed areas including the sides of roads, at trailheads, along recreation trails, or within past timber sale areas. There are limited isolated occurrences within the analysis area in undisturbed areas.

Forest Insect and Disease Activity

Forest insects and diseases, along with fires, are important ecological disturbance agents and at endemic levels add to forest complexity and diversity (Schmid and Mata 1996), providing habitat for many wildlife species. Insect and disease activity is very common in all forested vegetation types in the analysis area and some agents are currently beyond endemic levels. Spruce beetle, western spruce budworm (WSBW), and Douglas-fir beetle have had the greatest impacts over the last twenty years, followed by aspen defoliators, mountain pine beetle, and piñon *Ips*. Dwarf mistletoes are also locally common with the most severe infestations affecting Douglas-fir.

The rapid dieback of aspen, referred to as Sudden Aspen Decline, noticed in the Rocky Mountain Region in the early to mid-2000s, has not been a major factor in aspen on the Forest, but smaller, lower elevation clones have been impacted by recent droughts and likely increasing conifer

competition due to lack of disturbance. The non-native white pine blister rust fungus that can infest limber and bristlecone pines has not been found in the analysis area, but has been found in the nearby Sangre de Cristo mountains; this fungus could become important in future management strategies.

Other insects related to this project include Douglas-fir beetle pole and engraver beetles (*Pseudohylesinus nebulosus*, *Scolytus unispinosus*), pine engraver beetles (*Ips* spp), and piñon twig beetles (*Pityophthorus* spp.). Mountain pine beetle (*Dendroctonus ponderosae*) can attack all the pine species found in the analysis area (except piñon). Outbreaks tend to develop in mature to over mature pine trees of low vigor or affected by drought. The last outbreak in the analysis area peaked in 2003.

Spruce beetles (*Dendroctonus rufipennis*) – spruce beetle populations on the Rio Grande National Forest have been at outbreak levels since the mid-2000s and have killed the majority of mature Engelmann spruce on the forest. Populations initially increased due to the major regional drought that occurred in the early 2000s which stressed the spruce trees and reduced their ability to expel the beetles; this along with the presence of a continuous supply of a mature host trees across the forest has allowed the epidemic to continue across the Forest.

In the analysis area, the beetle has already killed or infested more than 90 percent of the spruce greater than eight inches diameter since 2012. Spruce beetles are still active in the analysis area, but due to the decreasing availability of larger live hosts they will/are declining. During the decline phase, they will likely attack smaller spruce and occasionally other species. Spruce beetles as an impact or risk to forest health will not be addressed further in the analysis, since proposed project activities would have no effect on the outbreak and most susceptible host trees have already been attacked and killed.

Douglas-fir beetle (*Dendroctonus pseudotsugae*) – outbreaks of this bark beetle have caused periodic mortality over many years. Outbreaks can develop in overly dense stands of low vigor; these beetles will also attack trees that are injured by fire scorch, defoliation, wind thrown, or affected by root diseases. Though populations appeared to decrease after 2007, ground observations in spring/summer of 2015 have indicated some increased activity.

Western spruce budworm (*Choristoneura occidentalis*) is the most damaging defoliating insect especially in the mixed conifer vegetation zones. Repeated severe defoliation decreases growth, reduces or eliminates cone production, causes tree mortality, and increases susceptibility to attacks by bark beetles. Based on aerial surveys, western spruce budworm has been affecting over 49,000 acres to various degrees since 2012, affecting primarily Douglas-fir and the spruces; both overstory and understory tree growth and vigor have been reduced along with cone production in mature trees.

Dwarf mistletoes (*Arceuthobium*, spp) – Dwarf mistletoes are parasitic, host-specific plants that can greatly impact forest health and growth, depending on the level of infection. Most dwarf mistletoes can infect one or more species of tree. Host trees can have reduced height and diameter growth, reduced cone and seed production, and at high levels of infection, the tree can be killed. Dwarf mistletoes can be found at some level in the pines, but the most common and severe infestations are in Douglas-fir.

Root diseases – *Armillaria ostoyae* is considered the most common root disease in the Rocky Mountain Region. It is considered widespread and found in all major forest types, though is likely most abundant in the moister spruce-fir and cool moist mixed conifer forests. It can cause mortality in small or stressed trees, but older vigorous, resistant trees can live for many years, though it may pre-dispose older trees to bark beetle attack. Root diseases are likely present to some level in the

analysis area though there has been no major problems identified; the generally dry conditions in the analysis area may reduce the potential for extensive spread (Cruickshank et al 1997).

3.2 Silviculture and Forest Products

Scope of Analysis

This analysis focuses on effects of proposed activities on forest vegetation in the analysis area. Quantitative indicators were used to evaluate how well each alternative would achieve the project purpose and need with respect to forest vegetation and movement toward desired conditions.

Method of Analysis

The FS Veg data analyzer model was used evaluate changes in stand characteristics due to the spruce beetle outbreak and also to model the effects of no action and the action alternatives. The model used Landsat 8 imagery from 2013, the digital elevation model, and the forest vegetation simulator climate data in conjunction with field sampled data to build an analysis area-wide dataset for forested stands using a nearest neighbor process to impute characteristics to stands without field sampled data. The forest vegetation simulator and the fire and fuels extension model were used to assess potential fire behavior and to simulate changes in stand conditions over time for no action and to compare the management actions and tradeoffs between alternatives, using the general proposed silviculture and prescribed fire management scenarios developed for this analysis. Prior to the analysis, a portion of the data analyzer imputed stands were field checked to assess the imputation quality (i.e. were stand being imputed correctly). Stands checked were verified as being imputed to the correct vegetation type and model results seemed reasonable.

For the discussion below, 2014 was modeled as pre-spruce beetle mortality and 2015 represents current conditions with the majority of mature Engelmann spruce having been killed by spruce beetles.

For this resource section, indicators for existing forest vegetation condition were compared to desired conditions. Forest-wide goals and desired conditions related to this analysis are listed in appendix C.2. Desired condition values for the forest vegetation indicators used were developed by the interdisciplinary team as points of comparison related to the desire to increase resiliency and landscape diversity, especially in the drier forest vegetation zones. The desired condition values are not specific goals to achieve across the entire landscape, but do represent forest stand conditions that would likely be resilient to uncharacteristic future disturbances and could be implemented strategically across a landscape to meet the purpose and need for this project. Assumptions made with the information available was similar to recent efforts elsewhere in that moving lower elevation, drier conifer forest communities toward more characteristic historic composition, patterns, and structure will increase their resilience to future disturbances and maintain their ability to provide ecosystem services (Reynolds et al. 2013).

Resource indicators used to represent and compare stand level and landscape changes by HUC (hydrologic unit code) 6 watershed for each alternative were: basal area, stand density index, canopy closure classes, canopy layers (representing even and uneven-age stand conditions), and vegetation structural stage. For less intensively managed communities, such as aspen and piñon-juniper, not all resource indicators were evaluated. Most HUC 6 watersheds have all forested vegetation zones present to some extent, but four of the lower elevation watersheds (130100040307, 130100040702, Biedell Creek, and Werner Arroyo) are missing spruce-fir, though they may have some spruce-mixed conifer).

Existing Conditions

Forest Health and Resiliency

As shown in table 5, across the analysis area, average stand basal area⁶ is generally higher than desired for stand health and resilience in the drier Douglas-fir-mixed conifer and ponderosa pine vegetation zones (Schmid and Mata 1992, Schmid and Amman, 1992, Bentz et al. 1993, Chojnacky et al. 2000, Romme et al. 2009). In the spruce-fir and spruce-mixed conifer vegetation zones where spruce beetle associated tree mortality has reduced average basal area substantially. Higher basal areas in the spruce-fir zone indicates the presence of other species that were not affected by the spruce beetle. The spruce-mixed conifer vegetation zone only partially meets desired conditions for basal area due to the mortality of Engelmann spruce.

Table 5. Existing vs. desired average (range) of stand basal area by vegetation zone, 2014 and 2015.

Vegetation Zone	Desired Basal Area (ft ² /ac)	Average basal area (ft ² /ac) - 2014	Average basal area (ft ² /ac) - 2015
Ponderosa pine	≤30-50	96	96 (0-226)
Douglas fir-mixed conifer	≤50-70	144	135 (11-298)
Spruce-mixed conifer	<60-80	181	106 (9-298)
Spruce-fir	<80-100	179	73 (0-250)

Table 6 shows the acres and percent of the landscape meeting or exceeding desired basal area values. All vegetation zones except the spruce-fir zone are still higher than desired; though, as indicated in table 7, a range of conditions exists across the landscape. For this analysis, there is no actual desired condition established for spruce-fir or piñon-juniper basal area or stand density index (SDI). Values for spruce-fir are included for comparison and as shown under the alternatives discussion, the vegetation type does recover and basal area and stand density index increases over time.

Table 6. Percent of vegetation zones meeting desired basal area, 2015.

Vegetation Zone	Acres and % meeting desired basal area	Acre and % of basal area greater than desired	Meets Desired Conditions?
Ponderosa pine	3,157 (24%)	10,259 (76%)	No
Douglas-fir/mixed conifer	3,886 (11%)	31,525 (89%)	No
Spruce-mixed conifer	2,671 (41%)	9,643 (59%)	partially
Spruce-fir	21,645 (83%)	4,467 (17%)	NA

Table 7 below shows the average basal area and range of conditions by watershed and vegetation zone for the analysis area in 2015 (post spruce beetle mortality).

⁶ Basal area is based on the cross-sectional diameter at 4.5 feet above the ground (diameter at breast height) of the live trees in a stand and is expressed in square feet per acre (ft²/ac). It has been commonly used over many years in forestry as an indicator of the density of the larger trees on a site and has been recorded in many research studies, so is still a useful point of comparison. Small diameter trees (i.e. less than 5 inches diameter at breast height) do not contribute substantially to basal area, unless they are present in large numbers. For example, basal area of a 4 inch diameter tree = 0.09 ft²/ac, while a 10 inch diameter tree = 0.55 ft²/ac.

Table 7. Basal area values by vegetation zone across all HUC 6 watersheds, 2015

	Ponderosa pine	Douglas-fir/ mixed conifer	Spruce- mixed conifer	Spruce-fir
Average basal area	96	135	106	73
Range of watershed averages	61-131	80-159	76-179	52-117
Minimum stand values	28	17	9	2
Maximum stand values	226	298	298	250

Stand density index (SDI) is a measure of the degree of crowding in a stand and can be used as an indicator of relative health and vigor (Long 1985, Reineke 1933). Decreased stand density leads to increased stand vigor and reduced susceptibility to insects and diseases. Trees are especially stressed above the lower limit of self-thinning, which occurs at 55 to 60 percent of SDI_{MAX} ⁷. Due to the low site productivity caused by lack of moisture, a lower SDI_{MAX} value than full site occupancy was used as a point of comparison for this analysis. For this analysis, desired forest densities were identified at which the forest would be at low risk of insect outbreak and tree growth and vigor would be maximized.

Across most of the analysis area, average percent SDI_{MAX} is generally higher than desired for maximum growth and vigor (see table 8), though there is a range of conditions across the landscape. An exception is the spruce-fir vegetation zone where spruce beetle associated tree mortality has reduced relative density substantially.

Table 8. Existing vs. desired stand density (range) and percent SDI_{MAX} by vegetation zone in 2014 and 2015.

Vegetation Zone	Desired % SDI_{MAX}	Average SDI 2014	Average SDI 2015	Average and range- % SDI_{MAX} - 2015
Ponderosa pine	≤30%	208	208 (57-424)	39 (11-82)
Douglas-fir/mixed conifer	≤30%	324	301 (16-705)	51 (3-86)
Spruce-mixed conifer	≤30%	417	263 (16-705)	41 (3-85)
Spruce-fir	≤30%	410	187 (8-566)	28 (1-83)

The majority of the ponderosa pine and Douglas-fir/mixed conifer vegetation zones have the greatest percentage of their acres exceeding thirty percent SDI_{MAX} , indicating stressed conditions for many of these stands. Spruce-mixed conifer and spruce-fir have a wider variety of conditions largely due to the spruce beetle activity. Table 9 shows the acres by vegetation zone that are currently meeting and exceeding percent of desired SDI_{MAX} .

Table 9. Acres and percent of acres by vegetation zone relation to desired SDI_{MAX} , 2015.

Vegetation Zone	Acres and percent less than desired % SDI_{MAX}	Acres and percent greater than desired % SDI_{MAX}	Meets Desired Conditions?
Ponderosa pine	3,611 (27%)	9,805 (73%)	No
Douglas-fir/mixed conifer	4,755 (13%)	30,656 (87%)	No
Spruce-mixed conifer	6,812 (42%)	9,529 (58%)	Partially
Spruce-fir	19,074 (73%)	7,037 (27%)	NA

⁷ SDI_{MAX} values used for the vegetation types: ponderosa pine= 453, Douglas-fir = 570, spruce-mixed conifer = 610, spruce-fir = 651.

Table 10 below shows the average SDI_{MAX} values and range of conditions by vegetation zone averaged across the watersheds. As shown by the range of values, though there is variability in stand density across the watersheds, many of the average conditions are above the thirty percent desired SDI_{MAX} value used for comparison.

Table 10. SDI_{MAX} and range of values present by vegetation zone across all HUC 6 watersheds, 2015.

	Ponderosa pine (range)	Douglas-fir/ mixed conifer (range)	Spruce- mixed conifer(range)	Spruce-fir (range)
Average SDI _{MAX}	38	51	41	29
Range of watershed averages	21-62	32-59	31-63	22-46
Minimum stand values	9	9	5	1
Maximum stand values	82	86	85	82

Forest Diversity

Many of the drier forest types have higher canopy closures than desired, and many of the wetter forest types have more open conditions than desired due to spruce beetle mortality. For canopy layer conditions, much of the analysis area is dominated by more single-storied conditions compared to the more desired multi-storied conditions in the moister forest types.

Canopy closure is the proportion of the sky hemisphere obscured by vegetation when viewed by a single point. Canopy closure influences understory light and temperature, and therefore understory plant survival and growth (Jennings et al. 1999). Canopy closure is also important for some wildlife species.

Desired stand conditions were determined by considering the estimated reference conditions for each vegetation type. To meet a variety of objectives, an appropriate mix of canopy densities within each vegetation zone would be desirable to provide for increased forest resiliency and habitat diversity. In general, it is more desirable and sustainable to have more open canopy conditions in the drier forest types and drier aspects and more closed canopy conditions at higher elevations or on cooler north or east aspects. Closed canopy, multi-storied conditions are desirable in lynx habitat to provide snowshoe hare/lynx habitat. Canopy closure and canopy layers were not identified as a specific resource indicator for piñon-juniper, since this vegetation zone is not usually managed intensively and desired conditions have been identified only to the level that there is a desire for more variation between stands, consistent with past disturbance regimes, and it is desirable to maintain a range of conditions structural and canopy levels to meet wildlife habitat needs, increase understory vegetative cover, and reduce potential fire behavior near private lands. Canopy closure classes include the following:

- Open: 0 to 39 percent of maximum stand density index.
- Moderately closed: 40 to 59 percent of maximum stand density index.
- Closed: 60+ percent of maximum stand density index.

Table 11 and table 12 show the existing average percent canopy closure and the desired canopy closures developed for each vegetation zone. Overall, the greatest difference between existing and desired conditions for the piñon-juniper zone is the lack of open and closed conditions. The majority of the stands are classified as moderately closed which displays the lack of within-stand variability across the landscape. Ponderosa pine shows more variability, but more acres than desired have moderately-closed to closed conditions. Douglas-fir/mixed conifer stands also have more

moderately-closed to closed conditions than desired, especially in the warm-dry and cool-dry types. As indicated in the spruce-mixed conifer and spruce-fir stands, those with a substantial Engelmann spruce component have a much reduced proportion of a closed canopy condition, which is also less than desired for lynx/snowshoe hare habitat.

Table 11. Existing average percent canopy closure distributions, 2015.

Vegetation zone	% Open	% Moderately closed	% Closed	Meets desired condition?
Piñon-juniper	0	88	11	NA
Ponderosa pine	24	45	29	Partly
Douglas-fir/ mixed conifer	9	39	51	Partly
Spruce-mixed conifer	21	45	27	No
Spruce-fir	45	18	13	No

Table 12. Desired average percent canopy closure distributions, 2015.

Vegetation zone	% Open	% Moderately closed	% Closed	Description
Piñon-juniper	30-40	40-50	30-40	Open to closed – increase between stand variability
Ponderosa pine	50-60	25-35	10-20	More open spaces, groups, individual trees
Douglas-fir/mixed conifer	30-40	35-45	10-20	More open in warm-dry & cool-dry sites, south or west aspects; More closed canopy in cool-moist, north aspects, & in lynx habitat
Spruce-mixed conifer	10-20	15-25	60-70	More closed canopy, multi-storied
Spruce-fir	10-20	15-25	60-70	More closed canopy, multi-storied

Table 13 shows the range of average percent canopy closure classes for the vegetation zones averaged across all watersheds in the analysis area. The values indicate the variability across the landscape and confirm the general trends shown in the table.

Average values within watersheds could be most useful for focusing on the vegetation zones with a substantial number of acres in a watershed that are particularly homogenous and should be evaluated more closely and may indicate areas most departed from desired conditions. Without disturbance, there has been relatively little forest regeneration, resulting in single-age forest structure and increased forest density. Increased competition and more continuous canopies are now putting the forest at increased risk of insect and disease outbreaks and potential large wildfires.

Table 13. Range of percentages canopy closure class by vegetation zone for all watersheds, 2015

Vegetation zone	% Open	% Moderately Closed	% Closed
Piñon-juniper	0	59- 88	12-38
Ponderosa pine	2-98	0-86	0-59
Douglas-fir/mixed conifer	0-40	8-64	1-82
Spruce-mixed conifer	0-47	17-66	13-65
Spruce-fir	6-55	2-39	4-42

Watersheds with only one stand of a vegetation type were excluded

Canopy layers: The number of canopy layers can be used as an indicator to determine whether a stand has an even-aged structure (single canopy layer) or uneven-aged structure (multi-layered canopy). To improve landscape diversity, move toward estimated reference conditions, and meet Forest Plan standards and guidelines, an appropriate mix of even and uneven-aged stand conditions are desirable, depending on the vegetation type.

As shown in table 14, ponderosa pine stands currently have a mix of even and uneven-aged stand structures, which indicates consistency with the desired condition. Spruce-mixed conifer and spruce-fir have shifted primarily to a single-storied structure which moves away from desired conditions for lynx/snowshoe hare habitat.

Desired conditions for the Douglas-fir-mixed conifer vegetation zone are more variable which reflect the variability and complexity of the local types. Warm-dry sites should be more similar to ponderosa pine with a mix of single-story and multi-storied conditions desirable. The lower site productivity of the cool-dry stands would restrict sustainable densities, but there may be some potential for a mix of open, single-story and open multi-storied stand conditions. The potential for sustaining dense, multi-storied structures in this type may be limited, though they are currently mapped as lynx habitat. Cool-moist mixed conifer and spruce-fir/spruce-mixed conifer sites are considered the highest quality lynx/snowshoe hare habitat where the desired condition is multi-storied.

Table 14. Existing percentage of each canopy layer condition by vegetation zone in 2015.

Canopy layers	Piñon-juniper	Ponderosa pine	Douglas-fir/mixed conifer	Spruce-mixed conifer	Spruce-fir
Single-story	19	49	75	84	89
Multi-story	81	51	25	16	11

Table 15 shows the range of average percentages of canopy structure averaged across watershed for each vegetation zone. Watersheds with only one stand of a vegetation type were excluded.

Table 15. Range of percentages of single-storied and multi-storied acres across all watersheds, 2015

Vegetation zone	% Single-story Acres	% Multi-story Acres
Piñon-juniper	<1 - 83	17 -99
Ponderosa pine	6 - 90	3 - 94
Douglas-fir/mixed conifer	37 - 89	21- 73
Spruce-mixed conifer	44 - 85	15 - 56
Spruce-fir	27- 92	8 - 48

Many of the drier forest types have higher canopy closures than desired and many of the wetter forest types have more open conditions than desired due to spruce beetle mortality. For canopy layer conditions, much of the analysis area is dominated by more single-storied conditions compared to the more desired multi-storied conditions in the moister forest types.

Forest Structural Diversity

As shown in table 16, except in the spruce-mixed conifer and spruce-fir zones, the early seral grass/forb/shrub/seedling/sapling stages are generally less than desired. In ponderosa pine, warm-dry mixed conifer, and likely piñon-juniper, these opening patches were an important component of the historic structure (Romme 2009 and Romme 2009a) and added to within-stand complexity and

resilience. Aspen and piñon-juniper types are also lacking early seral structural stages, though aspen has a higher proportion.

Much of the spruce-mixed conifer zone has shifted from mid-aged forest to a young forest and the majority of the spruce-fir forest has shifted from young and mid-aged stands to early seral grass, seedlings, saplings and young forest. In these two zones, the spruce beetle has shifted additional acres into the early seral stage away from desired conditions.

Table 16. Existing vs. desired average percent vegetative structural stage (VSS), by vegetation zone in 2015.

VSS code	VSS description	Desired % VSS	Piñon-juniper	Ponderosa pine	Douglas-fir/mixed conifer	Spruce-mixed conifer	Spruce-fir	Aspen mix
1 & 2	grass/forb/shrub & seedlings/saplings	15-25	1	5	4	26	42	6
3	young forest	15-25	<1	49	67	68	48	71
4	mid-aged forest	15-25	0	31	27	6	10	20
5 & 6	Mature & old forest	30-50	98	15	2	0	0	3

VSS = vegetation structural stage

Forest Products

Personal use firewood cutting and gathering is permitted along all open roads (outside of recreation sites) and the recent spruce beetle activity has increased the interest in this activity and the level of personal use permits sold over the last couple of years has increased. Maintaining the opportunity for personal use firewood was identified as an objective in the Forest Plan.

Approximately 25,500 acres of the planning area have been previously entered for commercial timber harvests. Approximately eighty timber sale and forest product removal activities have been documented in the analysis area since 1949. The majority of these treatments (eighty-two percent) were in the spruce-fir and spruce-mix conifer vegetation zones. The remaining activity acres were in the lower elevation Douglas-fir/mixed conifer and ponderosa pine vegetation zones. Other vegetation management activities have included pre-commercial thinning, site preparation for natural regeneration, post and pole sales and fuelwood cutting. See appendix C-1 for map of known past timber harvest and other disturbance activities in the analysis area.

Most commercial harvests had silvicultural systems that used the two-step or three-step even-aged shelterwood system. Treatments were generally either preparatory/ seed cuts or overstory removals. Clearcuts and small patch clearcuts have also been used in various vegetation zones, particularly with aspen and other shade-intolerant species. Sanitation/salvage treatments were most often applied in response to past disturbances from insects, disease, wind events or fire. More recently, uneven-aged management in the form of group selection harvest has been employed in the spruce-fir and spruce-mix conifer vegetation zone. Regeneration of group selection and preparatory cuts treatments have generally been successful.

Direct and Indirect Effects

Alternative 1, No Action

Alternative 1 would generally not move forested stands or the landscape toward desired conditions. Large numbers of spruce beetle killed trees and eventual large amounts of down dead wood is likely to reduce the vigor of aspen sprouting. Tree planting would not occur to speed forest recovery where residual live trees are lacking. However, residual live trees and other vegetation will have additional light and water available and will continue to grow. Over time, even stands most affected by the spruce beetle will move back toward a more complex structure.

The drier ponderosa pine and mixed conifer vegetation zones would persist at densities higher than desired for forest health, and vegetation structural stages would show minimal movement toward more open, diverse conditions needed to meet several resource objectives. No treatment activities to reduce stand density and maintain or improve stand health would result in continuation of the current outbreak conditions for Douglas-fir bark beetles and western spruce budworm (WSBW). Overly dense stands would continue to persist at low vigor and be at high risk to a variety of insects and diseases.

Outside the spruce-beetle-affected areas, conifers would continue to increase in riparian and open grasslands, which would continue to slowly decrease diversity on these sites.

Figures in appendix C.3 show the existing condition and spatial distribution for the resource indicators described and projected for 2024 and 2044 following the implementation of alternative 1 with no additional disturbances included in the model. For basal area and percent of desired SDI_{MAX} , these projections show a gradual increase over time, which is moving toward desired conditions in the spruce beetle impacted stands, but away from desired conditions in the drier forest types. There is a gradual increase in canopy density in the drier forest types, moving away from desired conditions, and over time the spruce beetle impacted stands also show recovery of canopy density, moving toward desired conditions. In 2024, vegetation structural stage trends are generally similar to the current conditions with most vegetation zones being dominated by vegetation structural stage 3 (young forest). Piñon-juniper is considered mostly mature. Spruce-fir and spruce-mixed conifer show the most grass/forb/shrub/seedling/sapling (vegetation structural stages 1 and 2) stages. By 2044 there are additional stands in vegetation structural stage 4 (mid-aged) stage.

Forest Products

Under alternative 1, no additional harvest of commercial forest products (sawtimber, firewood, biomass, house logs, etc.) would be implemented to meet project and silvicultural objectives on lands suitable for timber harvest. In the spruce-fir and portions of the spruce-mix conifer vegetation zones, the economic value of the mortality trees would not be recovered. By not salvaging dead and dying trees, this timber volume, primarily off national forest system lands, would not be available for use or nor would it contribute to the sustained yield of forest products while it still has the most value.

Effects Common to Alternatives 2, 3, and 4

Insects and Diseases

- Windthrow risk for residual live trees (can lead to insect outbreaks in some forest types) is considered less than average even for shallow-rooted species (spruce, subalpine fir) due to generally drier and rockier conditions and previous harvests which increase wind firmness.

- In stands with extensive spruce beetle mortality, residual trees should have additional water and nutrients available to increase tree growth and vigor for the next 20 to 30 years.
- Sanitation and intermediate harvests would decrease the level of dwarf mistletoe; shift species composition, improve tree vigor to reduce the risk of future successful Douglas-fir or mountain pine beetle outbreaks and increase resistance to *Armillaria* root disease, if present (Cruickshank et al. 1997).
- Reducing tree density to improve tree vigor and diversifying species composition also reduces the potential spread of root diseases.
- Prescribed fire may have some ability to kill the *Armillaria* fungus in dry mixed conifer sites (Filip and Yang-Erve 1997).
- In Douglas-fir-dominated sites, diversifying species composition, reducing overall conifer density and the extent of multi-layered stands would help reduce western spruce budworm populations and its adverse effects on tree growth and cone production.
- Prescribed broadcast burning in Douglas-fir can reduce the extent of dwarf mistletoe infection, especially where infections occur in the lower branches or in seedlings or saplings (Conklin and Armstrong 2001).
- Prescribed burning can increase the potential for Douglas-fir bark beetle attack on fire scorched trees.

Forest Health and Resiliency (basal area, stand density index)

- Salvage harvest operations would only focus on recovering economic value from trees that are already dead or dying from insect or disease activity, so there would be few effects on live tree density, except incidental damage due to logging operations.
- Basal area and stand density index values would show the greatest reduction following commercial timber harvest prescriptions (sanitation/salvage, intermediate harvests) that would reduce average tree density and insect or diseased trees, thereby improving tree vigor and stand health.
- Mixed-severity prescribed burns could also reduce basal area and stand density index, depending on the amount of overstory tree mortality.
- In the drier vegetation zones, un-thinned acres may continue to have higher than desirable basal areas to be sustainable over time, which may reduce tree vigor and increase the potential for continued outbreaks of bark beetles and the potential for large, stand replacement fires in the larger landscape.
- Timber stand improvement (pre-commercial) thinning with or without low severity prescribed broadcast burning would have the least potential to directly reduce stand basal area, since mortality in the larger overstory trees would be minor.
- Prescribed burning reduces numbers of seedlings and smaller saplings, raises crown base height, maintains or reduces fuel loading to increase land resiliency.

Forest Diversity (canopy closure, canopy layers)

- Commercial harvest of green trees would have the highest potential to decrease canopy closure with the degree of reduction dependent on the harvest objectives.

- Salvage and low severity prescribed burning would decrease canopy closure the least since salvage is focused on dead tree removal and the purpose of underburning is not to greatly affect the overstory.
- Timber stand improvement prescriptions could result in some decreases in canopy closure depending on the number of smaller diameter trees cut.
- Slash treatments would have minimal effects on canopy closure or canopy layers unless the amount of surface slash adds to fire behavior during broadcast burns which could scorch or kill trees in the overstory or mid-story.
- Mixed-severity burns would have some potential to reduce canopy closure and/or layers in order to meet objectives to increase canopy openings, reduce surface fuels, regenerate aspen, improve wildlife habitat, and increase canopy base height.

Forest Structural Diversity (vegetative structural/seral stage)

- Cutting mature aspen stands to regenerate a pure aspen (coppice cut) is not planned under this project. Recruiting young aspen would be done by cutting conifer dominated stands that still have a viable but declining seral aspen component.
- Aspen regeneration would also occur following completion of many of the proposed activities, especially those in aspen mix, cool moist Douglas-fir/mixed conifer, spruce-mixed conifer or spruce-fir vegetation zones.
- Commercial green tree timber harvest activities and mixed severity prescribed burning would have the most potential for diversifying forest structural conditions across the landscape in the drier forest types including increasing spatial patchiness and the “openness” lacking in the drier forest types.
- Thinning smaller diameter trees increases average stand diameter and often moves stands into a larger average vegetation structural stage class.
- Prescribed burning can stimulate aspen sprouting following reduction of conifer competition.
- Tree planting would help speed the redevelopment of the next spruce forest especially where Engelmann spruce seed sources are greatly reduced.

Alternative 2

Alternative 2 proposes the most acres of salvage and sanitation/salvage harvests so would have the greatest potential to ensure regeneration of the future forests on the most acres. Tree planting would increase the forest recovery rate where needed. Aspen regeneration is expected to increase in the spruce-fir, spruce-mixed conifer, and cool moist Douglas-fir/mixed conifer areas where disturbance occurs, moving toward desired conditions for maintaining aspen on the landscape. Western spruce budworm and dwarf mistletoe activity in the spruce-mixed conifer and Douglas-fir/mixed conifer vegetation zones would be treated on the most acres to improve long-term forest health.

This alternative would also propose the most acres of Intermediate timber harvests in the aspen mix and drier Douglas-fir/mixed conifer and ponderosa pine vegetation zones which would have the greatest potential to move overall stand density toward sustainable levels and diversify stand structure to move toward desired conditions on treated acres. Along with appropriate density reduction, the increase in openings (vegetation structural stage 1) and appropriate canopy cover reductions, in the drier ponderosa pine, and warm, dry mixed conifer types would be a major advantage for treated stands. These openings would increase the amount of understory vegetation and increase overstory diversity. Reduction in within stand density and increases in between stand

diversity would increase tree vigor and reduce the potential for insect outbreaks, increasing the likelihood for survival into the later structural stages, even if drier conditions worsen or wildfires occur.

Though alternative 2 proposes about 10 percent fewer acres of non-commercial (timber stand improvement thinning, prescribed burning, and reducing conifer encroachment) treatments than alternative 3, treatments would move substantial acres toward desired conditions by: reducing conifer density, increasing between-stand diversity in the piñon-juniper, reducing ladder fuels, increasing crown base height, maintaining or decreasing fuel loads, and increasing resources available to understory vegetation. Reducing conifer encroachment in meadows and riparian areas would ensure that these areas continue to function as part of the ecological diversity of the analysis area. These activities would improve stand health and increase vigor and would also help decrease the landscape scale potential for uncharacteristically large or severe wildfires.

Figures in Appendix C.3 show the spatial distribution for the resource indicators described and projected for 2024 and 2044 following the implementation of alternative 2 with no additional disturbances or regeneration treatments included in the model. As expected there would be fewer ponderosa pine, Douglas-fir/mixed conifer and spruce-mixed conifer acres exceeding desired conditions in treated stands, but many untreated stands would still exceed desired conditions. All treated stands evaluated with these indicators would show movement toward desired conditions. Canopy closure and canopy layers show increased landscape diversity in 2024 and into 2044. Average canopy closure is reduced in the drier forest types following completion of activities and over time multi-storied conditions increase in the moister forest types, moving toward desired conditions. For vegetative structural stages, in 2024 there is additional diversity between stands in the drier forest types and over time additional acres move into the larger tree VSS 4 (mid-aged) structural class.

Forest Health and Resiliency

The effects of management activities on forest health and resiliency as indicated by basal area and stand density index are described below for alternative 2.

Figure 7 shows the percent of acres by vegetation zone that would move toward desired basal area in 2024 through 2044, based on the model parameters. Again, at the landscape scale there are additional acres meeting desired basal area in 2024 in the drier ponderosa pine, and Douglas-fir/mixed conifer vegetation zones. However, by 2044 conditions are again showing higher than desired basal areas, indicating the continuing need for disturbance to keep basal and stand densities in a range to maintain stand vigor. Even in the moister spruce-mixed conifer and spruce-fir sites, density continues to recover and these stands would also have reduced vigor in the long term, especially during droughts or during warmer conditions.

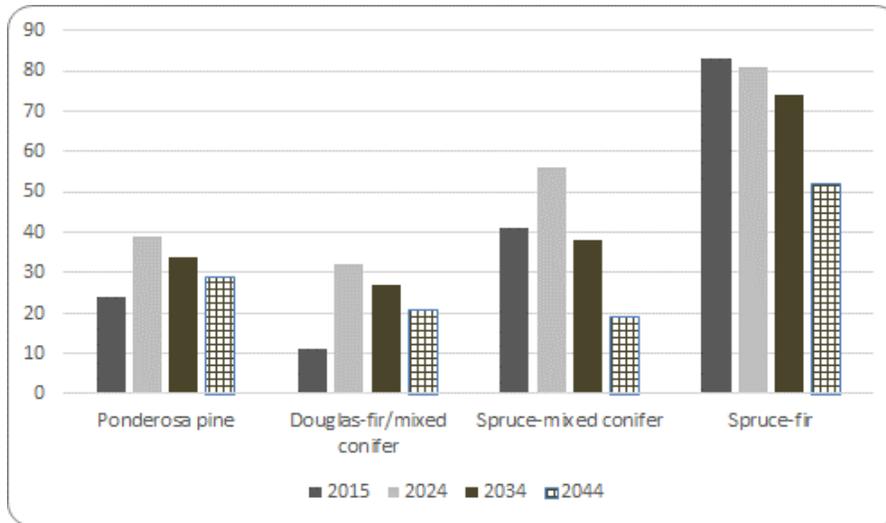


Figure 7. Percent of acres by vegetation zone meeting desired basal area, 2015-2044, alternative 2.

As with basal area, stand density index values (which are a function of tree size and tree density for different species) would show the greatest reduction following commercial timber harvest and mixed severity prescribed burns, depending on the amount of overstory tree mortality. Pre-commercial thinning would have less reduction and prescribed underburning the least effect for this indicator.

As indicated in figure 8, across the landscape, there would be a distinct increase in acres meeting desired SDI_{MAX} conditions in the drier forest types while the spruce-mixed conifer and spruce-fir zones would show a gradual increase in stand density, as remaining trees increase in diameter and new conifers and likely aspen, in many areas, increase in numbers.

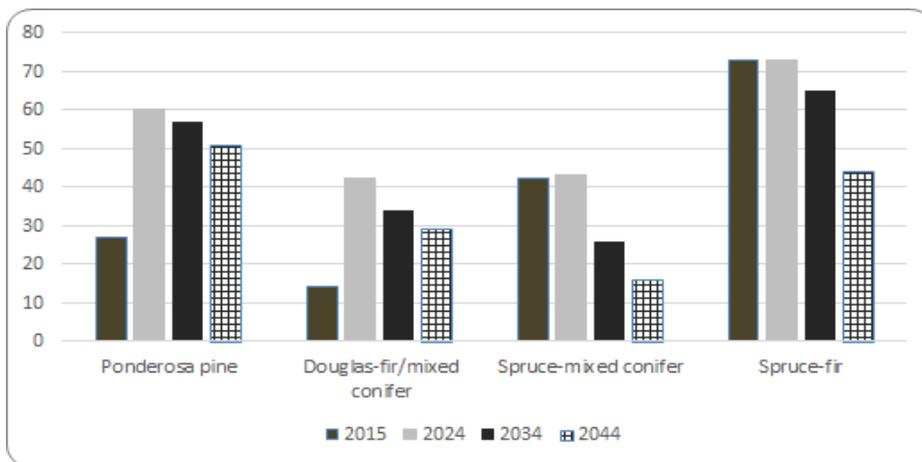


Figure 8. Percent of acres by vegetation zone meeting desired SDI_{MAX} , 2015 -2044, alternative 2.

Forest Diversity

The effects of management activities on Forest Diversity as indicated by canopy closure and canopy layers are described below for alternative 2.

As shown in table 17, in the drier ponderosa pine and Douglas-fir/mixed conifer vegetation zones, the average closed canopy (C class) percentage would decrease and the average amount of open

canopy increases, which would be moving toward desired conditions. The closed (C class) canopy closure for spruce-mixed conifer and spruce-fir increase over time, returning to desired conditions.

Table 17. Average vs. desired percent canopy closure by vegetation zone, 2015 - 2044, alternative 2.

Year	Ponderosa pine			Douglas-fir/ mixed conifer			Spruce-mixed conifer			Spruce-fir		
	open	mod closed	closed	open	mod closed	closed	open	mod closed	closed	open	mod closed	closed
2015	24	45	29	9	39	51	21	45	27	45	18	13
2024	27	42	7	26	39	28	20	44	32	49	21	14
2034	26	41	11	22	36	37	12	43	44	37	39	16
2044	31	42	12	20	34	31	7	36	56	28	47	23
Desired percent	50-60	25-35	10-20	30-40	35-45	10-20	10-20	15-25	60-70	10-20	15-25	60-70

A= open < 39%; B= moderately closed =40-59%; C= closed, >60%;

Values that do not add to 100 indicate the presence of openings or seedlings which do not have a canopy closure value.

Table 18 shows the change in percent of multi and single storied stands following the implementation of alternative 2 activities. Overall, there would be an improvement in the mix of single storied and multi-storied stands in the drier forest types under this alternative which would move toward desired conditions. The spruce-mixed conifer and spruce-fir vegetation zones also show an increase in multi-storied acres, which would also move toward desired conditions over time.

Table 18. Average percent single and multi-storied canopy layers by vegetation zone, 2015–2044, alternative 2.

Year	Ponderosa pine		Douglas-fir/ mixed conifer		Spruce-mixed conifer		Spruce-fir	
	Single storied	Multi storied	Single storied	Multi storied	Single storied	Multi storied	Single storied	Multi storied
2015	49	51	75	25	84	16	89	11
2024	37	38	65	24	66	15	65	10
2034	39	39	59	35	59	24	62	19
2044	45	40	58	33	56	29	59	24
Desired Condition	Mix of single and multi-storied stands		Mix of single and multi-storied stands; Multi-storied in lynx habitat		Multi-storied- lynx habitat		Multi-storied- lynx habitat	

Forest Structural Diversity

The effects of management activities on forest structural diversity as indicated by vegetation structural stage are described below for alternative 2.

Table 19 shows the average VSS distribution across the landscape from 2024 through 2044, following the implementation of alternative 2 treatment activities as compared to 2015, existing conditions and desired conditions. As indicated, structural stages would generally move toward desired conditions. Since VSS class is based on average stand diameter, large numbers of very large trees are unlikely to occur in the project area due to the lack of moisture, so having higher percentages in mid-aged (VSS 4) classes would indicate movement toward desired conditions over time.

Table 19. Vegetative structural stage (VSS) percent distribution, 2015 through 2044, Alternative 2.

Vegetation Zone	VSS code	Vegetative Structural Stage Description -	Desired Percent	Existing 2015	2024	2034	2044
Piñon-juniper	1 & 2	openings, seedlings, saplings	15-25	1	26	23	20
	3	young	15-25	2	2	4	6
	4	mid age	15-25	0	5	8	10
	5	mature	30-50	97	65	65	64
Ponderosa pine	1 & 2	openings, seedlings, saplings	15-25	4	25	22	15
	3	young	15-25	52	28	16	13
	4	mid age	15-25	29	39	51	62
	5 & 6	mature & old	30-50	16	9	10	10
Douglas-fir/ mixed conifer ¹	1 & 2	openings, seedlings, saplings	15-25	4	10	11	10
	3	young	15-25	67	52	44	39
	4	mid age	15-25	28	34	39	47
	5 & 6	mature, old	30-50	2	3	5	3
Aspen mix ¹	1 & 2	openings, seedlings, saplings	15-25	6	10	8	11
	3	young	15-25	71	69	69	48
	4	mid age	15-25	20	19	20	36
	5 & 6	mature, old	30-50	3	2	3	5
Spruce-mixed conifer ¹	1 & 2	openings, seedlings, saplings	15-25	20	19	18	15
	3	young	15-25	69	63	58	49
	4	mid age	15-25	9	17	22	34
	5/6	mature, old	30-50	2	1	2	2
Spruce-fir ¹	1 & 2	openings, seedlings, saplings	15-25	42	26	19	17
	3	young	15-25	48	56	55	57
	4	mid age	15-25	10	18	23	24
	5 & 6	mature, old	30-50	0	1	2	2

¹ Portions of vegetation structural stages 1 and 2 in the Douglas-fir/mixed conifer, aspen mix, spruce-mixed conifer and spruce-fir vegetation zones would likely regenerate to aspen.

Forest Products

Alternative 2 would produce the most volume of forest products of all the action alternatives and would best meet the objective for providing a sustainable yield of forest products to available industry. The following volume could be generated from proposed harvest activities if all acres were harvested:

- 225,000 to 450,000 hundred cubic feet (CCF) of sawtimber.
- 100,000 to 149,000 hundred cubic feet (CCF) of products other than sawtimber.

Salvage, sanitation/salvage, and intermediate harvest treatments would take place in spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/mixed conifer, and ponderosa pine.

Alternative 3

Effects of implementing alternative 3 would be a mix of alternative 1 and alternative 2. Salvage would only occur in spruce beetle impacted areas adjacent to open roads and other infrastructure. Effects on the limited acres treated in the spruce-fir stands would be similar to alternative 2, but the

effects on the majority of these acres would be similar to alternative 1. Tree planting would not occur to increase forest recovery where residual live trees are lacking. As with alternative 1, aspen regeneration would likely occur in the spruce beetle impacted stands to some extent due to the overall decrease in canopy cover, but shade from standing dead and eventually down woody debris may decrease the sprouting response.

The primary difference between this alternative and alternative 2 is the lack of Sanitation/Salvage or Intermediate harvest activities in the moister spruce-mixed conifer, Douglas-fir/mixed conifer, and aspen-mix vegetation zones. The lack of management opportunities in these vegetation zones would preclude the opportunity to reduce dwarf mistletoe levels and western spruce budworm activity in Douglas-fir that would improve long term health along with diversifying stand structure and improving species composition in these stands. These vegetation zones have high potential to increase aspen on the landscape since clones tend to be larger than in drier, lower elevations vegetation zones; the potential for maintaining aspen dominated stands on the landscape would be reduced.

In the lower-elevation, drier vegetation zones, acres proposed for commercial green tree thinning harvest treatments would be similar to alternative 2 and effects would be similar to those described; acres harvested would have the greatest potential to move overall stand density toward sustainable levels and diversify within and between-stand structure, to move toward desired conditions.

This alternative proposes about 10 percent more acres for the various non-commercial treatment activities (timber stand improvement thinning, prescribed burning, and reducing conifer encroachment) compared to alternative 2 with the primary difference being an increase in acres of potential of broadcast burning. Outside of acres burned under mixed severity conditions (warmer, windier), broadcast burning often has less potential to kill conifers larger than seedlings or small saplings under average burn conditions, so generally does not decrease overall stand density, especially if surface fuels are limited. Prescribe burn acres would increase crown base height, re-invigorate understory grasses and forbs, and reduce surface fuel loading. The overall decrease in the landscape scale potential for uncharacteristically large or severe wildfires may be slightly less under this alternative, depending on residual stand densities and canopy characteristics. The increase in patchiness from reducing conifer encroachment in meadows and riparian areas would be similar to alternative 2.

Since this alternative only authorizes salvage activities in spruce adjacent to roads and to protect infrastructure and other silviculture treatments in the drier forest types, effects on resource indicators would be a blend of alternative 1 and alternative 2 as shown in the maps in appendix C.3. Effects on basal area, desired SDI_{MAX} , canopy closure, canopy layers, and vegetation structural stages for the spruce-fir, spruce-mixed conifer, and aspen-mix vegetation zone would be similar to those shown for alternative 1. In the drier forest types, resource indicators would all show movement toward desired conditions, similar to alternative 2.

Forest Health and Resiliency

The effects of management activities on forest health and resiliency as indicated by basal area and stand density index are described below for alternative 3.

Figure 9 shows the percent of acres by vegetation zones that would meet the desired basal area in 2024 through 2044, based on the model parameters for alternative 3. Again, at the landscape scale there are additional acres meeting desired basal area and percent SDI_{MAX} values in 2024 in the drier ponderosa pine, and Douglas-fir/mixed conifer vegetation zones. However, by 2044 conditions are

again showing higher than desired, indicating the continuing need for disturbance to maintain tree vigor in these zones. Across the landscape, there would be a distinct increase in acres meeting desired conditions in the drier forest types while the spruce-mixed conifer and spruce-fir zones would show a gradual increase in stand density, as remaining trees increase in diameter and new conifers and likely aspen, in many areas, increase in numbers.

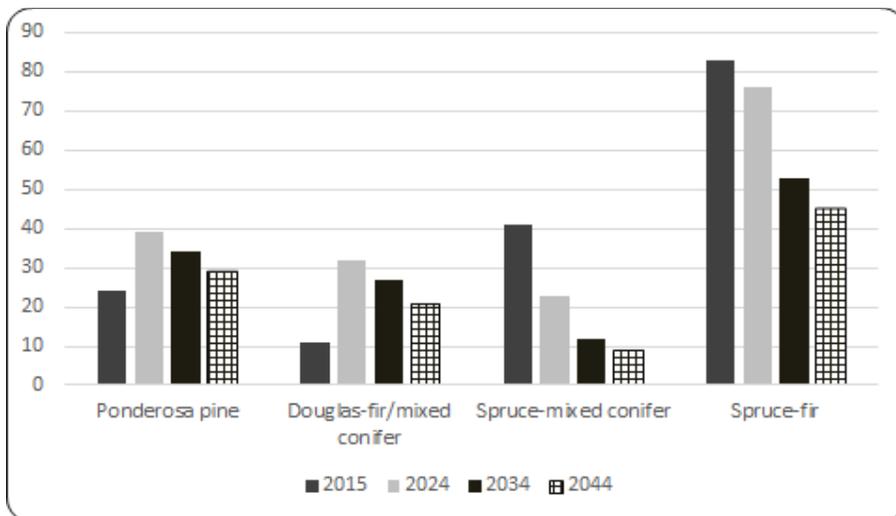


Figure 9. Percent of acres by vegetation zone meeting desired basal area, 2015-2044, alternative 3.

Forest Diversity

The effects of management activities on forest diversity as indicated by canopy closure and canopy layers are described below for alternative 3.

As shown in table 20, in the drier ponderosa pine and Douglas-fir/mixed conifer vegetation zones, the average closed canopy (C class) percentage would decrease and the average amount of open canopy increases, which would be moving toward desired conditions. The closed (C class) canopy closure for spruce-mixed conifer and spruce-fir increase over time, moving toward desired conditions.

Table 20. Average vs. desired percent canopy closure by vegetation zone, 2015 - 2044, alternative 3.

Year	Ponderosa pine			Douglas-fir/ mixed conifer			Spruce-mixed conifer			Spruce-fir		
	open	mod closed	closed	open	mod closed	closed	open	mod closed	closed	open	mod closed	closed
2015	24	45	29	9	39	51	21	45	27	45	18	13
2024	27	42	7	26	39	28	14	42	42	36	35	17
2034	26	41	11	22	36	37	9	35	55	32	44	22
2044	31	42	12	20	34	31	3	22	74	15	42	41
Desired condition	50-60	25-35	10-20	30-40	35-45	10-20	10-20	15-25	60-70	10-20	15-25	60-70

A= open, < 39%; B= moderately closed =40-59%; C= closed, >60%;

Values that do not add to 100 indicate the presence of openings or seedlings which do not have a canopy closure value.

Table 21 shows the change in percent of multi and single storied stands following the implementation of alternative 3 activities. Overall, there would be an improvement in the mix of single storied and multi-storied stands in the drier forest types under this alternative which would move toward desired conditions. Minimal treatment in the spruce-mixed conifer and spruce-fir vegetation zones also show a slow increase in multi-storied acres which would also move toward desired conditions over time.

Table 21. Average percent single and multi-storied canopy layers by vegetation zone, 2015–2044, alternative 3.

Year	Ponderosa pine		Douglas-fir/ mixed conifer		Spruce-mixed conifer		Spruce-fir	
	Single storied	Multi storied	Single storied	Multi storied	Single storied	Multi storied	Single storied	Multi storied
2015	49	51	75	25	84	16	89	11
2024	37	38	65	24	78	22	77	23
2034	39	39	59	35	73	27	78	22
2044	45	40	58	33	70	30	77	23
Desired condition	Mix of single and multi-storied stands		Mix of single and multi-storied stands; Multi-storied in lynx habitat		Multi-storied- lynx habitat		Multi-storied- lynx habitat	

Forest Structural Diversity

The effects of proposed management activities on forest structural diversity as indicated by vegetation structural stage for alternative 3 are described below.

Table 22 shows the average vegetation structural stage distribution across the landscape from 2024 through 2044, following the implementation of alternative 3 as compared to 2015, existing conditions and estimated desired conditions. As indicated, structural stages are generally moving toward desired conditions, except in the aspen mix vegetation zone where there is less opportunity to move toward desired conditions for maintaining aspen in a variety of structural stages on the landscape.

Table 22. Vegetative structural stage (VSS) percent distribution, 2015 through 2044, alternative 3.

Vegetation Zone	VSS code	Vegetative Structural Stage Description	Desired Percent	2015 Existing	2024	2034	2044
Piñon-juniper	1 & 2	openings, seedlings, saplings	15-25	1	27	23	21
	3	young	15-25	2	2	4	6
	4	mid age	15-25	0	5	8	10
	5	mature	30-50	97	64	65	65
Ponderosa pine	1 & 2	openings, seedlings, saplings	15-25	4	25	22	15
	3	young	15-25	52	28	16	13
	4	mid age	15-25	29	39	51	62
	5 & 6	mature, old	30-50	16	9	10	10
Douglas-fir - mixed conifer ¹	1 & 2	openings, seedlings, saplings	15-25	4	10	11	10
	3	young	15-25	67	52	44	39
	4	mid age	15-25	28	34	39	47

Vegetation Zone	VSS code	Vegetative Structural Stage Description	Desired Percent	2015 Existing	2024	2034	2044
	5 & 6	mature, old	30-50	2	3	5	3
Aspen mix ¹	1 & 2	openings, seedlings, saplings	15-25	6	8	7	9
	3	young	15-25	71	78	71	59
	4	mid age	15-25	20	12	19	29
	5 & 6	mature, old	30-50	3	2	3	3
Spruce-mixed conifer ¹	1 & 2	openings, seedlings, saplings	15-25	20	20	20	17
	3	young	15-25	69	64	62	55
	4	mid age	15-25	9	15	17	25
	5/6	mature, old	30-50	2	1	2	4
Spruce-fir ¹	1 & 2	openings, seedlings, saplings	15-25	42	26	20	21
	3	young	15-25	48	58	59	58
	4	mid age	15-25	10	17	21	21
	5 & 6	mature, old	30-50	0	1	2	4

¹ Portions of vegetation structural stages 1 and 2 in the Douglas-fir/mixed conifer, aspen mix, spruce-mixed conifer and spruce-fir vegetation zones would likely regenerate to aspen.

Forest Products

Alternative 3 would produce the least volume of forest products of all the action alternatives and would not meet the objectives for recovering economic value from the dead and dying trees in the spruce-fir, spruce-mixed conifer, and aspen mix zones. It would do the least to provide a sustainable yield of forest products to available industry. Commercial harvest in the spruce-fir, spruce-mixed conifer, and aspen mix zones would be limited to a three hundred foot buffer along each side of open roads and near other infrastructure. The following volume could be generated from proposed harvest activities if all acres were harvested:

- 62,000 to 124,000 hundred cubic feet (CCF) of sawtimber.
- 20,500 to 41,000 hundred cubic feet (CCF) of products other than sawtimber.

Salvage, sanitation/salvage, and intermediate harvest treatments would take place in spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/mixed conifer, and ponderosa pine.

Alternative 4

Alternative 4 proposes an intermediate level of commercial harvest treatments compared to alternative 2. Salvage harvest acres would be potentially about 8 percent less than alternative 2, so effects on the reforestation potential and rate of forest recovery could be somewhat less. Though the acres of tree planting and the extent of aspen regeneration would be similar to alternative 2, at the landscape scale.

Acres proposed for sanitation/salvage in the spruce-mixed conifer and Douglas-fir mixed conifer vegetation zones would be about 32 percent less than alternative 2, resulting in potentially fewer acres moving toward desired conditions. There would be less potential to increase aspen regeneration, reduce western spruce budworm and dwarf mistletoe activity in these vegetation zones at the landscape scale.

Since approximately 45 percent fewer acres are proposed for Intermediate harvest treatments in the drier Douglas-fir/mixed conifer and ponderosa pine vegetation zones, there is potentially less opportunity to move overall stand densities toward sustainable levels and diversify stand structure to move toward desired conditions at the landscape scale, compared to alternative 2, though harvested acres would move toward desired conditions and benefit the landscape conditions.

Overall, alternative 4 proposes about 30 percent fewer potential acres of non-commercial (timber stand improvement thinning, prescribed burning, and reducing conifer encroachment) treatments than alternative 2. There would be about 12 percent fewer acres eligible for low severity prescribed burning with or without mechanized thinning operations. The effects of this reduction in treated acres would not likely be measurable at the landscape scale. Treated acres would tend to move toward desired conditions, as described under alternative 2.

The major difference in non-commercial treatments compared to alternative 2 is the elimination of mixed severity broadcast burning in the aspen-mix and Douglas-fir/mixed conifer vegetation zones located in the Colorado Roadless Areas. Lack of disturbance in these vegetation zones would reduce the potential for aspen regeneration and the opportunity to diversify the forest canopy and structural stages slowly over time. An eventual wildfire in these stands would likely have more potential to burn uncharacteristically large or severe, which may have undesirable effects on the landscape. Effects of reducing conifer encroachment in meadows or riparian areas would be similar to alternative 2.

This alternative proposes the same management activities described for alternative 2, but on fewer acres. At a landscape scale, for the drier forest types, implementation of this alternative would have very similar effects on the movement of stands toward desired basal, percent SDI_{MAX} , canopy closure, canopy layers, and diversifying vegetative structural stages. Effects would be similar to alternative 2 in that there could be additional acres meeting desired conditions in treated stands, but untreated stands would still exceed desired conditions. See figures and tables under alternative 2 and appendix C for expected changes at the landscape scale for alternative 4.

Forest Health and Resiliency

The effects of management activities on forest health and resiliency as indicated by basal area and stand density index are described below, for alternative 4.

At the landscape scale, though fewer acres are proposed for treatment activities under this alternative, effects on average basal area and stand density index are the generally the same as alternative 2. Refer to figure 7 and figure 8 for the estimated percent of acres moving toward desired conditions. Across the landscape, there would be a distinct increase in acres meeting desired conditions in drier forest types while the spruce-mixed conifer and spruce-fir zones would show a gradual increase in stand density as remaining trees increase in diameter and new conifers and likely aspen, in many areas, increase in numbers.

Forest Diversity

The effects of management activities on forest diversity as indicated by canopy closure and canopy layers are described below for alternative 4.

At the landscape scale, though fewer acres are proposed for treatment activities under this alternative, effects on average canopy closure and canopy layers are the same as alternative 2. Refer to table 17 and table 18 for approximate percent of acres moving toward desired conditions. Across the landscape, there would be a distinct increase in acres meeting desired conditions drier forest

types while the spruce-mixed conifer and spruce-fir zones would show a gradual increase in stand density as remaining trees increase in diameter and new conifers and likely aspen, in many areas, increase in numbers.

Forest Structural Diversity

The effects of management activities on forest structural diversity as indicated by vegetation structural stage are described below for alternative 4.

At the landscape scale, though fewer acres are proposed for treatment activities under this alternative, effects on vegetation structural stage class distribution are similar to alternative 2. Refer to table 19 under alternative 2 for approximate percent of acres moving toward desired conditions. As indicated, structural stages are generally moving toward desired conditions.

Forest Products

Alternative 4 would produce an intermediate volume (between alternative 2 and alternative 3) of forest products and would meet the objective for providing a sustainable yield of forest products to available industry but to a lesser degree than alternative 2. The following volume could be generated from proposed harvest activities if all acres were harvested:

- 183,000 to 365,000 hundred cubic feet (CCF) of sawtimber.
- 61,000 to 121,000 hundred cubic feet (CCF) of products other than sawtimber.

Salvage, sanitation/salvage, and intermediate harvest treatments would take place in spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/mixed conifer, and ponderosa pine.

Cumulative Effects

The existing condition vegetation data used for the alternative analysis includes the effects of all past vegetation management activities including timber harvest, thinning, prescribed burning, and old piñon-juniper chaining treatments on BLM lands that have influenced forest health and resiliency, forest diversity, and forest structural diversity within the analysis area boundary. These activities are shown and summarized in appendix C.1.

Implementation of any of the action alternatives would incrementally move the landscape toward desired conditions silviculturally and to meet forest management objectives as described in the land management plans. Additional harvest, thinning, or prescribed burning would need to be considered in future years, especially in the drier forest types to maintain or continue to move the landscape toward a more sustainable condition.

Since a large portion of the proposed commercial harvest acres have been logged previously, no new system roads are needed. Though existing old temporary road prisms, skid trails, and landings used in previous harvests would be reused to the extent possible, some new temporary road segments and skid trails would be needed in proportion to the acres harvested. Temporary roads, skid trails, and landings would be rehabilitated and revegetated following use. In the long-term productivity would slowly increase over time following the re-establishment of vegetative cover.

Except for livestock grazing, no other present or reasonably foreseeable future vegetation management activity on federal or private lands within the analysis area boundary is expected. The only vegetation management activity currently approved under a separate NEPA decision is a sanitation or salvage harvest of about 550 acres in the ponderosa pine and warm-dry mixed conifer vegetation zones remaining off National Forest System Road 706 that was completed in the spring of

2016. This project resulted in a decrease of stands density in these stands, moving toward desired conditions as described in this analysis.

3.4 Biological Diversity

Scope of Analysis

The scope of the analysis for biological diversity is the forested stands in the analysis area focusing on snags, coarse woody debris and old growth/late successional stand conditions. Aspen is also considered an important biodiversity element and was considered in the silviculture section as part of the vegetation structural stage section.

Existing Conditions

Snags and coarse woody debris - Due to the extensive levels of insect activity in the analysis area, larger diameter snags are abundant in most forested vegetation zones. Based on the data used for this analysis, snags per acre greater than 12 inches diameter at breast height range from 0 to over 2,600 per acre with a landscape average of 195 per acre. On average the most snags per acre are found in the spruce beetle affected areas and Douglas-fir/mixed conifer vegetation zone, the fewest are in piñon-juniper vegetation zone. Firewood cutting is reducing the number of snags in the vicinity of open roads in areas with gentle slopes, but snags are common across the landscape.

Very little data has been collected on current levels of coarse woody debris across the landscape until recently. 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 large coarse woody debris. Away from open roads conditions are more variable depending on the disturbance history of the stand. Most stands likely meet the minimum tons per acre set in the Forest Plan standards and guidelines (appendix D.1), though the size diversity of down material may be limited in some areas, especially the larger diameter down woody pieces that are valuable for wildlife and as microsites for vegetation establishment. There were no minimum coarse woody debris levels set in the land management plans for piñon-juniper.

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 common forest types in Region 2. This paper identified a variety of stand structural characteristics, ages, and other attributes that would indicate a stand is providing old growth/late successional habitat values for the cover type.

The Rio Grande National Forest staff has recognized that the minimum structural attributes listed by Mehl may not be applicable to stands in the La Garita Hills analysis area and other parts of the forest due to wide variations in site productivity that limit stand complexity, especially in the drier forested stands; it is expected the criteria will be refined to better identify local old growth potentials during the next forest planning effort. However, old trees and stands can be found scattered across the drier vegetation zones in the analysis area; these old trees vary widely in diameter and the oldest trees are often not the largest trees. It is likely that there are stands outside of the major spruce beetle impacted zones where stands with old growth potential could occur.

Direct and Indirect Effects

Alternative 1

Snags and coarse woody debris - Under this alternative, away from open roads that are accessible to firewood cutting, snags and coarse woody debris (existing or future) would continue to be abundant or increase in most vegetation zones primarily due to the level of insect activity. The average values across the landscape would likely continue to be over 195 trees per acre with the highest numbers in the spruce, spruce-mixed conifer, and Douglas-fir/mixed conifer vegetation zones and less in piñon-juniper, since insect and disease activity is currently limited in this vegetation zone.

Old growth - Under this alternative stand conditions would not change due to management, except firewood cutting along open roads in accessible areas. Old trees may be at increased risk of mortality due to increased stand density and high levels of insect activity. Ladder fuels in the drier forest types may increase the potential for crown fire development, should a wildfire occur, which could negatively impact any old trees, old growth stands, or patches that may be present.

Alternative 2

Snags and Coarse Woody Debris - Under this alternative, the number of sound snags and future snags would be reduced in harvested stands with a salvage or sanitation/salvage harvest prescription (primarily spruce-fir and spruce-mixed conifer zones). At least, minimum numbers of snags and minimum levels of coarse woody debris would be left onsite to meet project design criteria and other resource needs. Outside of harvested areas, especially in the spruce beetle affected zones, snags and future coarse woody debris will continue to be abundant.

In treated stands with other commercial harvest or thinning prescriptions in green stands, snag numbers would not likely be reduced. These prescriptions would be focused on reducing density of live trees; snags are generally not cut except for safety reasons and are protected from mechanical damage. Provisions for retaining future snags would be addressed in the site-specific silviculture prescriptions. If coarse woody debris is lacking, additional slash can be left on site, as provided by project design criteria, silvicultural prescriptions, and during contract administration.

Prescribed broadcast burns have the potential to both decrease and increase snags and coarse woody debris. Low severity prescribed fires would decrease small diameter (less than about 3 inches) coarse woody debris, but would not greatly affect larger diameter wood pieces, unless they are very decayed. This activity may result in some indirect large tree mortality, resulting from tree scorch, which would increase snag numbers. Mixed severity broadcast burns would likely increase snag and coarse woody debris levels to some extent, depending on objectives.

Old growth - Prior to treatment implementation, stands will be evaluated for the presence of trees, old growth attributes, or future potential to move toward the desired condition of retaining a variety of vegetative structural classes across the landscape for each vegetation zone. The presence of these attributes does not mean no activities would occur, but silviculture and/or prescribed burn prescriptions would be adjusted to maintain or enhance old trees or old growth attributes, since it is expected that this structural stage would be less than desired across the landscape.

Under this alternative, there could be increased potential to sustain or increase old trees or old growth across the landscape. Increasing individual tree and stand vigor by reducing stand density would increase the potential to maintain existing old trees and old growth patches or stands, if or where, present. Reducing stand density in treated areas may also limit the extent of any

uncharacteristically large crown fires, which may also increase the potential for moving toward desired conditions for old growth.

Alternative 3

Snags and coarse woody debris - Under this alternative, the number of sound snags and future snags would be reduced along open road corridors and near infrastructure in spruce beetle impact areas to protect infrastructure and reduce risks to visitors. Outside of salvage harvest areas, spruce snags and future coarse woody debris would remain abundant.

As described under alternative 2, stands treated with other commercial harvest or thinning prescriptions, snag numbers would not likely be reduced and amounts of coarse woody debris would at least meet minimums. Low severity prescribed broadcast burns would decrease small diameter coarse woody debris, but would not greatly affect larger diameter wood pieces unless they are very decayed. Mixed severity broadcast burns would likely increase snag and future coarse woody debris levels to some extent.

Old Growth - This alternative would be similar to alternative 2; there would be increased potential to sustain or increase some old growth attributes and to sustain any remaining old trees across the landscape by reducing tree density, increasing tree vigor, and increasing patchiness across the landscape which has the potential to decrease the extent or intensity of future wildfires.

Alternative 4

Snags and coarse woody debris - This alternative would be similar to alternative 2. In stands with a salvage or sanitation harvest prescription, the number of sound snags and future snags would be reduced. It will be required that minimum numbers of snags and minimum levels of coarse woody debris be left onsite to meet resource objectives. Outside of harvested areas, especially in the spruce-fir zone, snags and future coarse woody debris will continue to be abundant.

As with alternative 2, in other commercial harvest or thinning prescriptions, would be focused on reducing density of live trees; snags are generally not cut except for safety reasons and are protected from mechanical damage. Provisions for retaining future snags would be addressed in the site-specific silviculture prescriptions. If coarse woody debris is lacking, additional slash can be left on site, as provided by project design criteria, silvicultural prescriptions, and during contract administration.

As described under alternative 2, stands treated with other commercial harvest or thinning prescriptions, snag numbers would not likely be reduced and amounts of coarse woody debris would at least meet minimums. Low severity prescribed broadcast burns would decrease small diameter coarse woody debris, but would not greatly affect larger diameter wood pieces unless they are very decayed. Mixed severity broadcast burns would likely increase snag and future coarse woody debris levels to some extent.

Old growth - This alternative would be similar to the effects described for alternative 2. Though fewer acres are proposed for thinning or prescribed burning activities, in thinned areas there would be opportunities to sustain or increase old trees or old growth attributes, as needed. Activities in these areas would also help increase the vigor of residual trees which would help reduce bark beetle outbreaks across the landscape and likely reduce the extent of uncharacteristically large wildfires which could contribute to reducing wildfire effects even in un-thinned sites.

Cumulative Effects

Firewood cutting along open roads is expected to continue into the foreseeable future which will continue to reduce snag numbers in this accessible zone. Individually signing or marking the most desirable large snags as wildlife trees has proven effective for maintaining some snags in this zone. This process is likely to continue as feasible, but its success depends on the availability of personnel. Outside the open road corridor, snags and future coarse woody debris should continue to be present. Commercial salvage activities would reduce existing snags and future coarse woody debris, but adequate amounts should remain across the landscape. Other types of harvest activity or prescribed burning should maintain or increase snags and future coarse woody debris.

Past timber harvest activities did likely reduce the number of old trees, especially those that were large in diameter and of a preferred species, to an unknown degree. The spruce beetle has effectivity changed the stand structure in areas where mature Engelmann spruce was a major part of the stand. True old growth conditions in these stands will not develop for hundreds of years.

In the other remaining vegetation zones, no additional vegetation management activities are reasonably foreseeable in the analysis area. Where harvest or other management activities are proposed, project design criteria to retain old trees and the pre-implementation checklist process ensure biological diversity elements, including maintaining or recruiting old growth attributes that are continually evaluated at the project implementation stage should help avoid any adverse cumulative effects to old trees or potential old growth stands that may be present.

3.5 Wildlife

Scope of Analysis

This section summarizes the effects for: the threatened, endangered, proposed, Region 2 sensitive terrestrial wildlife, Forest management indicator species, and migratory birds at the following at the scales:

- Canada lynx – the analysis area is the Carnero and 4-mile to La Garita (Four Mile) lynx analysis units.
- All other terrestrial threatened, endangered, proposed, and sensitive species are analyzed within the La Garita Hills analysis area boundary.
- Management indicator species are analyzed at the project and forest levels.
- Migratory birds - Potential influences on migratory birds were tiered to conservation objectives at the forest-wide scale and the Southern Rockies/Colorado Plateau Bird Conservation Region 16 (additional information on Bird Conservation Region 16 is available online at: <http://www.nabcius.org/bcrs.htm>).

The more detailed wildlife reports in the project file contain the biological assessment, biological evaluation, effects on management indicator species and migratory birds.

Existing Conditions

Wildlife species that have habitat and occur or may occur within the La Garita Hills analysis area include those species that occur from the piñon-juniper zone up to the spruce-fir zone. Riparian vegetation also occurs within or adjacent to the analysis area in association with stream channels, small ponds and wetlands. The following is a representative description of these species likely found in the analysis area:

- Reptile and amphibian species are relatively scarce in the analysis area, but the western terrestrial garter snake, prairie rattlesnake, western chorus frog, and tiger salamander are likely to be found in the analysis area.
- Avian species of management interest are southwestern willow flycatcher (federally endangered species), peregrine falcon (Region 2 sensitive species), bald eagle (Region 2 and BLM sensitive species), Brewer's sparrow (Region 2 sensitive species), flammulated owl (Region 2 sensitive species), golden eagle (BLM sensitive species), Lewis's woodpecker (Region 2 sensitive species), loggerhead shrike (Region 2 sensitive species), northern goshawk (Region 2 sensitive species), olive-sided flycatcher (Region 2 sensitive species and Colorado Bird Conservation Plan BCP priority species), boreal owl (Region 2 sensitive species and Colorado Bird Conservation Plan priority species), hermit thrush (management indicator species), pygmy nuthatch (management indicator species), Lincoln sparrow (management indicator species), Wilson warbler (management indicator species), Vesper sparrow (management indicator species), and brown creeper (management indicator species).
- Mammal species of concern that occur or may occur in the analysis area are Canada lynx (federally threatened species), North American wolverine (federally proposed), Rocky Mountain elk (Forest management indicator species), mule deer (Forest management indicator species), American marten (Region 2 sensitive species), Gunnison's prairie dog (Forest sensitive species), Townsend's big-eared bat (Region 2 and BLM sensitive species), Fringed myotis (Region 2 and BLM sensitive species), hoary bat (Region 2 sensitive species), Allen's big-eared bat (BLM sensitive species), spotted bat (BLM sensitive species), Rocky Mountain bighorn sheep (Region 2 and BLM sensitive species).

Wildlife habitat in the analysis area has been affected by past grazing, roads, and road locations, and timber harvests. The most recent major change in habitat has been the relatively rapid shift in Engelmann spruce dominated stands. The widespread mortality of mature Engelmann spruce caused by spruce beetles has changed stand characteristics, especially affecting the highest quality lynx habitat stands.

As described previously, the drier conditions in the analysis area limit site productivity and most likely the relative abundance of some wildlife species such as snowshoe hare, the primary prey for Canada lynx (lynx). Limited site productivity in most areas may effect understory growth and density in most of the major cover types such as spruce-fir, aspen, lodgepole pine, Douglas-fir/mixed conifer, as well as riparian zones..

Direct and Indirect Effects

Federally Listed or Proposed Species

The threatened Canada lynx, endangered southwestern willow flycatcher, and proposed North American wolverine are further analyzed in each alternative. The New Mexico meadow jumping mouse, Gunnison's sage grouse, Mexican spotted owl, Uncompaghre fritillary butterfly, and yellow-billed cuckoo were not further analyzed due to lack of suitable habitat in the analysis area or the analysis area being outside the species distribution range. For this project, there will be "*No effect*" to these five species.

North American Wolverine

Wolverine are believed to be extirpated from Colorado. There are no documented occurrences of wolverine in the analysis area. However, given the wide ranging habits of this species, there is a slight chance that an unknown wolverine may periodically utilize the area.

Alternative 1: For the wolverine no risk factors have been identified, the determination for alternative 1 is “no effect” on the wolverine or their habitat.

Alternatives 2, 3, and 4: Under the action alternatives, the proposed work is planned in areas with existing road systems in place. In the unlikely event that wolverines are present within the project area, direct impacts upon wolverine due to proposed management activities occurring outside the denning season would consist of temporary avoidance during project activities. If management activities are timed to occur during winter (i.e., winter logging) those activities occurring within one mile of secluded subalpine talus sites may displace wolverines from potential denning sites or cause abandonment if these sites are occupied. No activities are proposed within wolverine alpine habitats, the wolverine’s primary habitat.

Indirect effects include less large coarse woody debris available on the forest floor for wolverine prey species but this impact is not expected to be significant given the amount of debris that will be remaining. Removal of trees in the project site may degrade small mammal prey habitat in the immediate area but may improve habitat for large mammals prey. The spatial distribution and concentration of trees remaining will continue to provide suitable foraging habitat for this species within the surrounding forest matrix. Harvest activities are not expected to impact movement either within its home range or impact dispersal into other areas should one be present.

Cumulative effects: The project area constitutes the cumulative effects analysis area because is large enough (293 square miles) to encompass wolverine movements as well as a range of elevations and vegetation conditions contributing to supporting a home range. Past management actions such as road construction that may have affected habitat suitability are reflected in the existing condition. Ongoing and foreseeable activities overlapping with potential wolverine habitats consist primarily of recreation. However, additional effects generated by overlap between recreational activities and management actions proposed under this project area are not expected due to the lack of management activities proposed in alpine habitats. There are no other known or expected cumulative effects anticipated upon wolverine as the result of the proposed management or other state, federal, or private actions.

Southwestern willow flycatcher

Small amounts of suitable habitat have been identified in the Mill Creek, Houselog, Carnero, California Gulch and Cave Creek grazing allotments (South Saguache Range EA 2010) within the analysis area, but no birds were detected in surveys completed in 2009, 2010 and 2013. On BLM lands surveys and habitat assessments were conducted from 2005 through 2009. No suitable habitat occurs on BLM within the analysis area boundary. No breeding territories have been recorded or suspected on the Saguache District and only one bird was detected just over the BLM boundary about 1.5 miles south of the analysis area.

Alternative 1: For the southwestern willow flycatcher no risk factors have been identified, the determination for alternative 1 is “no effect” on the flycatcher or their habitat.

Alternatives 2, 3, and 4: The only activities proposed is to use chainsaws to remove encroaching conifers along select riparian reaches to promote aspen and willows. Any direct or indirect effects would be insignificant and discountable. Effects due to smoke generated by prescribed burning would be avoided by conducting burning activities outside the willow flycatcher breeding season when within ¼ mile of suitable habitat (appendix D.2) unless verified as unoccupied. Project design criteria described for watershed protection provide further assurances that direct and indirect impacts to Southwestern willow flycatcher would be insignificant and discountable under all action

alternatives. Determination for any action alternative is: “*may effect, but not likely to adversely affect*” Southwestern willow flycatchers, or their habitat.

Cumulative effects: The project area constitutes the cumulative effects analysis area because is large enough to encompass any potential species home ranges that may be affected. There are no State or tribal lands within the project area’s potential southwestern willow flycatcher habitat. There are some private land inholdings, but there are no known proposed activities that might impact habitat beyond those activities which currently exist, such as livestock grazing and summer home occupancy. On federally-managed lands, the existing condition encompasses past management activities. Ongoing and foreseeable activities include recreation, existing road use, and livestock grazing. Impacts resulting from the overlap of activities proposed under this project with those of livestock grazing may be additive, but are expected to be insignificant due to existing direction for management of the species.

Canada lynx

The biology, ecology, habitat requirements, anthropogenic influences on lynx and their habitat, and recommended conservation measures are provided in the *Canada Lynx Conservation Assessment and Strategy* (LCAS) (Interagency Lynx Biology Team 2013), the *Southern Rockies Lynx Amendment* (SRLA) to the Forest Plan (USDA Forest Service 2008a), the *Southern Rockies Lynx Amendment Biological Assessment* (USDA Forest Service 2008b) and *Biological Opinion* (US Fish and Wildlife Service 2008), hereby incorporated by reference. These resources provide best available science on habitat requirements and conservation measures. National Forest system lands are managed under the Southern Rockies Lynx Amendment in conjunction with the *Implementation Guide for the SRLA* (USDA Forest Service 2009). Lynx habitats on BLM lands are managed for consistency with conservation measures for vegetation management described in the *Canada Lynx Conservation Assessment and Strategy* (USDI BLM, USDI FWS 2013), shown in appendix D.1A. Critical habitat has not been designated for Canada lynx in the Southern Rocky Mountains.

Lynx have been confirmed to be present on the Forest by Colorado Parks and Wildlife researchers using radio-telemetry studies. These studies along with an assessment of population level habitat use showed that only 2 documented lynx locations occurred within or adjacent to the project analysis area, suggesting little or no home range use by lynx; the analysis area is also located outside lynx utilization distribution for southern Colorado (Theobald and Shenk 2011). However, the SRLA identifies all lynx habitat for the National Forests in the Southern Rocky Mountains as occupied. Information used in this analysis is based on the most recent mapping criteria for the Forest lynx analysis units (October 2011) which has been reviewed and accepted by the U.S. Fish and Wildlife Service.

The analysis area encompasses portions of three lynx analysis units: Four-Mile to La Garita Creek (Four Mile), Carnero, and Groundhog Park. No proposed treatments would occur in mapped lynx habitat in the Groundhog Park lynx analysis unit, so effects to lynx habitats will only be assessed for the Four Mile and Carnero lynx analysis units (figure 10). The majority of the mapped lynx habitat in the analysis area is on national forest system lands. On BLM lands the Carnero and Four Mile lynx analysis units include about 589 (1.3 percent) and 490 (less than 1 percent) acres of mapped lynx habitat, respectively, in the Douglas-fir/mixed conifer and aspen-mix vegetation zones.

The analysis area does not include any of the designated lynx linkage areas on the Forest. However, current information indicates that lynx moving across the mid to upper elevations of the Saguache Ranger District exhibit focused movements into the linkage area along Highway 114 at North Pass/Cochetopa Pass (Ivan 2011) located about 10 miles north and west of the analysis area. So,

though the analysis area may not support resident female home ranges, it may be important to facilitating lynx movements from north to south.

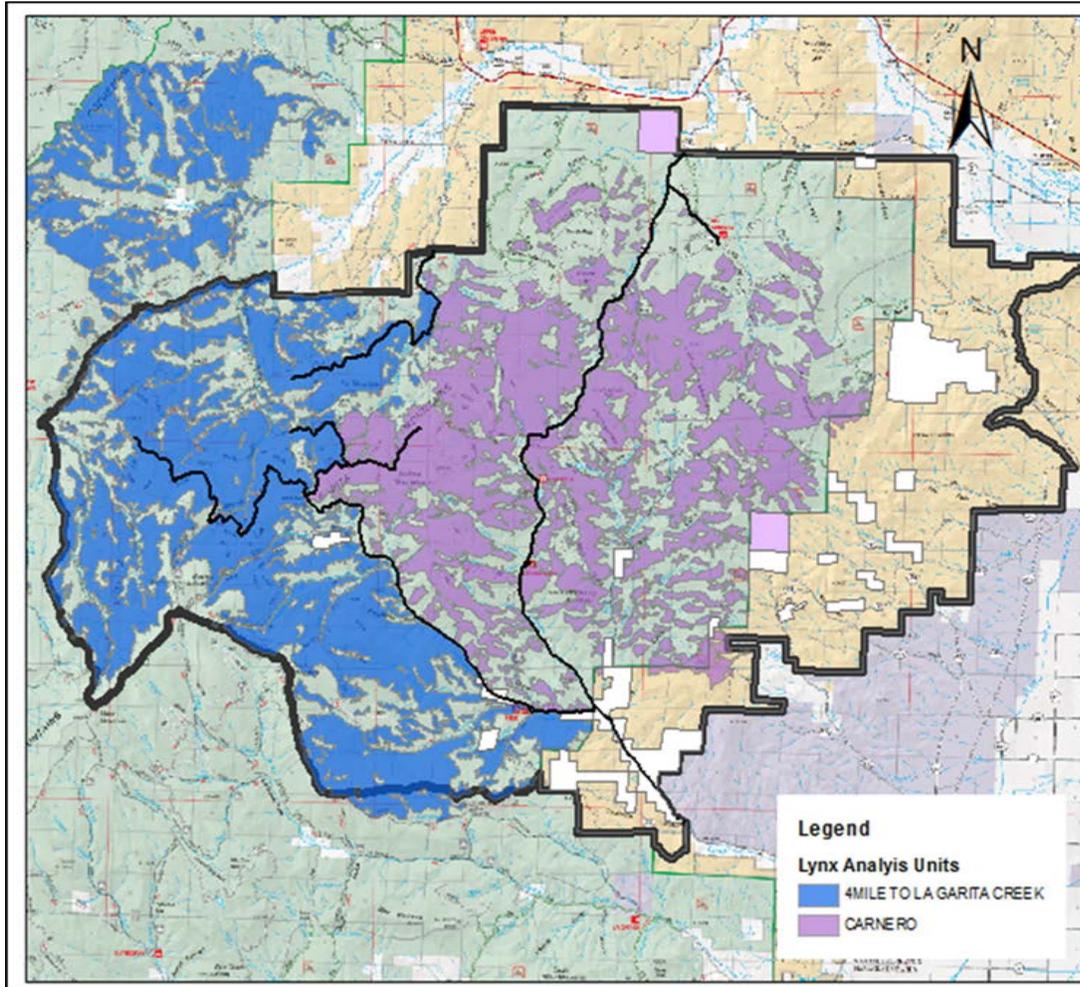


Figure 10. The Four Mile and Carnero Lynx Analysis Units and mapped lynx habitat.

Lynx habitat baseline conditions were estimated using the FSVeg Data Analyzer model to simulate the effects of the spruce beetle mortality on lynx habitat (*Silviculture and Forest Products* section). Based available data, additional acres were moved into the stand initiation structural stage (SISS) and became temporarily unsuitable lynx habitat due to spruce beetle activity. Any proposed management activities that increase acres in the stand initiation structural stage would be added to this baseline.

Table 23 and table 24 display the acres and status of mapped lynx habitat by vegetation zone. The Four Mile lynx analysis unit is only partially within the analysis area, so table 23 shows the vegetation zone acres by both the entire lynx analysis unit and the percent within the analysis area boundary. Approximately 30 percent of the Four Mile lynx analysis unit is spruce-fir/spruce-mix habitat that is higher quality lynx habitat. The Carnero lynx analysis unit has approximately 21 percent spruce-fir/spruce-mix habitat.

Table 23. Existing lynx habitat, Four Mile lynx analysis unit (percent within analysis area).

Vegetation Zone	Acres by vegetation zone	Acres Lynx Habitat	Habitat Acres in SISS	Multi-Story Mature/ Late Successional Conifer	Single Story Mature/ Late Successional Conifer
Spruce	19,959	19,108 (95%)	8,804 (96%)	122 (84%)	108 (53%)
Spruce-mixed conifer	11,276	9,289 (68%)	1,433 (82%)	133 (100%)	68 (0%)
Douglas-fir/mixed conifer	24,068	18,585 (52%)	154 (88%)	958 (67%)	3,751 (57%)
Aspen-mix	10,946	10,011 (79%)	139 (100%)	802 (63%)	2,350 (97%)
Lodgepole pine	4,391	434 (0%)	0 (0%)	0 (100%)	62 (0%)
Riparian	2,772	535 (100%)	N/A	N/A	N/A
Other vegetation types – non habitat	21,545	N/A	N/A	N/A	N/A
Total acres	94,952	57,953 ⁸	10,525	2,014	7,239

Table 24. Existing lynx habitat, Carnero lynx analysis unit

Vegetation Zone	Acres by vegetation zone	Acres Lynx Habitat	Habitat Acres in SISS	Multi-Story Mature/ Late Successional Conifer	Single Story Mature/ Late Successional Conifer
Spruce	7,164	6,690	1,374	591	138
Spruce-mixed conifer	8,971	7,352	594	153	426
Douglas-fir/mixed conifer	19,497	15,353	212	1,371	1,706
Aspen-mix	16,723	15,718	243	702	1,642
Riparian	1,570	75	N/A	N/A	N/A
Other vegetation types – non habitat	19,952	N/A	N/A	N/A	N/A
Water	8	N/A	N/A	N/A	N/A
Total acres	73,977	45,190 ⁸	2,423	2,216	3,912

Alternative 1: Importantly, the main factor influencing the highest quality lynx habitat is the spruce beetle outbreak. Under this alternative, there would be no additional human-influenced habitat manipulation impacts on lynx movement in the analysis area that could affect lynx foraging, movement, or reproduction. Existing levels of firewood cutting within 300 feet of open roads would continue. No additional road work would occur beyond standard forest-wide system road maintenance activities and implementation of the 2010 Travel Management Plan. Conversely, this alternative would not provide land managers the opportunity to implement the Southern Rockies Lynx Amendment and examine the influence of management techniques on lynx habitat and lynx use of the area.

⁸ The lynx habitat numbers from the tables do not exactly match the acres in the corporate lynx habitat map layer mainly due to updates in the FSveg GIS layer for this project and mismatches in stand boundaries between the two GIS coverages.

The spruce beetle outbreak is likely to continue to indirectly affect lynx population dynamics by affecting the lynx’s prey species. Based on recent studies on the Forest, snowshoe hare are exhibiting little to no response to overstory mortality in spruce-fir stands, suggesting that hare populations may not change or might increase as understory vegetation is released and grows (Ivan 2015). Single story spruce-fir stands experiencing extensive mortality would be converted to an unsuitable condition because they lack an understory of sufficient density and height to support snowshoe hares in the winter. Multi-story spruce fir stands and aspen with a spruce or fir understory above average snow depth would still support hares and remain suitable lynx habitat. 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.

Spruce beetle mortality is expected to affect red squirrel populations, especially in areas where Engelmann spruce is the dominant conifer species. Colorado Parks and Wildlife studies on the effects of spruce beetle kill suggest that when overstory canopy closure is reduced to 75 percent or less, there is a marked reduction in red squirrel occupancy and use (Ivan, pers. comm.). Therefore, maintaining overstory at or above 25 percent canopy closure is used in this analysis as a threshold of suitability for lynx prey species and lynx foraging (see appendix D.5).

Some areas would improve in habitat quality as down, dead jackstraw piles form, root wads are exposed, and more coarse woody debris becomes available for potential denning areas. In areas with extensive overstory mortality, additional light and moisture will facilitate regeneration and growth of understory vegetation that provide habitat for hares and lynx.

Overall, it is anticipated that some attributes of quality lynx habitat have and will continue to decrease due to the extensive overstory mortality, primarily due to an expected decrease in red squirrels. Primary prey species such as snowshoe hare may increase as any understory vegetation is released and grows rapidly due to less closed forest canopy conditions. In true spruce-fir stands, the return of closed canopy conditions are projected to return to within the natural range of variation within about 45-50 years (Rio Grande National Forest, Plan Revision Assessment 1 2015). However, a large tree, closed canopy structural component may not be present for several decades more.

Table 25. Environmental baseline conditions for the Carnero and Four Mile lynx analysis units.

Lynx Analysis Unit	LAU Acres	Acres Mapped Lynx Habitat	SISS Acres – Post Bark Beetle	Remaining Currently Suitable Acres (Percent of LAU)
Carnero	74,472	45,190	2,423	38,767 (86%)
Four Mile	95,017	57,953	10,526	47,410 (82%)

Suitable lynx habitat in the Carnero lynx analysis unit has been less affected by the spruce beetle epidemic, since a large number of the mapped lynx habitat acres are Douglas-fir/mixed conifer and other mixes of conifers, not spruce-fir.

Determinations for alternative 1: Forest Service and BLM lands – “No effect” on Canada lynx or their habitat. Overall, the no action alternative provides the best option for providing continuous high quality habitat for snowshoe hare and lynx. There would be no additional alteration of plant communities or disturbance of lynx habitat within the analysis area from management actions.

Elements Common to Alternatives 2, 3, and 4

Analysis of the likely effects of the La Garita Hills Restoration project to Canada lynx (lynx) and their habitat is based on the best available recommendations for lynx habitat conservation. On national forest system lands, the framework and incidental take statement established by the *Southern Rockies Lynx Amendment* (SRLA) to the Forest Plan and supporting documents (USDA Forest Service 2008) along with the associated Biological Opinion (USDI Fish and Wildlife Service, 2008). For activities on BLM lands, the analysis of effects is based on the consistency with 2013 LCAS (*Canada Lynx Conservation Assessment Strategy*). This analysis examines the potential effects on lynx habitat assuming the maximum treatment acres for each lynx analysis unit by alternative.

As applicable, the documents included in appendix D will be the primary guidance for ensuring adherence to *Southern Rockies Lynx Amendment* standards, objectives, and biological opinion requirements and the LCAS conservation recommendations. All Forest Plan standards and guidelines will apply to all alternatives. Project Design Criteria, pre-implementation checklist process, and the silviculture-prescribed fire guidelines that 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 analysis area. The implementation process will require close coordination between biologists and the silvicultural team during implementation. Monitoring effects and tracking changes in habitat will be required as the adaptive implementation process moves forward (appendix D.6 and D.7). Tracking and reporting to U.S. Fish and Wildlife Service would be conducted annually for both the Forest Service and BLM lands during the life of project implementation following signing of any Records of Decision.

Southern Rockies Lynx Amendment Standards VEG S1, VEG S2, VEG S5, and VEG S6: The Southern Rockies Lynx Amendment standards set limits on the types and amounts of habitat modification allowed within lynx habitat. See appendix D.1 for full text of each Standard.

Standard VEG S1 – limits the amount of lynx habitat that can be in a stand initiation structural stage within any lynx analysis unit to 30 percent of lynx habitat acres. For this analysis it was assumed that up to 30 percent of each LAU (lynx analysis unit) could move to into a stand initiation structural stage through a combination of the effects of spruce beetle mortality and the additional management activity acres described for each alternative.

Standard VEG S2 - limits timber management activities that regenerate stands to 15 percent of lynx habitat acres within any lynx analysis unit over a ten year period. This standard does not include salvage harvest acres except on acres that change lynx habitat from suitable to unsuitable.

Lynx Analysis Unit	Maximum total acres in stand initiation structural stage (VEG S1)	Maximum acres in stand initiation structural stage resulting from timber management (VEG S2)
Carnero	10,836	6,718
Four Mile	6,906	8,617

Standard VEG S5 – limits pre-commercial thinning projects intended to reduce the density of seedling or saplings that provide winter snowshoe hare habitat to a maximum of 3 percent across the Forest.

Standard VEG S6 –prohibits vegetation management practices that would reduce winter snowshoe hare habitat within multi-story mature or late successional conifer forests with a canopy cover greater than 40 percent with understory dense horizontal cover (cover 1-2 meters

(3.2 to 6.5 feet)) above average snow levels greater than 35 percent) unless a VEG S6 Exception is used.

As allowed under Exception #3, limited incidental removal of dense horizontal cover may occur during salvage harvest operations.

VEG S6 Exception #3 does not apply to stands where overstory canopy closures have been reduced below 40 percent. However, stands with understories that meets the definition of dense horizontal cover still function as high quality winter snowshoe hare habitat and remain suitable lynx habitat. Project design criteria related to dense horizontal cover will be applied to these stands.

The VEG S6 Exception #3 also does not apply to stands with understory horizontal cover less than 35 percent. These stands are considered lesser quality summer habitat which has value but is not as limiting.

VEG S6 Exception #4 permits uneven-aged management practices to maintain or encourage multi-storied attributes.

Direct effects on lynx: Potential direct effects on lynx include disturbance, temporary displacement and potential mortality. The use of mechanized equipment (mechanical harvesters, skidders, chainsaws) would likely result in the temporary displacement of any lynx due to noise and increased human presence. Activities or smoke associated with pile burning or nearby broadcast burning could also cause temporary displacement. Due to displacement, it is unlikely treatment activities would result in direct mortality to adults. Currently, there are no female home ranges known to exist within the affected lynx analysis units; therefore the project has little risk of impacting a resident lynx or any young.

Increased traffic associated with project activities may increase the risk of mortality to lynx from vehicular collisions. Project activities may increase logging traffic on Highway 114, within the lynx linkage area, if logs are transported to Montrose, Colorado. However, under any of the action alternatives, road use would still expected to remain well below the 2,000 vehicles per day, where increased risk of lynx-vehicle collisions becomes a measureable factor (Clevenger et al. 2002, Alexander et al. 2005) over the life of this analysis. Forest roads support low volume, low-speed vehicular traffic that is unlikely to result in traffic-related mortality of lynx.

Indirect effects to VEG S6 stands: For this project, the intent is to generally avoid impacts to VEG S6 habitat; except to provide for minor incidental impacts that may occur from activities in adjacent stands, the maximum amount of incidental removal of dense horizontal cover is capped by alternative. However, harvest of dead or dying trees would reduce the amount of future down woody-debris and likely have some incidental impacts from logging operations to dense horizontal cover which would degrade habitat conditions and reduce the capacity to support both snowshoe hare and lynx. As a result of these changes, lynx may not utilize these areas until habitat components recover.

Any tree planting that occurs in these areas would help speed the recovery of horizontal density, increase age diversity, and restore snowshoe hare habitat within treatment sites over time.

To protect high quality winter snowshoe hare habitat, the project implementation process (appendix D) will be used to evaluate the presence of and protection needs for dense horizontal cover prior to implementation of salvage projects. The following project design criteria have been included to minimize effects to dense horizontal cover (DHC):

- Avoid impacts to high quality advanced regeneration to the extent possible;
- Focus on protecting high quality advanced regeneration (DHC) in blocks of 0.3 acres or more;
- Manage activities so that average incidental damage is limited to less than 20 percent of the project area.

These avoidance and minimization criteria would ensure that project activities maintain at least 80 percent of any existing high-quality lynx habitat within each treated area. Any damage would be tracked and counted against the stated cap for each alternative.

Indirect effects on lower quality horizontal cover (not dense horizontal cover): Incidental damage from salvage harvesting in mature stands where horizontal cover is less than 35 percent can still result in the reduction of snowshoe hare habitat. Lesser quality summer foraging habitat likely contains a lower density of snowshoe hares but still provide foraging opportunities for lynx. Damage and reductions in this type of habitat can have effects on lynx since it can reduce the stand capacity to support snowshoe hares and can impede the future development of quality winter snowshoe hare habitat and a multi-storied stand. This can delay habitat suitability and occupancy of lynx and associated prey. These stands will most likely be converted into temporarily unsuitable habitat and will be counted against the VEG S1/VEG S2 caps for each alternative.

Indirect effects on other lynx habitat and prey-base resources: A variety of commercial harvest (salvage, sanitation/salvage, intermediate, and uneven-aged prescriptions) and non-commercial forest management treatments activities (pre-commercial thinning, pile burning, and limited broadcast burning) are proposed in lynx habitat to meet a variety of objectives. The parameters of how these various treatments options could be implemented to meet the goals, objectives, standards, and guidelines of the *Southern Rockies Lynx Amendment* are outlined in the silviculture-prescribed fire guidelines, appendix D.5.

All proposed commercial harvest activities are expected to have a short-term negative impact on suitable lynx habitat, but could have beneficial long-term effects depending on current stand structural conditions. These activities have the potential to reduce herbaceous understory vegetation and damage younger trees during harvest and skidding operations, which can delay the development of dense horizontal cover. If winter logging occurs potential damage herbaceous vegetation is greatly reduced. Temporary roads, major skid trails, landing locations, and burning of large slash piles cause the most long-lasting damage to understory vegetation. Project design criteria and the use of other contract requirements help reduce overall damage to established understories by requiring agency pre-approval of landings and skid trails. Incidental damage to understory trees and shrubs is expected during logging operations, but the extent or amount is limited by VEG S1 and VEG S2 acre caps.

Salvage/sanitation and Intermediate harvest treatments have the potential to reduce existing overstory canopy cover to less than 25 percent and reduce understory horizontal cover to less than 20 percent. If this occurs, the resulting regeneration acres would apply toward VEG S1/VEG S2 caps.

Lynx habitat stands with a dead overstory due to bark beetles and more than 75 percent of the overstory dead and do not have understory trees that provide at least 20 percent horizontal cover, are considered temporarily unsuitable and are not subject to VEG S1/VEG S2 caps.

Any group selection or patch cuts, implemented in Douglas-fir/mixed conifer associations, would be intended to treat single story stands with low amounts of horizontal cover or to regenerate aspen to maintain and promote multi-story attributes as part of gap dynamics and would encourage creation of

multi-story stands and are considered a conservation measure under the SRLA. As understory vegetation recovers and a multi-story stand develops over the long-term, the treatment would be expected to result in many years of improved snowshoe hare and lynx habitat, subject to the biological limits due to the drier, rain shadow conditions. Treatments may not result in the abandonment of treatment areas by lynx, but would be expected to lower the short-term (up to 10 years) ability of the area to provide suitable habitat and produce prey. Acres regenerated to aspen or conifers count against VEG S1 and VEG S2 caps.

Use of prescribed broadcast burning in non-spruce-fir lynx habitat containing less than 20 percent horizontal cover would have limited or no effects on lynx since habitat is considered currently unsuitable.

Under alternatives 2 and 3, mixed severity prescribed burning, proposed in the Colorado Roadless Areas where other management options are limited, would be expected to create some level of stand initiation structural stage (SISS) conditions and have a negative effect on suitable lynx habitat even though it would not be implemented in stands that were field verified to have Engelmann spruce regeneration. Any impacts to dense horizontal cover patches resulting from prescribed broadcast burns would be counted against VEG S6 caps; acres moving into a stand initiation structural stage would count against VEG S1/VEG S2 caps.

Lynx habitat in the drier, lower quality, mixed conifer and other associations with less overstory mortality would continue to function as lynx habitat, though activities could degrade habitat or result in loss of habitat, reducing potential success for lynx foraging. The magnitude of effects would depend on the activity and existing stand conditions.

Timber stand improvement (pre-commercial thinning) would change habitat, but is not expected to result in a complete loss of habitat. As described in the silviculture-prescribed fire guidelines, in lynx habitat, the intent is to generally focus most pre-commercial thinning in areas where understory regeneration has grown beyond the height that provides winter snowshoe hare habitat. However, some pre-commercial thinning that may reduce seedling/saplings is provided for under VEG S5 caps developed for each alternative to prolong aspen dominance or meet other objectives. Extent of allowable change would be capped under each alternative, remaining within approved Forest caps.

The expected decline in red squirrel abundance in Engelmann spruce dominated stands is related more to beetle kill than project activities. Removal of dead trees that are no longer producing a cone crop should have no measureable increase in squirrel decline beyond what is caused through spruce-beetle induced mortality. Group selections or other harvests to enhance understory regeneration in mixed conifer associations would have no measurable effect on squirrel density.

Indirect effects on foraging competition: Studies in other parts of the parts of the country have indicated some increased competition for food in the winter with coyotes when roads or trails are plowed in the winter (Bunnell et al. 2006, SRLA FEIS 2008) though the extent of use of these compacted routes was not extensive (Kolbe et al. 2007) and coyotes did not seem to venture far from the compacted surface, especially in deep snow (Dowd et al. (2013). Snow-plowing and compaction of routes providing temporary access for winter logging of treatment units may occur under all action alternatives; based on available information there may be some level of effect to lynx due to increased competition with coyotes, resulting from compacted routes in snow. However, any effect would likely localized to areas adjacent to compacted routes and effects to lynx is expected to be insignificant under all action alternatives.

Indirect effects on landscape connectivity: No construction of infrastructure that would substantially impede lynx movement, such as developments or highways, are proposed under this project. Vegetation treatments could have some local effects to connectivity depending on the extent of habitat change by alternative. Project design criteria to ensure green trees are retained in spruce salvage stands, protection of dense horizontal cover patches, interspersed of untreated areas, along with limits on the increase in stand initiation structural stage (SISS) acres would maintain landscape connectivity within and between lynx analysis units.

Alternative 2: For alternative 2, maximum potential treatment acres in lynx habitat are 28,998 acres within the Carnero lynx analysis unit and 32,182 acres within the Four Mile lynx analysis unit. Southern Rockies Lynx Amendment Exception caps and alternative specific caps for VEG S5 and VEG S6 are shown below along with the potential treatment acres by activity type and vegetation zone for alternative 2.

Lynx Analysis Area	VEG S1 cap (acres)	VEG S2 cap (acres)	VEG S5 cap (acres)	VEG S6 cap (acres)
Carnero	10,836	6,718	800	250
Four Mile	6,906	8,617		

Activities	Vegetation Zones	Carnero LAU Acres	Four Mile LAU Acres
Salvage	Spruce-fir, aspen mix	4,686	15,207
Sanitation/Salvage	Spruce-mixed conifer, Douglas-fir/ mixed conifer	4,305	4,780
Intermediate-Sanitation/Salvage	Aspen-mix	5,557	4,853
Intermediate Harvest	Aspen-mix, Douglas-fir/ mixed conifer ⁹	5,742	5,255
Timber Stand Improvement (TSI)	Aspen-mix, Douglas-fir/ mixed conifer	157	320
TSI/Prescribed Burn	Spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	2,019	49
Prescribed broadcast burn- mixed severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	6,291	1,557
Prescribed broadcast burn- low severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	0	0
Reduce conifer encroachment - riparian	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	15	164
Total Acres		28,772	32,185

Indirect effects to VEG S6 stands: Alternative 2 has the largest number of acres of VEG S6 that could be impacted, compared to the other action alternatives, so would have the greatest effect on reducing the amount of high quality habitat most suitable to support a higher density of snowshoe hares in the winter, incrementally affecting habitat quality for the lynx. However, impacts to 250 acres project-wide would remain well below the allowable Forest-wide impact acres remaining for VEG S6.

⁹ Modeling of current lynx habitat on the Forest includes spruce, spruce-fir, aspen, cool-moist and cool-dry Douglas-fir/mixed conifer local cover types.

Vegetation modeling estimates approximately 972 acres of lynx habitat is proposed for timber harvest treatment consists of mature or late successional multi-storied conifer stands (Habitat Structural Stages 4BMS, 4CMS, 5BMS, and 5CMS). These are stands most likely to contain dense horizontal cover subject to VEG S6 limitations. Based on the model parameters, approximately 2,401 acres of multi-storied mature and late conifer stands would remain unharvested in the two lynx analysis units.

Indirect effects on lower quality horizontal cover (not dense horizontal cover) and prey-base resources: Since alternative 2 has the greatest number of acres proposed for treatment, it would have the greatest likelihood of converting the most acres to temporarily unsuitable, though all effects would be within the maximum lynx analysis unit (LAU) caps for VEG S1 and VEG S2.

Indirect effects to landscape connectivity: Suitable lynx habitat in the Four Mile and Carnero lynx analysis units currently totals about 47,000 acres and 43,000 acres, respectively. As stated above, alternative 2 would have the most potential to move stands into a stand initiation stage which may reduce connectivity in some areas. Maximum regeneration and shifts in habitat from suitable to unsuitable as a result of management activities under this alternative would be limited by available caps under the *Southern Rockies Lynx Amendment* and adverse effects would be minimized by the pre-implementation process (appendix D). Though this alternative would have the most effects in lynx habitat, lynx movement within and between LAUs is expected to be maintained following guidance described in the *Southern Rockies Lynx Amendment*.

In currently suitable Douglas-fir/mixed conifer stands which contribute to supporting lynx movement on the landscape patches of dense horizontal cover would be protected and a minimum overstory canopy cover of at least 25 percent would be retained in harvested stands to maintain habitat suitability (appendix D).

BLM Lands – Direct and Indirect Effects

Temporary disturbance of lynx is possible, similar to that described above for the project as a whole. Some amount of snow compaction may occur as a result of access for winter logging, but the potential impact is insignificant. Treatments are proposed in mapped lynx habitat on BLM lands will be consistent with vegetation management recommendations in the *Canada Lynx Conservation Assessment Strategy* (2013; appendix D.1A)

Determinations for alternative 2: Forest Service Lands – “*May Affect, Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative in conjunction with post-beetle conditions is expected to have a measurable negative effect on lynx habitat. This alternative would potentially affect to varying degrees up to 60,957 acres of lynx habitat including up to 250 acres of VEG S6 stands, 800 acres of VEG S5 stands, as well as regeneration activities within the limits identified by the SRLA in standards VEG S1 and VEG S2. Design criteria have been incorporated into this alternative to reduce or minimize impacts to high quality lynx habitats (VEG S6), minimize conversion of suitable habitat to unsuitable due to regeneration by minimizing damage to advanced regeneration to the extent possible.

BLM lands – “*May Affect, Not Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative is expected to have an insignificant negative effect on lynx habitat because some amount of temporary disturbance and habitat alteration may occur, but the project is consistent with management recommendations in the Canada Lynx Conservation Assessment Strategy.

Alternative 3: For alternative 3, maximum potential treatment acres in lynx habitat are 15,794 acres within the Carnero lynx analysis unit and 9,883 acres within the Four Mile lynx analysis unit.

Southern Rockies Lynx Amendment Exception caps and alternative specific caps for VEG S5 and VEG S6 are shown below along with the potential treatment acres by activity type and vegetation zone for alternative 2.

Lynx Analysis Area	VEG S1 cap (acres)	VEG S2 cap (acres)	VEG S5 cap (acres)	VEG S6 cap (acres)
Carnero	10,836	6,718	997	50
Four Mile	6,906	8,617		

Under this alternative, direct and indirect effects to lynx would be similar to those described for alternative 2 for the lower quality Douglas-fir/mixed conifer lynx habitat, but is more similar to alternative 1 for the spruce-fir, spruce-mixed conifer, and aspen mix vegetation zones. It would have a reduced caps for Exceptions to VEG S6 and a slightly higher cap for VEG S5 Exceptions. Treatment activities within the spruce-fir zone would be limited to safety mitigation treatments that would salvage harvest within 300 feet of existing open roads totaling about 46 miles as well as around existing structures, estimated to total 4,080 acres.

Management activities in non-spruce-fir lynx habitat would be focused on intermediate, non-commercial timber stand improvement and fuels treatments with restoration objectives to improve landscape composition, structure, and diversity in the cool/moist and cool/dry mixed conifer vegetation types. Though some of these stands may have characteristics of lynx habitat, the overall quality is likely less due to lack of structural diversity and lower levels of understory vegetation due to the dry conditions. Diversifying stand structure and reducing canopy cover may increase understory vegetation to some extent in moister stands and improve forage for hares to some level.

Activities	Vegetation Zones	Carnero LAU Acres	Four Mile LAU Acres
Salvage (infrastructure protection, safety)	Spruce-fir, spruce-mixed conifer, aspen mix	1,345	2,735
Sanitation/Salvage	Spruce-mixed conifer, Douglas-fir/ mixed conifer	0	0
Intermediate-Sanitation/Salvage	Aspen-mix	0	0
Intermediate Treatment	Aspen-mix, Douglas-fir/ mixed conifer	6,263	5,363
Timber Stand Improvement	Aspen-mix, Douglas-fir/ mixed conifer	157	102
TSI/Prescribed Burn	Spruce-mixed conifer, aspen mix, Douglas-fir/ mixed	1,876	49
Prescribed broadcast burn- mixed severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	6,138	1,557
Prescribed broadcast burn- low severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	0	0
Reduce conifer encroachment - riparian	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	15	77
Grand Total		15,794	9,883

Indirect effects to VEG S6 stands: Alternative 3 has the fewest number of acres of VEG S6 that could be impacted, compared to the other action alternatives, so would have the least effect on

reducing the amount of high quality habitat most suitable to support a higher density of snowshoe hares in the winter and the fewest incremental effects to habitat quality for the lynx.

Vegetation modeling estimates that approximately 394 acres of lynx habitat that is proposed for timber harvest treatment within identified treatment units and within 300 feet of roads identified for public safety treatment mature or late successional multi-storied conifer stands that may contain dense horizontal cover (Habitat Structural Stages 4BMS, 4CMS, 5BMS, and 5CMS). Locations of other existing infrastructure to be treated for public safety, including near structures, fences, has not been identified, and therefore, not modeled for effects to lynx habitat, but would not exceed 4,890 acres in total. Nearly all acres (393 acres) consist of intermediate treatments in Douglas-fir/mixed conifer stands, and only one acre proposed for salvage for public safety is currently modeled as multi-storied mature or late conifer. These are stands most likely to contain dense horizontal cover and subject to VEG S6 limitations.

Vegetation modeling estimates approximately 394 acres of lynx habitat is proposed for timber harvest treatment consists of mature or late successional multi-storied conifer stands (Habitat Structural Stages 4BMS, 4CMS, 5BMS, and 5CMS). These are stands most likely to contain dense horizontal cover subject to VEG S6 limitations. Based on the model parameters, approximately 3,007 acres of multi-storied mature and late conifer stands would remain unharvested in the two lynx analysis units. In addition, project design criteria pertaining to Scenic Resources would minimize creation of open linear corridors when removing hazard trees along roads, power lines, fences, or other linear infrastructure (Appendix D.2).

Indirect effects on lower quality horizontal cover (not dense horizontal cover) and prey-base resources: Since alternative 3 the fewest number of acres proposed for treatment in lynx habitat, it would likely result in converting the fewest acres to temporarily unsuitable, all effects would be well within the maximum lynx analysis unit caps for VEG S1 and VEG S2.

Indirect effects to landscape connectivity: Since this alternative proposes the fewest acres of treatment in lynx habitat, it would likely have the least effect on landscape connectivity of the action alternatives. Outside of salvage in spruce-fir stands adjacent to open roads and infrastructure, no additional management activities would occur in spruce-mixed conifer or aspen mix, so it is assumed habitat connectivity would be unaffected in these areas, similar to alternative 1. In currently suitable Douglas-fir/mixed conifer stands which contribute to supporting lynx movement on the landscape, patches of dense horizontal cover would be protected and a minimum overstory canopy cover of at least 25 percent would be retained in harvested stands to maintain habitat suitability (Appendix D). Lynx movement within and between lynx analysis units is expected to be maintained under this alternative.

Determinations for alternative 3: Forest Service Lands – “*May Affect, Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative would likely result in some lynx habitat alteration, but it would leave much of the highest quality lynx habitat areas undisturbed. This alternative would potentially affect to varying degrees up to 25,677 acres of lynx habitat including up to 50 acres of VEG S6 stands, 977 acres of VEG S5 stands, as well as regeneration activities within the limits identified by SRLA in standards VEG S1 and VEG S2. Design criteria have been incorporated into this alternative to reduce or minimize impacts to existing high quality lynx habitats (VEG S6), minimize conversion of suitable habitat to unsuitable due to regeneration by minimizing damage to advanced regeneration to the extent possible.

BLM lands – “*May Affect, Not Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative is expected to have an insignificant negative effect on lynx habitat because some amount of temporary disturbance and habitat alteration may occur, but the project is consistent with management recommendations in the *Canada Lynx Conservation Assessment Strategy*.

Alternative 4: For alternative 4, maximum potential treatment acres in lynx habitat are 20,015 acres within the Carnero lynx analysis unit and 16,667 acres within the Four Mile lynx analysis unit. Southern Rockies Lynx Amendment Exception caps and alternative specific caps for VEG S5 and VEG S6 are shown below along with the potential treatment acres by activity type and vegetation zone for alternative 2.

Lynx Analysis Area	VEG S1 cap (acres)	VEG S2 cap (acres)	VEG S5 cap (acres)	VEG S6 cap (acres)
Carnero	10,836	6,718	500	150
Four Mile	6,906	8,617		

Direct and indirect effects to lynx would be similar to those described for Alternative 2, but at a reduced magnitude due to the decrease in acres proposed for treatment. Alternative 4 would manage vegetation on up to 36,682 acres of lynx habitat which is approximately 60 percent less than Alternative 2. All proposed treatment acres are reduced for alternative 4 except for TSI/Prescribed Burn, which is increased by up to 358 acres and low severity prescribed burning is increased by up to 276 acres.

Activities	Vegetation Zones	Carnero LAU Acres	Four Mile LAU Acres
Salvage	Spruce-fir, aspen mix	4,374	12,068
Sanitation/Salvage	Spruce-mixed conifer, Douglas-fir/ mixed conifer	3,328	2,608
Intermediate-Sanitation/Salvage	Aspen-mix	4,790	260
Intermediate Treatment	Aspen-mix, Douglas-fir/ mixed conifer	5,146	1,047
Timber Stand Improvement	Aspen-mix, Douglas-fir/ mixed conifer	157	25
TSI/Prescribed Burn	Spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	1,929	495
Prescribed broadcast burn- mixed severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	0	0
Prescribed broadcast burn- low severity	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	276	0
Reduce conifer encroachment - riparian	Spruce-fir, spruce-mixed conifer, aspen mix, Douglas-fir/ mixed conifer	15	164
Grand Total		20,015	16,667

Indirect effects to VEG S6 stands: Alternative 4 has an intermediate number set at 150 acres of VEG S6 that could be impacted, compared to the other action alternatives, so would have an intermediate effect on reducing the amount of high quality habitat most suitable to support a higher density of snowshoe hares in the winter.

Vegetation modeling estimates approximately 953 acres of lynx habitat (608 acres in Carnero LAU, 345 acres in Four Mile LAU) is proposed for timber harvest treatment consists of mature or late

successional multi-storied conifer stands (Habitat Structural Stages 4BMS, 4CMS, 5BMS, and 5CMS). These are stands most likely to contain dense horizontal cover subject to VEG S6 limitations. Avoidance and minimization criteria would ensure that project activities maintain at least 80 percent of existing high-quality lynx habitat within harvested areas. Based on the model parameters, approximately 2,420 acres of multi-storied mature and late conifer stands would remain unharvested in the two lynx analysis units.

Indirect effects on lower quality horizontal cover (not dense horizontal cover) and prey-base resources: Since alternative 4 has fewer acres proposed for treatment in lynx habitat compared to alternative 2, it likely result in fewer acres being converted to temporarily unsuitable, all effects would be within the approved maximum lynx analysis unit caps for VEG S1 and VEG S2.

Indirect effects to landscape connectivity: Since this alternative proposes activities on fewer lynx habitat acres compared to alternative 2, it would have less overall potential to reduce connectivity by increasing acres in the stand initiation structural stage. However as with alternative 2, lynx movement within and between lynx analysis units is expected to be maintained and shifts in habitat from suitable to unsuitable as a result of management activities would be limited by available caps under the Southern Rockies Lynx Amendment, adverse effects would be minimized by the pre-implementation process (appendix D).

Determinations for alternative 4: Forest Service Lands – “*May Affect, Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative in conjunction with post-beetle conditions is expected to have a negative effect on lynx habitat, but at a level less than Alternative 2 due to reduced acreage treated. This alternative would potentially affect to varying degrees up to 36,590 acres of lynx habitat including up to 150 acres of VEG S6 stands, 500 acres of VEG S5 stands, as well as regeneration activities within the limits identified by SRLA in standards VEG S1 and VEG S2.

BLM lands – “*May Affect, Not Likely to Adversely Affect*” the Canada lynx or their habitat. The selection of this alternative is expected to have an insignificant negative effect on lynx habitat because some amount of temporary disturbance and habitat alteration may occur, but the project is consistent with management recommendations in the *Canada Lynx Conservation Assessment Strategy*.

Effects summary for action alternatives: all action alternatives would have some negative effects on lynx habitat characteristics even with the Southern Rockies Lynx Amendment objectives, standards, and guidelines as well as specific design criteria intended to minimize negative consequences of project activities. Some effects may be short-term with a long-term benefit as stand diversity is increased in the Douglas-fir/mixed conifer lynx habitat areas. Alternative 3 would have the fewest effects in the higher quality spruce-fir vegetation type. All alternatives would remain within the limits of management disturbance approved under the Southern Rockies Amendment Record of Decision (2008). The table below shows a summary comparison of the potential effects of the proposed action alternatives.

	Carnero LAU acres	Four Mile LAU acres	Maximum acres	VEG S5 cap acres	VEG S6 cap acres
Alternative 2	28,772	32,185	60,957	800	250
Alternative 3	15,794	9,883	25,677	997	50
Alternative 4	20,015	16,667	36,590	500	150

Cumulative effects: The cumulative effects analysis area is defined by the boundaries of the Carnero and Four Mile lynx analysis units. LAUs do not depict actual lynx home ranges, but should approximate the size of a female's home range, have a sufficient amount of habitat to support female lynx, and contain year-round habitat components (Interagency Lynx Biology Team 2013). Past management activities and occurrences that may have affected lynx habitat suitability are reflected in the existing condition. The cumulative effects analysis recognizes the current (updated) baseline conditions established by modeling tree mortality.

There are no tribal inholdings. State lands are currently leased for grazing and use is not expected to change. State lands primarily consist of upland non-lynx habitat that is not expected to influence lynx or their prey species. Extensive private inholdings exist along Carnero Creek. A majority of these properties have been developed into secondary/summer residences. There are other scattered private inholdings and one cattle ranch in the Miners Creek drainage. Continued development would be expected along Carnero Creek as demand for summer homes increases. While these developments are in the Carnero Creek riparian corridor, most are at lower elevations and are not believed to be utilized as much by lynx as higher elevation areas on the Forest. If any future logging activities occurred on state or private lands near or within the La Garita Hills analysis area, the activity would be unlikely to affect lynx habitat since these areas are generally in the lower elevation, non-habitat areas.

On Forest Service and BLM lands, ongoing and foreseeable activities coinciding temporally and spatially with this project include recreation, livestock grazing, and permitted special uses. Both recreation and permitted special uses may increase disturbance to lynx locally; however, overlap of these impacts with those generated by the action alternatives is expected to be insignificant because implementation of management activities would occur within different portions of the landscape and distributed over approximately a ten to fifteen year period. Therefore, only a small portion of any lynx analysis unit would be affected in a given year. No additional disturbance or lynx habitat impacts due to overlap with livestock grazing are expected. The analysis of past, proposed, and foreseeable future activities indicate that the implementation of the proposed La Garita Hills project would have no substantial cumulative effects on lynx or lynx habitat for all alternatives. Any future federal actions would be evaluated under additional section 7 consultation procedures.

Terrestrial Sensitive Species

The biological evaluation for the La Garita Hills project considered thirty-three Forest Service and eight BLM sensitive species. Sensitive species having no suitable habitat within the analysis area are not analyzed in detail. For Forest Service, these species include: Great Basin silverspot butterfly, northern leopard frog, triploid checkered whiptail, black swift, burrowing owl, ferruginous hawk, mountain plover, northern harrier, sage sparrow, white-tailed ptarmigan, and river otter. The project would not impact the following BLM sensitive species: American white pelican, long-billed curlew, western snowy plover, white-faced ibis, and swift fox.

Pre-field and habitat surveys determined that at least some suitable habitat exists for the following twenty-six sensitive species in the analysis area. These species are further analyzed in each alternative. A more detailed analysis is included in the project biological evaluation.

- Monarch butterfly, western bumblebee;
- western boreal toad;

- American peregrine falcon, bald eagle, boreal owl, Brewer's sparrow, flammulated owl, Lewis's woodpecker, loggerhead shrike, northern goshawk, olive-sided flycatcher, and golden eagle (BLM sensitive species);
- American marten, fringed myotis, Gunnison's prairie dog, hoary bat, Rocky Mountain bighorn sheep and Townsend's big-eared bat, North American wolverine (see federally listed species), Allen's big-eared bat (BLM), and spotted bat (BLM).

Alternative 1: For all sensitive species analyzed, the finding for alternative 1 is *no impact*.

Under alternative 1, there is no potential for direct or indirect impacts from project activities since no additional management activities would occur. None of the sensitive species analyzed would be disturbed, displaced or both.

Alternative 1 would allow natural disturbances such as spruce beetles and other bark beetles to slowly re-shape the forest, providing the best opportunity for a continued and naturally created mosaic pattern across the landscape that would provide habitat from most sensitive species to some level. Stands with a large Engelmann spruce component would eventually provide a patchy distribution of deadfall, standing dead, and newly regenerating trees and shrubs across the landscape. Understory growth is expected to accelerate as the overhead canopy opens up and release occurs. However, the extensive mortality of Engelmann spruce resulting from spruce beetle activities may affect Boreal owl habitat quality as canopy closures decrease and is reducing the food source for the red squirrel which is a prey species for the American martin.

Large standing snags and coarse woody debris would accumulate in large amounts in some areas. Coarse woody debris plays a critical role in supplying the type of structure needed for forested species such as the American martin and boreal owl. In addition, decomposing coarse woody debris could improve soil nutrient composition and moisture retention and overall forest regeneration of herbaceous vegetation. This could provide micro habitats and burrow opportunities for the boreal toad if it is re-established and improve prey species abundance for the northern goshawk.

In the Douglas-fir/mixed conifer and drier ponderosa pine and piñon-juniper vegetation types, increasing tree density and decreasing landscape patchiness may continue to reduce habitat values for some species like flammulated owls that utilize large diameter trees or olive-sided flycatcher that requires a variety of habitat structural stages. Uncharacteristically large or severe wildfires in these vegetation zones may also adversely affect use of these vegetation zones by several sensitive species.

Alternatives 2, 3, and 4: For the terrestrial sensitive species analyzed, the finding is: *No Impact* for the following six species: western boreal toad, Lewis's woodpecker, Loggerhead shrike, Gunnison's prairie dog, Townsend's big-eared bat, and Rocky Mountain bighorn sheep. These species have either not been found in the analysis area, have limited habitat in the analysis area, or would not be directly or indirectly affected by proposed activities.

For the remaining fifteen terrestrial species, the finding is "*may impact individuals, but not likely to result in loss of viability or cause a trend toward federal listing.*"

Alternatives 2, 3, and 4 would result in a given amount of habitat change depending upon acres treated. Although overall treatment acres are reduced in alternatives 3 and 4, the acres and activity types of habitat treated are not substantial enough to warrant a different determination between alternatives, except for the reduction in acres of salvage or sanitation/salvage harvests in alternative 3. This alternative would have effects similar to alternative 1 for species utilizing the spruce-fir, spruce-mixed conifer, Douglas-fir/mixed conifer and aspen mix forest stands. Forest Plan standards

and guidelines, project design criteria, and the pre-implementation checklist process are intended to reduce potential impacts to all sensitive species.

Insects

Direct effects could include crushing or burning of milkweed plants with monarch butterfly caterpillars or pupa on the plants. Potential indirect effects would include loss of habitat from crushing or burning of individual milkweed plants, if they are present in the analysis area. The pre-implementation review process described in appendix D would be used to help minimize impacts to any concentrated milkweed patches, if they occur in individual project areas.

Direct effects on the western bumblebee could include logging equipment or other off-road vehicles crushing bee colonies. Reductions of flowering plants might also have negative consequences for the bumblebee. Reductions in forest canopy cover and prescribed burning may increase flowering plants. No pesticide applications are expected within the project area, thus avoiding the greatest threat to this species. Conservation measures include: avoiding prescribed broadcast burning from June through late August in areas where large numbers of wildflowers are present. The pre-implementation review process described in appendix D would be used to help minimize impacts to any concentrated wildflower areas, if they occur in individual project areas.

Birds

Alternative 3 would have no effect on boreal owls, olive-sided flycatcher, or any northern goshawk territories located in the spruce-fir, spruce-mixed conifer, Douglas-fir/mixed conifer, and aspen mix forest vegetation zones where only limited activities would occur. Effects on species utilizing other, lower elevation, drier habitats would be similar to alternatives 2 and 4 below, since proposed activities are similar.

For alternatives 2, and 4 proposed forest and woodland management activities could impact habitat characteristics for boreal owl, flammulated owl, northern goshawk, and olive-sided flycatcher. For small owl species, the most likely direct effect from timber harvest activities would be inadvertent nest destruction, displacement, adult and nestling mortality if any nest trees were felled during the nesting through the post-fledging season (mid-April to late July), or some combination of those effects. Indirect effects may include the reduction in existing large diameter snags and future snag recruitment, which can influence potential nesting habitat and occupancy. In the spruce-fir or moister Douglas-fir/mixed conifer vegetation zones, the reduction of understory components such as surface litter and coarse woody debris could also reduce habitat of the boreal owl's primary prey species, the red-backed vole. However, future improvements in understory regeneration and composition due to natural regeneration and replanting could improve habitat for the red-backed vole (ten years or less) and thus improve foraging habitat for the boreal owl. In lower elevations, thinning and prescribed broadcast burning would increase understory grasses, forbs and shrubs that might also indirectly increase insect abundance for flammulated owls. Reducing tree density on portions of the drier ponderosa pine and dry mixed conifer vegetation zones would allow for the recruitment and longer retention of larger diameter ponderosa pine or Douglas-fir over the long term, improving habitat quality for flammulated owls.

Timber harvest activities during northern goshawk breeding season (May through early July) might inhibit breeding activity and cause nest abandonment and reproduction failure. Project design criteria would be in place to minimize activities around active nest sites or during nesting periods. Forest management strategies in active post-fledging areas would be adjusted to maintain or improve habitat conditions, as needed.

Indirectly, the removal of bark beetle-killed trees, thinning of live trees in other vegetation zones, regeneration, or impacts to vegetation components that might provide habitat for prey species could negatively impact the northern goshawk and small owl species. Reductions in prey could displace raptors to other areas in search of food. However, the reductions should be temporary. Harvested areas should result in more open stands which could benefit many avian species such as goshawk and olive-sided flycatcher, due to the increase in herbaceous understory vegetation where the overstory is decreased. Through time, a patchy distribution of deadfall, snags, and regenerating trees and shrubs should occur across the landscape, which should restore the prey base for avian species.

There is a potential for nesting raptors and birds such as the olive-sided flycatcher to be disturbed or suffer direct mortality as the result of tree-felling activities. However, this potential would be decreased by implementing Forest Plan standards and guidelines and project design criteria to protect active raptor and bird nests, cavities, and soft snags and avoiding the key nesting and post-fledging periods. Habitat effectiveness may be impacted; however, the analysis area should continue providing adequate habitat for avian species.

Prescribed fire treatments in the suitable grass/shrub Brewer's sparrow habitat during the spring breeding season may result in mortality of individual fledglings. However, most prescribed burns in the area tend to occur in the longer fall burn window, so any effects during the breeding season would be infrequent over a ten to fifteen-year period. Other activities are not expected to negatively impact the Brewer's sparrow. Increases in grass, forb or shrub diversity may increase available food for this species over the mid-term.

Project activities may impact foraging habitat for bald and golden eagles but is not expected to impact nesting habitat for either species.

Mammals

Alternative 3 would have no effect on the American marten which is the only sensitive mammal closely associated with spruce-fir and cool-moist Douglas-fir/mixed conifer vegetation zones. Effects on mammals utilizing other, lower elevation, drier habitats would be similar to alternatives 2 and 3, since proposed activities are similar.

For alternatives 2 and 4, American marten is suspected to occur in the analysis area in the spruce-fir and cool-moist mixed conifer vegetation zones and might be disturbed or displaced by harvest activities. Activities that modify canopy closure, snag densities, ground-level coarse woody debris, or some combination of those factors may be particularly detrimental. Under this alternative, sufficient woody debris would remain available on the forest floor for marten prey species and for marten denning habitat. The spatial distribution and concentration of trees remaining would continue to provide suitable habitat for forage species. At this time, most mature Engelmann spruce has died which has reduced overall canopy closure, especially in the spruce dominated stands. Effects in the mixed conifer stands are much less; harvests in these stands may reduce canopy closure, but sufficient habitat should remain to provide suitable habitat until the spruce-fir forest recovers structural complexity over time.

The fringed myotis, Allen's big-eared bat, hoary bat, and spotted bat are all either known to utilize, or are suspected of utilizing, lower elevation vegetation types in the analysis area (hoary bat can use the trees across the full elevation range). Some roosting habitat, maternity sites, or both might be lost to timber harvest activities in the ponderosa pine or drier mixed conifer vegetation zones. Treatment activities should not cause negative impacts to foraging resources for these species. Implementing Forest Plan standards and guidelines and project design criteria should provide an abundance of

snags across the analysis area and Forest to meet bat habitat needs for several decades. Proposed activities in piñon-juniper vegetation zones should have minimal direct effects, indirect effects may include additional foraging areas where canopy cover is reduced or snag where snags are increased following mixed severity prescribed broadcast burning (alternatives 2 and 3).

Cumulative effects: The proposed project, in addition to other past, present, or reasonably foreseeable activities in the analysis area and other activities on the Forest, should potentially have minor incremental impacts such as disturbance, displacement, or both. Most sensitive species are not expected to be greatly affected by project activities; for most species the analysis area is adjacent to other quality habitat and project implementation would generally occur in relatively small areas at one time. Overall, for sensitive species, the implementation of Forest Plan standards and guidelines, project design criteria and the pre-implementation checklist process will help to alleviate most of the potential for impacts, thus reducing the potential for cumulative effects.

Terrestrial Management Indicator Species

The Forest has eight terrestrial management indicator species, all have habitat in the analysis area, and so further evaluation was completed on impacts to habitat.

Effects from Alternative 1

Brown creeper - No discernible effect on population persistence or viability would be expected at the Forest level. A large percentage of the Forest's mature Engelmann spruce has or will ultimately die from the spruce beetle epidemic. Forest trend data (Pavlacky and Sparks 2016) collected in response to the spruce beetle outbreaks indicates continued occupancy of the spruce-fir vegetation zone by this species, though more use is occurring in stands with a remaining live subalpine fir component and with only a moderate number of snags.

Hermit thrush- No discernible effect on population persistence or viability would be expected at the Forest level. A large percentage of the Forest's mature Engelmann spruce will ultimately die from the beetle epidemic. The amount of coarse woody debris should increase substantially as dead trees fall over time. Horizontal cover consisting of understory vegetation and small, dense, green trees would also increase. Forest trend data (ibid) for this species has indicated a general positive response in use to the spruce beetle caused mortality, especially in severe mortality areas. The presence of saplings and mature aspen increase the amount of use.

Pygmy nuthatch – Not much change would be expected in the ponderosa pine zone under this alternative. Therefore, not much change would be expected to pygmy nuthatch viability or population trend at the project or Forest level.

Elk and Mule deer- Overall, alternative 1 would likely result in modest improvements in summer foraging habitat at the project level in areas where forest mortality is high, but no discernible effect on elk or mule deer population persistence or viability would be expected at the Forest level; some improvement in deer summer foraging habitat is expected in the analysis area. In some areas, large amounts of coarse woody debris on the forest floor could decrease ease of movement for these animals. Increases in aspen or other shrubs would improve summer foraging habitat for mule deer. Under this alternative, there would be no additional management activity on open or closed roads, so would not change the current habitat effectiveness and security from human disturbance. This is expected to be most beneficial to elk, however mule deer would likely benefit as well in some areas.

Lincoln's sparrow, Wilson's warbler – In areas with substantial decrease in forest cover that may increase runoff and stream flows, riparian conditions would likely display some improvement into

the future. As riparian condition improves, population trend for these two species might improve at the project level but no discernible effect on population persistence or viability would be expected at the Forest level.

Vesper sparrow – Vesper sparrow numbers would be expected to remain unchanged under alternative 1, at least in the short-term. Encroaching trees and shrubs may decrease habitat in the long-term in the project area.

Effects from Alternatives 2, 3, and 4

Habitat effects from proposed action alternatives are similar for all management indicator species with minor differences depending on the acres proposed for treatment in a species general habitat. There would be no discernable effects on any management indicator species population persistence or viability at the Forest level for any action alternative. The effects of limited salvage and sanitation salvage in alternative 3 would be slightly different in the analysis area for brown creeper and hermit thrush, but at the forest-scale would be difficult to detect.

Brown creeper - Disturbance would occur from human activity associated with salvage harvest activities. Some nesting habitat loss could also occur with the removal of timber. However, sufficient snags should remain for brown creepers to meet nesting and foraging needs. It is expected that some individuals would disperse into adjacent non-impacted or untreated habitats.

Hermit thrush - Over time, approximately three percent of spruce-fir forest-wide could be impacted by this alternative, which could temporally impact hermit thrush through incidental understory damage. Sufficient amounts of coarse woody debris would remain for hermit thrush habitat. Horizontal cover consisting of understory vegetation and small green trees would also remain, but canopy closure is expected to fall below desired condition in treatment areas. It is also expected that some individuals would disperse into adjacent non-impacted or untreated habitats.

Pygmy nuthatch – Proposed thinning and prescribed burning activities in ponderosa pine to decrease stand densities and reduce fuels would be expected to have few negative short-term impacts on this species. Long-term habitat conditions should improve in treated acres.

Elk and mule deer –Forage would improve following timber harvest where canopy cover is reduced. In salvage harvest areas, large amounts of coarse woody debris that would impede movement would be reduced. Primarily, where timber harvest would be active, traffic would increase for the length of the activity, (any closed roads used for individual projects would not be open to public travel unless allowed for 1 to 2 seasons for firewood collection following harvest) and might displace elk or deer for short periods of time. Alternatives 2 and 4 would have the greatest potential for disturbance, due to the number of potential treatment acres, though activities would not occur on all acres at the same time. For deer, increases in early seral aspen or shrubs for browse would be beneficial to increase summer forage in the analysis area. Prescribed broadcast burns could temporarily decrease browse for deer, but overall vegetative diversity should increase over time.

Lincoln's sparrow, Wilson's warbler – Any improvement in runoff, stream flows, or riparian conditions would likely improve in the future, and Lincoln's sparrow and Wilson's warbler habitat should improve as a result. Reducing encroaching conifers to maintain aspen or willow will also be beneficial over the long-term. Activities occurring in or near riparian areas during the breeding season would affect relatively small areas at one time, so effects to nesting birds would be limited in space and time.

Vesper sparrow – Timber harvest treatment would have little impact on this species. Conifer encroachment treatments in upland meadows may help maintain open bunchgrass and shrub areas used by this species. Most prescribed fire treatments would occur during the longer fall burn window, so would not negatively impact this species since they would occur outside the breeding season. If spring burning is used, there is the potential to have mortality of young. Any negative effects would be expected to be small in scale, temporary, and infrequent over the ten to fifteen year implementation period.

Table 26. Acres of MIS habitat affected and relative to Forest level habitat, alternatives 2, 3, and 4

Species	Habitat type/acres at Forest level	Potential analysis acres affected	Percent Forest habitat affected
Brown Creeper	Mature spruce-fir/mixed conifer (634,000 acres)	43,256	7%
Hermit Thrush	Mature spruce-fir/mixed conifer (634,000 acres)	43,256.	7%
Pygmy Nuthatch	Ponderosa pine - (38,000 acres)	12,152.	32%
Elk and Mule deer	All Forest lands (1,836,866 acres)	187,778	10%
Lincoln's Sparrow and Wilson's warbler	Willow riparian (11,680 acres)	950.	8%
Vesper Sparrow	Grasslands and montane shrub lands (222,000 acres)	50,023	23%

Cumulative Effects: The proposed project, in addition to other past, present, or reasonably foreseeable activities in the on the Forest, should potentially have minor incremental impacts such as disturbance, displacement, or both. Most management indicator species are not expected to be greatly affected by proposed project activities; for most species, the analysis area is adjacent to other quality habitat and project implementation generally occurs in relatively small areas at one time. Overall, the implementation of Forest Plan standards and guidelines, project design criteria and the pre-implementation checklist process will help to alleviate most of the potential for impacts, thus reducing the potential for cumulative effects.

Migratory Birds

Neotropical migratory land birds breed in the U.S. and winter south of the border in Mexico and Central and South America. Direction on land bird conservation in Forest Service Region 2 and the BLM San Luis Valley Field Office is to reference the Birds of Conservation Concern list produced by the U.S. Fish and Wildlife Service when completing National Environmental Policy Act evaluations for project activities.

Effects from Alternatives on Migratory Birds

The following is a list of the migratory birds that might be impacted by project activities and the anticipated effects:

- Golden eagle, peregrine falcon, Lewis's woodpecker, flammulated owl – effects are discussed in the sensitive species section. Golden eagle, peregrine falcon -no effect; flammulated owls and: Lewis's woodpecker in ponderosa pine: may affect individuals, but not likely to result in loss of viability, potential to improve habitat over the mid to long-term.

- Virginia's warbler – no effect because the riparian scrub habitat for this species would not be disturbed.
- Grace's warbler (ponderosa pine), Williamson's sapsucker (snags, mixed conifer forests), piñon jay (piñon-juniper)– may affect individuals, but not likely to result in loss of viability because there is potential for disturbance or displacement of individuals and some potential for direct mortality of young from proposed management activities (intermediate harvest, thinning, and prescribed burning) in the general habitats for these species. At least minimum numbers of conifer snags will be retained, mature aspen will not be treated, and prescribed burning may create additional snags.

The *Colorado Landbird Conservation Plan* (Beidleman 2000) identified priority species and habitats for each physiographic area in the state, based on the Partners-In-Flight species prioritization process. The complete list of priority birds analyzed is in wildlife specialist report on file in the project record. Some birds in the report have been analyzed in other sections.

Effects from Alternatives on Priority Bird Species

The following is a list of priority bird species and potential effects from project activities.

- Rednaped sapsucker, purple martin, violet-green swallow – Loss of mature aspen should be minimal since mature aspen stands are not being proposed for treatment; some loss of individual hazard trees or mortality resulting from prescribed fires may occur. Under alternative 1, the mortality of much of the conifer overstory should create a widespread opportunity for aspen sprouting.
- Dusky grouse, Williamson's sapsucker, band-tailed pigeon– Snags and live conifers would be removed if salvage occurs; cavity nesting trees would be avoided. Prescribed broadcast burns could increase snag numbers. Under alternative 1, an increase in snag habitat would be expected for several decades.
- Hammond's flycatcher – Live conifers would be removed, and salvage logging would reduce snags. Cavity nesting trees and wetland areas would be avoided. Prescribed broadcast burning could only occur in parts of the Colorado Roadless Areas (alternatives 2 and 3) depending on lynx habitat conditions. Under alternative 1, extensive loss of mature spruce due to spruce beetle activity would have potential negative effects; however, this species would be expected to utilize other suitable habitat where available.

Cumulative Effects

Selection of any action alternative would be expected to have similar direct or indirect impacts on migratory birds within the area of influence. Cumulatively, implementation of this project, in addition to other activities in the analysis area, would have minor incremental effects on migratory birds (for example, increased cumulative chance for disturbance or displacement). Minor cumulative effects might impact individuals, but would not likely contribute to a loss of species viability of any migratory bird that occurs on the Forest. Management activities in the active nesting season (mid-April to mid-July) may occur in some areas, but are often limited by weather conditions, especially in the higher elevations during spring snow melt. Conditions for spring burning generally occur very infrequently, though in some years prescribed broadcast burns may be implemented in the spring in the lower elevations, which may affect young birds. The pre-implementation checklist process is intended to provide another opportunity for site specific review and design to help minimize adverse effect to the extent feasible.

Cumulatively, the spruce beetle infestation has had a widespread effect on habitat and species in the spruce–fir zone (with some local populations increasing and some decreasing). Project activities would be expected to further change existing conditions. However, project activities would be designed to accelerate recovery and improve long-term future habitat conditions.

3.6 Fisheries

Scope of Analysis

The biological evaluation for fisheries reviewed the La Garita Hills project to determine how the proposed action may affect proposed or listed threatened, endangered, and sensitive fish species. The biological evaluation process 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 analysis for aquatic management indicator species evaluated potential effects of vegetative management treatments in the La Garita Hills analysis area in relationship to the diversity objectives and standards and guidelines in the Rio Grande National Forest Land and Resources Management Plan (Forest Plan).

Existing Conditions

There are no federally listed or proposed fish species present in the analysis area, so no biological assessment or Section 7 consultation is needed. There are two Region 2 sensitive fish species in the analysis area: Rio Grande cutthroat trout and Rio Grande sucker. There is no suitable habitat for the Rio Grande chub in the analysis area.

Rio Grande Cutthroat Trout

There are five core and two conservation core Rio Grande cutthroat trout populations and four introduced Rio Grande sucker populations in the analysis area. Core populations are more than ninety-nine percent genetically pure and represent the historic genome of the native trout. Conservation core populations are self-sustaining Rio Grande cutthroat trout populations that are more than ninety percent genetically pure and are managed at the same conservative level as core populations. Core populations of Rio Grande cutthroat trout are found in North Fork Carnero Creek, Prong Creek, Cave Creek, Miners Creek, and Big Springs Creek in the analysis area. Conservation core populations are found in South Fork Carnero Creek and Middle Fork Carnero Creek.

Rio Grande cutthroat trout populations are assigned a population status (CPW 2004) based upon a various population parameters. The status categories are:

1. At risk and declining population – impacted by limited habitat, habitat degradation, or non-native salmonids. Population statistics indicate declining trend in biomass and density. Successful reproduction is inconsistent.
2. At risk and stable population – impacted by limited habitat, habitat degradation, or non-native salmonids. Population statistics are not increasing or decreasing in biomass or density. Successful reproduction observed in at least two years during a five-year span.

3. Secure and stable population – secure from impact of limited habitat, habitat degradation, or encroachment by nonnative salmonids.
4. Secure and expanding population – not impacted by habitat degradation, limited habitat, or non-native salmonids. Population statistics are increasing in biomass and density. Successful reproduction observed in at least two years during a five-year span.
5. Unknown population – limited knowledge of genetic classification, population status, and/or habitat condition.

The Rio Grande cutthroat trout population in Middle Carnero Creek is classified as at risk and declining. In 2005, multiple size classes of trout were present in the upper section of the stream. Looking at the size distribution of fish collected in 2009, it appears limited reproduction and population recruitment have occurred since 2005. Bank degradation and a heavy silt load have impacted trout habitat in the survey area.

The population in Cave Creek was at risk and stable in 2001 but was reclassified as at risk and declining in 2009 due to the extremely low population found. In 2009, biomass dropped from twenty pounds per acre to three pounds per acre with a density decrease from sixty-five fish per mile to only twenty per mile. Only one young-of-year trout was collected. As in Middle Fork Carnero, bank degradation and a heavy silt load have impacted habitat in the survey area. Grazing impacts and runoff from roads were the likely sediment contributors at that time and continue in some areas.

Three North Fork Carnero Creek stream sections were surveyed in 2009, and no fish were collected. Only four Rio Grande cutthroat trout were collected in 2005 surveys. The decline in this population is most likely due to low water conditions in 2002 with the corresponding removal of fish and not from land management actions. This stream had supported a small relic population, but in 2001-2002, stream flows became very low and water temperatures became elevated. Some fish were removed from the stream by Colorado Parks and Wildlife and relocated to another site. The remaining trout have not recovered from the harsh conditions during the drought or from the loss of individuals due to the relocation.

A downward trend in Rio Grande cutthroat trout population parameters is also noted in South Fork Carnero Creek, although it remains classified as at risk and stable. The decrease in population parameters is likely due to a combination of factors, including limited spawning success and competition with brook trout for food and space. The overall trout population in South Fork Carnero appears to be stable but nonnative trout appear to be outcompeting native Rio Grande cutthroat trout. Some sections of South Fork Carnero Creek exhibit heavy riparian use resulting in bank alteration, hummocking in wet areas, and heavy browse utilization. These changes in habitat conditions may benefit fall-spawning brook trout which are more tolerant of habitat changes (Fausch et al. 2006).

Miners Creek and Prong Creek both support relic populations of Rio Grande cutthroat trout which are coexisting with brook trout. Surveys show both Rio Grande cutthroat trout populations increasing slightly from previous surveys.

Big Springs Creek supports an introduced population of Rio Grande cutthroat trout that has received several hatchery stockings and is classified as secure and expanding. However, surveys in 2014 documented a decrease in population biomass and density compared to sampling in 2011 and 2005.

Rio Grande Sucker

Rio Grande suckers are known to occur in twelve streams in the Rio Grande Basin in Colorado. Only three of these streams are historic self-sustaining populations (none on Forest). The remaining

populations have been reestablished through stocking. Rio Grande suckers have been introduced into Middle Fork Carnero Creek, North Fork Carnero Creek, South Fork Carnero Creek, and Big Springs Creek in the analysis area. However, Big Springs is the only stream in the project area where persistence remains likely.

Multiple yearly stockings have occurred since the first stockings, but no populations have become established in any of the four streams. Each of the four streams has received at least ten thousand (three-inch) Rio Grande suckers in an attempt to get them established. Surveys in 2014 documented a small Rio Grande sucker population surviving in Big Springs Creek.

Aquatic Management Indicator Species and Other Fish

Rio Grande cutthroat trout were selected as a Forest management indicator species to serve as an indicator of the health of montane aquatic ecosystems. Other nonnative trout such as brook, rainbow, or brown trout can be utilized as management indicator species if Rio Grande cutthroat trout are not present in the area. A review of monitoring results for Rio Grande cutthroat trout suggests that current forest activities are likely having a negative consequence on aquatic management indicator species populations (Rio Grande cutthroat trout) in at least two streams.

Some fish populations in the analysis area appear to be affected by alterations in habitat conditions, resulting in changes in population numbers, density, and biomass. Middle Fork Carnero Creek, South Fork Carnero Creek, and Cave Creek exhibit heavy sediment loading which is impacting spawning, overwintering pool habitat, and possibly macroinvertebrate production. Roads, permitted livestock, and other large ungulate use (elk, moose, and deer) have impacted some sections of the riparian areas leading to increased stream sedimentation from runoff and bank degradation. Multiple age classes were noted in Miners Creek, Prong Creek, and Big Springs Creek which indicate successful natural reproduction and recruitment to the populations. Overall stream condition in Miners Creek, Prong Creek, and Big Springs Creek appears to be good with only isolated areas of concern, and habitat does not appear to be a limiting factor for the continued existence of Rio Grande cutthroat trout in these areas.

Direct and Indirect Effects

Road systems in the analysis area often follow stream channels and are a primary concern for sedimentation delivery to stream systems. As described in the Hydrology section, the percent equivalent roaded area for each HUC 6 watershed varies from less than one percent to approximately ten percent.

Rio Grande Cutthroat Trout

The effects determination for all alternatives is “*may impact individuals but is not likely to cause a trend towards Federal listing or loss of viability in the planning area*” for Rio Grande cutthroat trout (RGCT), their habitat, or both either directly, indirectly, or cumulatively. Conservation measures have been included in the project design criteria and the project pre-implementation checklist process (appendix D) would provide an additional opportunity for review prior to ground disturbance.

Alternative 1

Under alternative 1, vegetation management activities involving silvicultural and prescribed fire applications would not occur at this time. This alternative may have both positive and negative influences on aquatic habitats for fisheries.

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. Under Alternative 1, 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, sedimentation issues involving aquatic habitats remain in Middle Fork Carnero and Cave Creek and have the potential to prolong impacts to existing Rio Grande Cutthroat trout (RGCT) reproduction and population recruitment.

Baseline conditions for RGCT in the analysis area also involve the presence of nonnative trout that had been stocked historically. Introduced nonnatives can pose a threat to RGCT existence due to competition for space and food. Fish stockings can also increase the risk of introduction of various fish diseases and invasive species. The action alternatives associated with this 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.

Native surface roads along the streams and within the riparian corridors are a primary influence on aquatic habitats in the analysis area. These concerns vary by watershed, with the percent Equivalent Roaded Area (ERA) varying from near zero (Werner Arroyo watershed) to 10 percent (Trough Creek-Saguache Creek watershed). Existing culverts and stream crossings also contribute to aquatic habitat issues within the analysis area, and vary from a high of 6.6 crossings/mile in the Trough Creek-Saguache Creek watershed to near zero in the Werner Arroyo watershed. In the South Fork and Middle Fork Carnero watersheds, which are of primary concern for RGCT, the ERA is 6 percent for each with stream crossing densities of 1.17 and 0.87 per mile, respectively. This alternative would neither contribute to these issues through additional disturbance associated with timber harvest and hauling, nor offer the long-term corrections associated with the vegetation management proposals or the proposal to relocate portions of NFSR 673, 708, and 720.

The amount and distribution of standing dead and dying trees in various forest cover types might negatively 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 might be somewhat offset by increased growth in forest understory vegetation and riparian vegetation.

Dead and dying trees along the riparian corridor would provide a source for large wood contributions to the stream and floodplain which is important for many aquatic species including trout and macroinvertebrates or, conversely, cause potential impacts if large log jams occur. Very high stand-level mortality rates might also lead to increased runoff and higher flows which could 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). 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.

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. Under alternative 1, fuel load trends associated with these risks might be expected to continue until a wildfire eventually does occur on a landscape scale. High tree densities and fuel loads could contribute to higher intensity wildfires which could have a detrimental effect on stream conditions and fish populations if the intensity was uncharacteristic for a particular fire regime. Floods following fires could contribute large amounts of

ash and debris into stream channels resulting in fish kills and changes in stream channel geomorphology.

Alternative 2

Alternative 2 proposes various management treatments on approximately sixty-eight percent of the analysis area. The percentage of watershed acres potentially treated in alternative 2 is the largest of all action alternatives and might therefore require more administration and monitoring to ensure potential influences on streams and aquatic habitats would be minimized as intended over several years of activity.

Proposed timber harvest activities associated with alternative 2 could include the re-opening of up to over 76 miles of currently closed national forest system roads and over 52 miles of old non-system, temporary roads used in previous timber harvests. Given the amount of area and activity proposed, at least moderate short-term risks might be associated with alternative 2. However, effects should be acceptable if Forest Plan standards and guidelines, best management practices, project design criteria, and Watershed Conservation Practices Handbook practices are fully implemented, with response taken to mitigate unanticipated impacts such as summer storm events or soil freeze-thaw conditions. The potential for indirect effects from sedimentation that may influence aquatic habitats and fish-bearing streams is considered moderate under alternative 2 due to the increase in Equivalent Roaded Area, disturbance of previously closed roads that would be opened to access the harvest areas, landings, log hauling, prescribed burn areas, and other activities associated with this alternative.

Alternative 2 would provide an opportunity to influence potential wildfire effects to the greatest extent of all action alternatives while reducing existing road impacts, improving stream and riparian habitat, and sustaining or improving habitat for fish populations. Focused administration and monitoring would be warranted in Rio Grande cutthroat trout streams, particularly in South Fork and Middle Fork Carnero Creek.

Road work is included in all action alternatives and some surface disturbances would occur during pre-haul road maintenance, during reconstruction or construction of old, temporary roads, new temporary road segments, and during road maintenance or reconstruction. Negative impacts should be controlled and minimized by implementing project design criteria and Forest Plan standards; however, risks associated with sedimentation could be moderate to high depending on site-specific conditions and would need to be closely monitored. Stream crossings needed for access would be coordinated with the forest hydrologist, fish biologist, or both to minimize impacts to the stream and riparian areas and designed to provide aquatic species passage. The relocation/re-alignment of portions of National Forest System Roads 673, 708 and 720 to areas outside the water influence zone should help reduce impacts to these respective streams. As the roads are upgraded and drainage issues are resolved, there should be some long-term benefits to the stream corridors if the design criteria are fully implemented.

Up to approximately 55,255 acres of upland non-commercial thinning, prescribed burning, or both in could occur under alternative 2. The fuel reduction treatments being proposed are outside the water influence zone and should have minimal, if any, effect on aquatic habitats or fisheries resources. Part of the intent of these treatments is to reduce the potential for high-intensity wildfires which might also have negative influences on watershed and aquatic habitats.

Alternative 2 includes proposes up to 770 acres of conifer removal from riparian areas. This would need to be evaluated on a case-by-case basis before occurring on the ground. In some areas, the

conifers might be providing stream shading and contributing to stream bank stability. The removal should be closely coordinated with the fish and wildlife biologists and the forest hydrologist. Long-term thermographs have been deployed in streams in the analysis area to monitor stream temperatures. The thermographs will help identify streams where shading might be needed to cool the waters or where conifer removal might help in warming the waters for earlier spawning.

There is a wide variety of management actions associated with alternative 2 that should provide benefits to stream health and fisheries value in the long-term. These benefits should include more resilient forest stand conditions that influence hydrologic regimes, replanting or encouragement of natural regeneration to reduce bare soil areas, reduced stocking and fuel loads that reduce fuel loads and the risk of uncharacteristic wildfire, correction of road drainage issues that potentially contribute sediment loads to streams, and reduction of conifer encroachment into specific meadows and riparian areas that may be influencing water yields and/or understory vegetation growth. 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-measurable or short-term.

Alternative 3

Alternative 3 proposes various management treatments on approximately fifty percent of the analysis area. It proposes up to a ten percent increase in the area proposed for non-commercial thinning, prescribed fire, or both. It substantially reduces the miles of road that would need to be reopened for activities. In alternative 3, these figures are reduced by 85 percent to 11.6 miles of currently closed national forest system roads and by 46 percent to about 24 miles of old non-system, temporary roads, respectively, compared to alternative 2. It is estimated that alternative 3 may also require up to roughly 740 acres of areas dedicated to landings for logging operations, which is a 67 percent decrease compared to alternative 2. This alternative would have reduced risk associated with stream crossings and potential sedimentation.

As in alternative 2, this alternative provides an opportunity to reduce wildfire risk, reduce road impacts, improve stream and riparian habitat, and sustain or improve fish populations. Potential effects from alternative 3 on aquatic habitats and fisheries values should be similar to alternative 2 but with less risk of contributing to some of the negative baseline conditions for aquatic habitats and fisheries resources. Other differences in alternative 3 include a slight increase in the amount of meadow acres proposed for thinning conifer encroachment and a slight reduction in the amount of streamside acres associated with potential thinning of conifer encroachment. A significant reduction (about 82 percent) in acres expected to regenerate aspen is also expected under this alternative. The same amount and portions of roads 673, 708 and 720 would be relocated outside of the stream influence zone to reduce sedimentation.

A primary benefit of alternative 3 would be the increase in non-commercial thinning, prescribed fire use, or both. The proposed increase in these activities would address the need to move stand densities and fuel loads toward historic fire regimes in mid to lower elevation forest cover and vegetation types. All potential impacts associated with alternative 3 would be subject to the same design criteria and standards and guidelines as alternative 2. Potential impacts should be controlled and minimized to the extent that any negative influences on aquatic habitats and fisheries are non-measurable or short-term in nature. However, given the reduced amount of activity area, the risk of potential negative influences should be low.

Alternative 4

Alternative 4 proposes various management treatments on approximately forty-three percent of the analysis area. It would reduce the area proposed for non-commercial thinning, prescribed fire

treatment, or both by approximately thirty-three percent from alternative 2 and thirty-nine percent from alternative 3.

Under alternative 4, potential effects to aquatic habitats and fisheries values should be similar to those described for alternative 2 but greater than those described for alternative 3. Potential effects are expected to be similar to alternative 2 if Forest Plan standards and guidelines, best management practices, project design criteria, and Watershed Conservation Practices Handbook practices are fully implemented.

A negative aspect of alternative 4 would be the decrease in area proposed for upland non-commercial thinning, prescribed fire treatments, or both. Alternative 4 would address the need to move stand conditions towards the historic fire regime but over fewer acres. Compared to alternative 3, alternative 4 would increase some potential risks associated with timber harvest but reduce the benefit associated with thinning and fire reintroduction. Impacts under alternative 4 would be subject to the same design criteria and standards and guidelines and pre-implementation process (appendix D) as alternatives 2 and 3. Potential impacts should be controlled and minimized to the extent that negative influences on aquatic habitats and fisheries would be immeasurable or short-term in nature.

Rio Grande Sucker

All alternatives associated with the La Garita Hills Restoration Project will have “*no impact*” on Rio Grande suckers, their habitat, or both either directly, indirectly, or cumulatively.

None of the action alternatives propose activities that could impact habitat conditions for the Rio Grande sucker population in Big Springs Creek. No activities are proposed in this general area, and the need for vegetative and/or fuels treatments in the vicinity of Big Springs is not considered significant. Therefore, no effect is anticipated from the alternative 1. It is unlikely any Rio Grande sucker populations continue to survive in any other stream systems in the analysis area. If individual suckers survive in South Fork Carnero Creek or other systems where they were introduced, the effects of all alternatives should be similar to those described for the Rio Grande cutthroat trout. However, occurrence is unlikely except for in Big Springs Creek.

Aquatic Management Indicator Species

See effects discussion for Rio Grande cutthroat trout.

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.

Baseline conditions for aquatic habitats in the planning area have been influenced by various natural and human-caused disturbances since settlement in the late 1800s. Although not extensive, there has been a long history of timber harvest within some portions of the analysis 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 roads and amounts of 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 analysis area. Other activities affecting baseline conditions

for aquatic systems include beaver removal, non-native fish introductions, and various recreational pursuits.

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 stockings contribute recreational value for human uses but can also impact native trout populations where emphasized. Brook trout and brown trout currently can be found co-existing with Rio Grande cutthroat trout in South Fork Carnero, Cave Creek, Miners Creek, and Prong Creek. These nonnative salmonids pose a threat to Rio Grande cutthroat trout existence due to competition for space and food. Fish stockings can also increase the risk of introduction of various fish diseases (whirling disease, bacterial kidney disease, etc.) and invasive species (snails, clams, mussels, etc.), particularly when combined with the incremental impacts of sedimentation facilitated by anthropogenic activities.

Although not extensive at this time, some riparian zones within the analysis area do receive recreational use such as hiking, camping, and fishing. Timber harvest, road construction and maintenance, and livestock grazing have also affected some of these stream sections. These activities can lead to loss of riparian vegetation, soil compaction, and stream bank degradation resulting in increased sedimentation and loss of riparian cover which can degrade fish habitat. It is likely that existing roads along the Middle Fork and South Fork Carnero Creek and Cave Creek are currently having an impact on aquatic habitats during run-off events that contribute sediment to the streams thereby impacting spawning and overwinter pool habitat. Road culverts can also fragment trout habitat if not properly sized and installed.

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 Rio Grande cutthroat trout populations are decreasing and/or suppressed due to these potential impacts. The action alternatives associated with the La Garita Hills Project have the potential to contribute additional incremental impacts to aquatic habitats, particularly in relationship to surface disturbances involving roads and road use. If all activities were implemented on all acres, seven HUC 6 watersheds are expected to exceed 15 percent equivalent roaded area under the maximum alternative 2, which indicates potential concern for additional disturbance-related sedimentation. Under the action alternatives, re-opening and use of closed and old temporary roads may involve approximately 128 miles (alternative 2) to 36 miles (alternative 3). These roads would be in addition to the use of the existing open road system, which varies from approximately 209 miles (alternative 2) to 109 miles (alternative 3).

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 would 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.

Private lands encompass approximately 7,519 acres and State Lands encompass an additional 1,223 acres within the La Garita Hills analysis area. Known current and future activities within these

ownerships consist primarily of annual livestock grazing. According to the wildlife report, these activities are not known to be contributing to major watershed health concerns on federal lands. There are no other known projects or activities planned on private or state land within the project area that would affect baseline conditions for aquatic habitats. Although some short to mid-term disturbances are anticipated from project implementation, improvement in aquatic habitat conditions are expected over time. Therefore, depending upon the alternative selected, there is a high to moderate risk for potential cumulative effects to aquatic habitats associated with the project. However, project design criteria are associated with all action alternatives including monitoring and administration to ensure corrections are enacted if and when issues are discovered. These activities will be essential to ensure that habitat conditions for Rio Grande cutthroat populations and other aquatic species will be maintained and improved over time.

3.7 Rangeland

Scope of Analysis

This analysis focuses on the effects to rangeland and rangeland management from the proposed management activities in the La Garita Hills analysis area boundary.

Existing Conditions

The analysis area encompasses portions of eleven Forest Service and nine BLM active grazing allotments with fourteen term grazing permit holders. There are a variety of range improvements in the analysis area, including pasture and allotment boundary fences, corrals, and water developments including wells, spring developments, pipelines, and stock tanks. The allotments have rotational grazing systems in place and utilize adaptive management grazing practices.

In general, existing range conditions across the analysis area are trending towards desired conditions. Species diversity throughout the area is satisfactory with sufficient amounts of litter to prevent active erosion. However, there is active tree encroachment occurring in parks and meadows. Lack of recent disturbance, specifically wildfire, prescribed fire, and mechanical treatments, have allowed conifer encroachment throughout the analysis area. This encroachment will reduce grassland species diversity and composition over time and will negatively affect the grazing capacity in the analysis area.

Direct and Indirect Effects

Alternative 1

Without active management, including timber harvest and prescribed fire, species diversity and composition will decline as basal area increases. Permittee operations would be affected in the short- and long-term due to declining forage capability and a subsequent reduction in permitted livestock numbers, season of use, or both and increasing management costs.

Alternative 2

Mechanical treatments may reduce forage in the short-term due to soil disturbance and understory vegetation damage, depending upon the season when treatments are completed. Direct effects on rangeland vegetation will be minimal if treatments are completed during the winter and late fall and more substantial if completed during the summer and early fall. Treatments will increase light and moisture availability to understory vegetation. Previous timber stand improvement and prescribed

fire treatments in the analysis area have produced positive effects on rangeland and shrub species diversity, composition, and vigor.

In the mixed-conifer zone, landscapes may become more dominated by open parks, savannahs and park-like stands of timber. Desirable herbaceous vegetative diversity and richness would likely increase in many of these areas. Mason and others (2009) concluded that non-commercial and commercial treatments may increase herbaceous production in dry mixed conifer stands. However, vegetation response in non-commercial treatments may be limited and four years or more may be required before vegetation differences are observed. On more mesic sites, vegetation response in the overstory and understory may be more visible after just two or more years (Mason et al. 2009).

Burning in the short term should result in nutrient flush, increase soil nitrogen, remove litter, and remove live vegetation. In the long term, litter should increase as dead and dying vegetation falls to the ground. In localized areas of high-intensity burn sites, newly established range plants might be killed as a direct result of the fire. However, on other sites with lower burn intensities soil nutrients should increase and thus should favor well established plant communities. Where rangeland conditions are fair or good, sites should move in an upward trend. Where rangeland conditions are poor to fair and static, sites might move in a downward trend or stay static depending on seeding success and presence of invasive species.

Generally, late summer and fall burns would be more detrimental to warm season grasses while spring and early summer burns would be more detrimental to cool season grasses during the active part of the growing season. Non-native plants might increase with levels of treatment disturbance, but understory species richness might also increase (Schwilk et al. 2009). Richness increases would likely be composed of fire-adapted plant species and species that are favored by more xeric forest floor conditions (Schwilk et al. 2009).

Mechanical treatment and prescribed burning operations could displace livestock and affect permittee operations in the short-term, depending upon the duration and scheduling of treatments. In most cases, mechanical treatments should result in a much shorter-term displacement of livestock, since typically rangeland vegetation would be minimally affected.

The indirect effects of implementing the proposed action should be positive on permittee operations in the long-term and negative to neutral in the short-term, provided an implementation schedule was developed and followed. The proposed activities for the short-term could result in short- or long-term modification of grazing operations including the following:

- Shorter grazing season.
- Fewer permitted livestock.
- A grazing rotation that alters the sequence, timing of use, or season of use for one or more pastures.
- Increased range improvement maintenance.
- Increased costs for permittee management practices, including salting and riding for the duration of the project.

These actions may be needed to avoid specific treatment areas or types of treatments. These actions could be implemented to allow vegetation recovery following restoration treatments or to increase fine fuel loading for prescribed fire on a site-specific basis in coordination with the permittees and the range specialists.

There are large wild ungulate populations in the analysis area. It is anticipated these herds would utilize the newly treated areas and burned areas for forage. Livestock might be excluded from use for a time but it is assumed these new open areas would become usable forage for the long-term. Portions of patch cut areas might not regenerate or would slowly regenerate with aspen due to heavy grazing by wild and domestic ungulates.

Alternatives 3 and 4

The areas identified for treatment in these alternatives are smaller; however, the effects would be similar to those discussed for alternative 2.

Cumulative Effects

The combination of past, present, and future management practices may result in significant short-term cumulative impacts to forage capability, plant communities, sustainable rangeland ecosystems, and grazing operations in the analysis area. Generally, the cumulative effects over the long-term would be less intense and would occur on a more frequent basis and smaller scale than those associated with the no action alternative.

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). Climatic variability and consequently, the frequency and intensity of droughts and floods are predicted to increase (ibid). Future precipitation availability for range vegetation establishment and growth will depend on the degree of warming and the local effects on snowpack and evapotranspiration. Temperature increase and precipitation changes are likely to result in a shift of species distribution and reorganization of rangeland communities.

3.8 Noxious Weeds and Invasive Species

Scope of Analysis

The scope of this analysis is within the La Garita Hills analysis area boundary and areas immediately adjacent to the analysis area.

Existing Conditions

Noxious plants documented in the analysis area include Canada thistle (*Cirsium arvense*), perennial pepperweed (also known as tall whitetop) (*Lepidium latifolium*), black henbane (*Hyoscyamus niger*), Russian knapweed (*Acroptilon repens*), and downy brome (also known as cheatgrass) (*Bromus tectorum*), hoary cress (also known as whitetop) (*Cardaria draba*), oxeye daisy (*Chrysanthemum leucanthemum*), chamomile (*Anthemis arvensis*), field bindweed (*Convolvulus arvensis*), and musk thistle (*Cardus nutans*). The majority of the known noxious plant occurrences are in disturbed areas including the sides of roads, at trailheads, along recreation trails, or in past timber sale areas. There are limited isolated occurrences in undisturbed areas in the analysis area.

The following noxious plant species are found outside the analysis area: leafy spurge (*Euphorbia esula*), houndstongue (*Cynoglossum officinale*), yellow toadflax (*Linaria vulgaris*), and common mullein (*Verbascum thapsus*).

The intent of invasive plant management in the project area is to proactively manage existing and potential invasive plant/noxious weed populations in several ways:

- Using vegetation management to reduce the possibility of a broad-scale, high-severity disturbance.
- Restricting the possibility of invasive plant propagules entering the project area.
- Applying mitigation measures to reduce the potential for invasive plants to establish within recently disturbed areas.
- Monitoring recently disturbed areas for signs of new invasive plant establishment. Controlling invasive plant populations using means available under the Rio Grande National Forest and San Luis Valley Field Office BLM Invasive Species Action Plan (2013- 2015).

Direct and Indirect Effects

Alternative 1

There would be no direct effect on invasive weed populations. Isolated infestations of invasive species exist in the project area. Efforts to isolate and eradicate Colorado List A, B, and C species are ongoing as a result of the Rio Grande National Forest and San Luis Valley Field Office BLM Invasive Species Action Plan (2013- 2015). Effects of establishment and expansion of invasive species in the analysis area could include:

- Negative changes to native plant abundance, density, and species composition due to the ability of invasive species to aggressively compete for sunlight, water, nutrients, and space.
- Displacement of native plants and animals.
- Reduced forage capability for ungulates, including domestic livestock and wildlife.
- Increased soil erosion due to inability of some invasive species to provide effective ground or canopy cover, exposing soil to rainfall impacts, overland flow, and higher soil temperatures.
- Increased costs of mitigation and treatment.

Alternative 2

Mechanical and prescribed fire treatments could temporarily increase existing invasive plant cover and density where invasive species currently occupy the area, but it is likely some species would decrease slowly following treatments with the rebound of native plant populations. Almost all studies addressing the effects of silviculture treatments on exotic plants have found an increase in at least one exotic species following treatment (Sutherland and Nelson 2010). New invasive weeds could be introduced through mechanized equipment or revegetation material. Adherence to invasive species forest plan standards and guidelines, project design criteria along with the pre-implementation checklist process (see appendix D) should minimize the chances of this occurring.

Ground disturbance and canopy openings caused by the proposed activities could lead to a short-term increase in the occurrence of certain invasive species (thistles, cheatgrass, and other common non-natives) already present within the project area. Invasion potential is highest in lower elevation vegetation zones: warm-dry mixed conifer and piñon-juniper/mountain shrub zones. Mitigation measures would lessen the chance of invasive species outbreaks. If new populations of invasive plants are detected, treatment strategies would be initiated using control options identified in the Rio Grande National Forest and the San Luis Valley Field Office BLM Invasive Species Action Plan (2013-2015). The overall low abundance of invasive/noxious weeds in the project area should reduce the potential for invasion of weeds into thinned and burned areas. Many studies have found similarly

low levels of weedy plant invasion following thinning and burning treatments (Wayman and North 2007, Dodson et al. 2008, Nelson et al. 2008).

Existing, but currently unknown, weed populations would likely be discovered and documented over the life of the project. These populations could currently exist in scattered locations or could establish following disturbances associated with the proposed action. Once discovered, these populations could then be treated using a range of control options identified in the Rio Grande National Forest and the San Luis Valley Field Office BLM Invasive Species Action Plan (2013-2015).

Alternatives 3 and 4

The areas identified for treatment in these two alternatives are smaller; however, the effects would be similar to those discussed under alternative 2.

Cumulative Effects

Land use activities such as motorized and non-motorized recreation, travel, road maintenance, grazing, or a combination of the activities could potentially serve as vectors for invasive weed propagules into the project area. Unknown or uncontrolled invasive plant populations on adjacent private and state land could also serve as a source for invasive species.

Skid trails, obliterated temporary road beds, and roadsides could also provide additional areas of bare soil for invasive plant establishment in addition to those caused by the proposed treatments. Once invasive plant populations are discovered, they could be treated using a range of control options identified in the Rio Grande National Forest and San Luis Valley Field Office BLM Invasive Species Action Plan (2012-2015).

Over time, the combination of proposed treatments and revegetation activities should increase overall plant species diversity in affected stands. A proportion of the species diversity could be composed of invasive or exotic plants, but it is likely the majority of plant diversity would be composed of native species present on-site prior to treatment (Griffis 2001, Fulé 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, there would be fewer available areas of light and growing space where invasive plant species would be able to establish.

3.9 Threatened, Endangered, and Sensitive Plants

Scope of Analysis

The sensitive species addressed in this document are from the February 12, 2015 Rocky Mountain Region sensitive plant list. Species identified and included are those known or suspected to occur on the Forest or BLM lands in the analysis area. The threatened, endangered, and proposed species considered are from an August 11, 2014 concurrence letter from the U.S. Fish and Wildlife Service.

The analysis area is located in the southwestern portion of the Saguache Ranger District and San Luis Field Office management area. It encompasses approximately 187,778 acres including national forest system land, land management by the BLM, Colorado state land, and private land. The general

boundaries can be described as the Saguache Ranger District boundary along the south, west to Saguache Creek, north and east through Tracy Canyon down to Lime Creek.

The scope of this analysis is defined by the areas proposed for management treatments under the action alternatives. The temporal context for the analysis begins from the period of Euro-American settlement (approximately 1870) and continues one decade into the future. The spatial context is the analysis area.

Existing Conditions

A review of the current U.S. Fish and Wildlife Service list confirmed there are no reported records or suspected occurrences of threatened or endangered plants on the Rio Grande National Forest. There are also no plants proposed for listing or candidates for listing 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 2015). The current Region 2 sensitive species list was evaluated to judge the likelihood of occurrence on the forest. Local forest data and GIS data from the Colorado Natural Heritage Program (CNHP 2015) were analyzed to determine known populations of sensitive species in the analysis area. Field surveys were conducted for this project; however, the entire analysis area has not been surveyed for sensitive plants.

Direct and Indirect Effects

Alternative 1

Since no new management actions are proposed under alternative 1, no direct or indirect effects would be expected on sensitive plants species. The determination for all sensitive plant species is “*no impact*”.

Alternatives 2, 3, and 4

Eleven Region 2 and three BLM sensitive plants have habitat that are suspected to overlap with the analysis area. One sensitive plant species, *Neoparrya lithophila* (Bill’s neoparrya), has a known occurrence in the analysis area on BLM lands.

For *Aquilegia chrysantha* var. *rydbergii* and *Utricularia minor*, the determination under alternatives 2, 3, and 4 is “*no impact*”. For the rest of the sensitive plants, the determination 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*”.

Though the sensitive plant species listed below have never been found in the analysis area and no specific surveys have occurred for these plants, there is potential habitat in the analysis area. Direct effects could occur from activities causing plants to be burned, uprooted, crushed/trampled or skidded off by logs. Indirect effects could arise from changes in nearby canopy cover of forest vegetation or changes in litter/duff layers from burning. Indirect effects could also be caused by the introduction of invasive plant species. With the implementation of the project design criteria, effects to these sensitive plant species should be minor and of short duration.

- *Aquilegia chrysantha* var. *rydbergii*
- *Astragalus iodopetalus*
- *Astragalus ripleyi*

- *Cleome multicaulis* (BLM)
- *Cryptantha rollinsii* (BLM)
- *Cypripedium parviflorum*
- *Eriogonum brandegeei*
- *Machaeranthera coloradoensis*
- *Penstemon degeneri*
- *Salix arizonica*
- *Salix serissima*
- *Sisyrinchium pallidum* (BLM)
- *Utricularia minor*

Though the following two sensitive plants have never been found in the analysis area and no specific surveys have occurred for these plants, there is potential habitat in the analysis area. Direct effects should be negligible since these species are associated with very rocky habitat that would not be targeted by any activity that would disturb the species or the habitat to an appreciable extent. Indirect effects would not be expected for these species since there are no proposed triggering actions that would lead to an effect occurring later in time or distance. The determination for these two 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*”.

- *Draba smithii*
- *Ranunculus karelinii* (*R. gelidus* ssp. *grayi*)

There is a known occurrence of *Neoparrya lithophila* in the analysis area. There would be no direct effects by commercial logging, thinning, mastication or associated activities on this species because it occurs on slopes greater than forty percent (see additional project design criteria) and no logging or associated activities would occur there. The only action that might cause direct effects to this species would be prescribed burning. However, as burning would not likely occur during peak growing or flowering time for this species (June – August), direct effects to this population from prescribed burning should be negligible. Indirect effects from burning might include crushing or trampling plants from foot traffic during burning operations. Indirect effects might occur if invasive plant species were spread to this area. The determination for *Neoparrya lithophila* 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 or project design criteria during the pre-implementation process, based on the results of the surveys for sensitive plant species.

Cumulative Effects

Since there are no direct or indirect effects under alternative 1, there are no cumulative effects.

Overall, cumulative effects to sensitive plants tied to other past, present, and foreseeable activities in the analysis area should be minor for alternatives 2, 3, and 4. The following past, present, and

foreseeable future activities were considered in cumulative effects analysis: timber harvesting/thinning and wood gathering, wildlife herbivory, livestock grazing in the area, recreation, private land development, roads and trails, fire suppression and use, mining, and insect and disease.

Except for timber harvesting/thinning, wood gathering, roads and trails and fire suppression and use, refer to Cumulative Effects for Alternative 1 for a complete explanation of relevant past, present, and foreseeable future activities for consideration since they are also applicable here. Cumulative effects for the activities associated with proposed activities are described below:

- **Timber harvesting/thinning and wood gathering.** There has been past timber cutting and wood gathering in the analysis area (some harvesting and thinning of Engelmann spruce and Douglas-fir; and firewood cutting throughout the area adjacent to the existing road network). There are current and foreseeable future plans for commercial timber harvest and firewood gathering activities. However, these actions are not particularly targeting Sensitive plant habitat. Overall impacts to potential Sensitive plant habitat are expected to be minimal.
- **Roads and trails.** There is an infrastructure network of roads and trails in the analysis area that would continue to receive periodic maintenance. This infrastructure has been in place for many decades and there are no current or foreseeable proposed actions to appreciably change this. Temporary roads may be constructed or re-opened to facilitate timber removal but will be rehabilitated after the proposed timber activities have ceased. Although these disturbances can reduce potential Sensitive plant habitat and can facilitate invasive species spread, the existing infrastructure is not especially concentrated in potential Sensitive plant habitat (or causing appreciable invasive species spread). Therefore, cumulative effects to Sensitive plant habitat are expected to be minimal.
- **Fire suppression and use.** 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 and are not well understood. Currently, and in the foreseeable future, there are plans for more use of prescribed fire to mimic natural fire regimes—especially in the piñon pine, ponderosa pine, and Douglas-fir cover type portions of the analysis area. Potential sensitive plant habitat is not particularly targeted so prescribed fire would be expected to have negligible effects on Sensitive plants.

3.10 Hydrology, Watershed, Aquatics

Scope of the Analysis

Sixteen HUC (hydrologic unit code) 6 watersheds were considered in this analysis along with three HUC 7 sub-watersheds of concern that were identified during the forest planning process. Most of streams in the analysis area are intermittent or ephemeral. Major perennial streams include Johns Creek, Bear Creek, Saguache Creek (on the northern boundary), Middle Fork Carnero Creek, North Fork Carnero Creek, South Fork Carnero Creek, Big Springs Creek, Miners Creek, Prong Creek, and Cave Creek. Identified wetlands are generally associated with perennial streams.

All streams originating in the analysis area drain into the hydrologically closed basin in the San Luis Valley where water spreads into the valley floor into underground aquifers or evaporates. As part of the San Luis Valley Closed Basin Project, groundwater is extracted and used to help meet Rio Grande Compact contributions and other needs such as supplying water to local wildlife refuges. Figure 11 shows the HUC 6 watershed with the perennial and intermittent streams along with the water influence zone buffers for streams and wetlands.

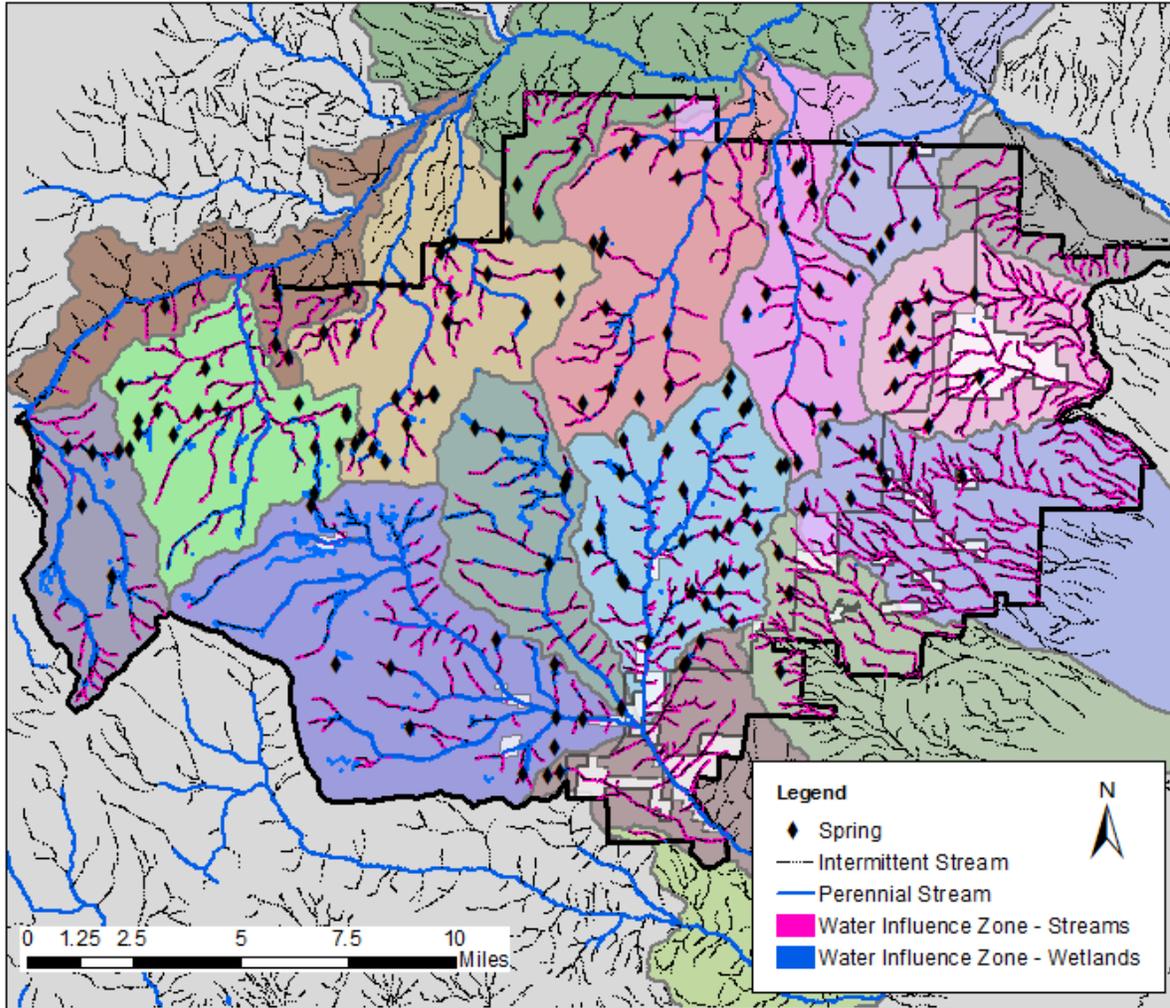


Figure 11. HUC 6 watersheds showing springs, wetlands, and streams channels with buffers represented.

Existing Conditions

Current watershed conditions in the area reflect impacts from previous timber harvest activities, historic and recent cattle grazing, roads located in water influence zones, and stream-road crossings that introduce sediment into the stream channels. Isolated areas of bank alteration and segments of over-widened streams are not uncommon. Despite current and past activities, overall stream health is showing an upward trend.

Water quantity/yield - Water yield (annual runoff) is a function of the amount of annual precipitation and the loss back to the atmosphere via evaporation and transpiration which is a function of the types of vegetation present and the amount of annual precipitation. Changes in evaporation and transpiration rates can occur when live tree numbers are reduced from timber harvest, bark beetle mortality, or wildfires. In the La Garita Hills analysis area, approximately 25 percent of the forested acres have been substantially affected by spruce beetles over the past 2 to 3 years; the mixed conifer vegetation zones are also being affected by Douglas-fir bark beetle and western spruce budworm, but to a much lesser extent than the mortality in the spruce-fir vegetation zone. The spruce beetle is the most widespread recent mortality agent that has changed the evaporation and transpiration rate.

Current live tree basal area, resulting primarily from the spruce beetle epidemic, represents current conditions which has been substantially reduced in several of the higher elevation watersheds. To date, there have been no negative effects observed from any increases in water yield resulting from decreases in evaporation and transpiration. Spring conditions were wetter than average in 2015, which resulted in higher stream flows through most of the summer; stream channels in the analysis area remained stable.

Watershed disturbance - Overall, current watershed disturbance levels are below identified concern levels (less than 15 percent of a watershed area in an equivalent roaded area (ERA) based on existing disturbances as converted to equivalent roaded area) in all of the sixteen, HUC 6 watersheds analyzed. However, during the 1996 forest planning process, watersheds of concern were identified that will need additional analysis. The “watershed of concern” designation does not preclude additional management disturbance within the watershed, but it does require specific watershed analysis prior to any new land disturbing activities (Dobson 1996). In a more recent study, Steuer (2010) found a similar correlation between impervious areas and stream/watershed health, in that effects were increased dramatically once the area affected in a watershed reached 15 percent. Higher levels of disturbance can lead to increases in overland runoff, erosion, sediment deposition, and decrease in infiltration rates.

HUC 6 watersheds of concern - On the Rio Grande National Forest, there are two HUC 6 watersheds of concern: 130100040307 and California Gulch in the analysis area. The California Gulch watershed was identified during 1996 forest planning and watershed 130100040307 was identified in the Houselog Vegetation Management Project analysis. The conclusion for the Houselog assessment is carried forward to ensure that an appropriate level of consideration is given to the watershed. The concern for these watersheds was based on the number of roads that were developed primarily for previous timber harvests many of which are located close to stream channels.

HUC 7 sub-watersheds of concern - There are three HUC 7 sub-watersheds of concern on the Rio Grande National Forest were identified during the 1996 forest planning process: Cave Creek (13010004090106) and Miners Creek (13010004090103) are part of the South Fork Carnero Creek watershed and Hat Springs (13010004020601) is in the Squaw Creek watershed. Figure 12 shows the locations of the watersheds of concern. Similar to the HUC 6 watersheds of concern, these sub-watersheds also have a high road density with many roads located close to stream channels.

Middle Fork Carnero priority watershed – As part of the Watershed Condition Framework classification process the Middle Fork Carnero Creek was identified as a priority watershed. A list of proposed activities to improve watershed condition was developed using an interdisciplinary process (USDA Forest Service, Rio Grande National Forest 2011). Types of needed activities included: road maintenance (culvert replacement, water bar installation, and surface hardening) on specific roads, replacing a culvert that is a barrier to fish passage, fencing to control livestock use, projects to improve bank stability, fencing springs, rehabilitating user created unauthorized roads, and increasing aspen regeneration. Several of these projects have been completed.

Some of the needed road maintenance and vegetation management actions to improve watershed conditions were within the scope of the activities proposed for this analysis area and are included as opportunities in this project.

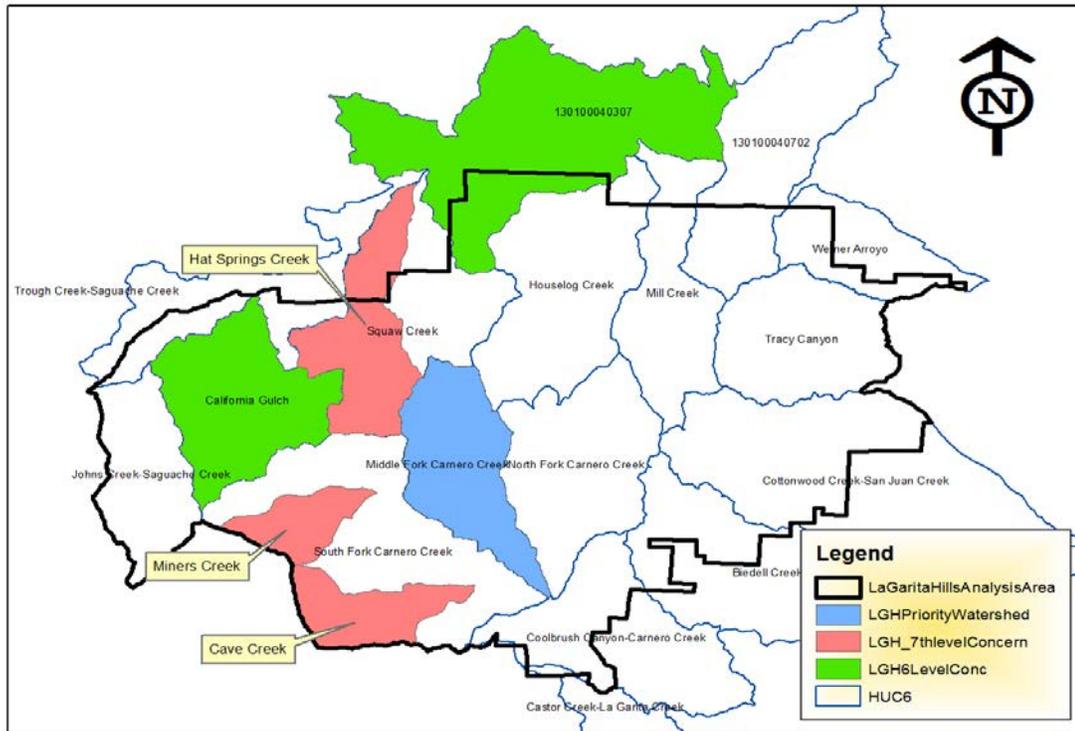


Figure 12. La Garita Hills analysis area watersheds, watersheds of concern, and priority watershed.

Water quality- the Clean Water Act requires that chemical, physical, and biological integrity of all waters, stream channels, and wetlands be protected. There are no water bodies in the analysis area listed as impaired or threatened for water quality on the Colorado 303(d) list. No streams near the analysis area are on the 305(b) list; therefore meeting designated uses (Colorado Water Quality Control Division 2012 update).

Connected disturbed area – Forest Service Handbook 2509.25 (Watershed Conservation practices Handbook) chapter 10 sets forth as design criteria, that ‘in each watershed containing a 3rd order and larger stream, limit connected disturbed areas so the total stream network is not expanded by more than 10 percent’ and advises working toward zero connected disturbed areas where it is practical to do so. Most HUC 6 watersheds in the analysis area have less than 2 crossing per mile except: Trough Creek-Saguache Creek (130100040205), 130100040307, and 130100040702. Crossing in these watersheds are higher and range from just over three crossings to greater than six crossings per mile.

Stream channels and riparian condition - Stream and riparian health assessments were completed in the summers of 2008-2009 for the South Saguache range allotment analysis (2010). The South Saguache Watershed Specialist Report (hereby incorporated by reference) described conditions in eleven of the sixteen watersheds in the La Garita Hills analysis area. Though this analysis was focused on the effects of livestock grazing on stream channels and riparian areas, usually in the most heavily used meadows, the analysis did provide information on overall channel stability and riparian condition; localized problems were noted due to livestock grazing and use and roads, however, overall conditions met Forest Plan requirements.

Direct and Indirect Effects

Alternative 1

Under Alternative 1 no additional management would occur. Routine road maintenance will occur periodically with many secondary roads maintained on a 7-year schedule with less emphasis on correcting existing road erosion or other problems. Opportunities to complete road maintenance actions needed to improve watershed condition in the Middle Fork Carnero watershed would occur when additional funds become available. No additional connected disturbed area would be added to any of the watersheds.

Though the majority of the mature Engelmann spruce have already been killed by the spruce beetle, it is expected that additional smaller trees will continue to be infested until the population subsides in the analysis area. Although standing dead spruce no longer transpire they still serve some of the hydrologic functions of live standing trees such as snow interception, shading, and providing soil stability (Schnorbus 2011). Spruce-fir stands can also be multi-storied and the remaining live understory trees along with other species that are not attacked by spruce beetle, help mitigate effects of bark beetle mortality in the overstory.

The HUC 6 watersheds with the most change in live basal area (Johns Creek–Saguache Creek, California Gulch, South Fork Carnero Creek) due to tree mortality might have observable increases in water yield due to decreased transpiration. Though this area is relatively dry and generally receives much less snow than areas closer to the Continental Divide, there might be changes in snow accumulations and melting, especially in higher snow years. Any increases in water yield would decrease over time as understory trees and other vegetation increase. As the trees start to fall, there would be an increase in coarse woody debris in the watershed and likely in the stream channels over time which could affect wetlands and potentially obstruct waterways. Altogether, with the loss of transpiration, shading, and an increase in water yield (without even considering potential impacts from climate change) there would be potential for earlier peak runoff in these watersheds.

Over time, most standing dead trees would eventually fall over the next few decades, increasing fuel loadings. Though the potential for wildfires is usually low at the highest elevations, high fuel loadings could result in a high severity wildfire with detrimental effects on soils and hydrologic function. Stream water temperatures may increase slightly where spruce canopy cover adjacent to streams was been substantially reduced by bark beetle activity.

In the drier vegetation zones, stand density would continue to increase and patchiness would continue to decrease. The potential for uncharacteristically large crown fires would also increase in the more continuously forested portions of the analysis area. Should a large wildfire occur, additional detrimental hydrologic effects are possible.

Effects Common to Alternatives 2, 3, and 4

Planned activities proposed under alternatives 2, 3, and 4 could include various amounts of hand thinning, broadcast burning, pile burning, road relocation and maintenance, temporary road construction and re-construction, and mechanical treatments including hydro-axing or roller chopping, and commercial timber harvests including salvage and a range of live tree thinning prescriptions. Activities associated with commercial timber harvest generally increase equivalent roaded area to the greatest extent, so will be the main focus of this analysis.

In unharvested spruce stands, there will be an increase in fuel loading as dead trees fall over time, which could increase fire severity, should a wildfire occur.

Commercial timber harvest activities can increase soil disturbance by increasing compaction and increasing potential for soil erosion and overland flow. Skid trails and roads pose the risk of funneling overland flow into one preferential flow path, amplifying surface erosion and sedimentation issues, if not properly located. Sediment delivery can be reduced when skid trails are located away from the water influence zone, by increasing the frequency of water bars, by maximizing surface roughness downslope of water bars, and promptly decommissioning skid trails following harvest (Litschert and MacDonald 2009). When winter logging is used, soil disturbance, compaction, and effects from skid trails are minimal and disturbance levels are greatly reduced.

Temporary road construction or reconstruction associated with commercial timber harvests will increase disturbance area and road densities during harvest operations. Any new road-stream crossings will increase the connected disturbed area in the short term until they are rehabilitated. Road construction effects can lead to increased soil erosion and increased sediment transportation. Roads decrease organic matter, decrease infiltration rates, increase overland flow of water, and increase erosion and streambed sediment load, if the road is connected to the stream. Project design criteria and best management practices that protect the water influence zone and maintain infiltration buffers can effectively minimize adverse effects to streams. Closing and rehabilitating temporary roads can also lead to a short-term (1 to 5 years) increase in erosion and sediment transport.

Timber harvests can remove nutrients from forested stands especially for whole-tree harvesting systems, since tree branches and foliage have the highest nutrient concentrations (Grier et al. 1989). Effects in the spruce beetle impacted sites would likely be minimal since the needles have already fallen and the smaller branches are starting to fall or will break off when the tree is harvested and any future harvests would not occur for over a hundred years which would allow recovery. If whole tree harvesting is used in the commercial thinning of live trees in the drier vegetation zones there may be some nutrient lost, but the frequency of timber harvest or other disturbances are relatively low and site recovery is likely. Project design criteria are also in place to return limbs and tops to exposed soil areas, if needed, which will return nutrients to the sites.

Burning of large slash piles created at landings during commercial timber harvests usually create hydrophobic soils under the majority of the landing area, though effects diminish toward the edges of the pile. Hydrophobic soils can increase overland flow, sediment transportation and debris flow but, at a watershed scale, these heavily impacted acres comprise a relatively small, disconnected impact areas; project design criteria require these piles to generally be located at least 200 feet away from streams, wetlands, or other water sources to ensure they are not connect to water, minimizing adverse effects on water quality.

Hand thinning or the use of a hydro-axe or roller chopper, without follow-up prescribed broadcast burning, does not affect nutrient levels since the cut material is left on-site; organic matter is moved from an aerial position to the ground surface. Though the density of the tree canopy could be reduced in some stands, depending on project objectives, ground cover is increased which will continue to intercept precipitation and reduce erosion potential. Mechanized thinning equipment can increase upland soil disturbance and, as with all heavy equipment, should only be used when soils are dry or frozen to minimize soil compaction; this equipment would not be used in water influence zones as per best management practices.

Low severity broadcast burns are conducted under relatively cooler and moister conditions compared to wildfires. Prescribed fires temporarily reduce above ground portions of grasses and forbs, reduce surface litter, and consume smaller coarse woody debris. In forested stands, the majority of the live tree canopy will not be affected. Where prescribed burning is used as a follow-up treatment after hand or mechanized thinning, fire intensity and severity can be increased since more fuel is

available; burn prescriptions and timing of the burns will need to be adjusted to ensure soil and watershed affects are within acceptable limits. Since fire intensity will be relatively low and vegetative recovery will be rapid, there would be few effects on watershed health.

Depending on stand objectives, mixed severity broadcast burns could be conducted under warmer, drier, or windier conditions compared to low severity broadcast burns, since the intent would be to reduce a portion of the live tree canopy, increasing patchiness and diversity. These burns would have a higher potential to temporarily decrease vegetative cover, which could decrease the interception of precipitation and increase overland flow or erosion to a small extent. However, understory grasses and forbs will increase along with coarse woody debris and other ground cover /organic matter, which should minimize any adverse changes. This activity would occur in Colorado Roadless Areas, which have minimal levels of disturbance and the project would be done in stages over several years, which would allow watershed recovery before additional burning. This activity would likely have minimal effects on watershed condition, since areas burning at higher severity would likely be small and discontinuous.

The relocation of road segments and rehabilitation of the old road segments will increase disturbance area, but since the existing road segments are poorly located and often adversely affecting streams or wet areas; the short-term increase in disturbance would improve conditions in the long-term (more than 5 years). Best management practices and rapid revegetation will minimize erosion.

Water quantity/yield - Since they receive less precipitation, tree thinning activities in the drier forest types is not expected to increase runoff at the watershed scale as long as project design criteria and best management practices are followed. Paired watershed studies in Colorado and elsewhere have determined that even substantial reductions in vegetative cover or basal area in sites receiving less than 18 to 20 inches of precipitation does not result in an increase in runoff (McDonald and Stednick 2003). Reducing evapotranspiration from tree cover in the lower precipitation vegetation zones will increase local soil moisture to some level which should benefit understory vegetation and may benefit local spring flows to some extent for a few years, at least in wetter years.

Salvage harvest itself would not have a direct effect on water quantity or yield, since the harvested trees would have already stopped transpiring, increasing water availability to some level.

Water quality - The Clean Water Act requires that chemical, physical, and biological integrity of all waters, stream channels, and wetlands be protected. Forest Plan standards and guidelines (appendix D.1), project design criteria (appendix D.2) and the pre-implementation checklist process (appendix D.4) would ensure that these areas are protected and any impacts are expected to be minimal. Standard project design criteria prevents skidding logs in or near stream courses and keeps heavy equipment a safe distance from channels. Prior to project implementation, all surface disturbances would be adequately buffered to prevent direct impacts to the water influence zone, floodplains, wetlands, and riparian areas. Clean Water Act requirements would be met for all action alternatives.

Alternative 2

Since this alternative would have the most commercial timber harvest, it would have the greatest potential effects on watershed health

Water quantity/yield – Recent studies show a potential for greater water yields following harvesting of a large percentage of dead trees in a beetle killed forest (Schnorbus 2011; Carlson 2008) since the harvest of dead trees reduces interception of precipitation and shading that slow snowmelt. So, the greatest potential effects would be related to the acres of commercial timber harvest in the spruce beetle impacted vegetation zones. This alternative would result in the greatest number of acres

harvested in the spruce beetle impact zone, since up to about two-thirds of the spruce areas could be harvested. This alternative would have the largest potential change in acres of standing dead trees.

Johns Creek–Saguache Creek, California Gulch, and South Fork Carnero watersheds show the most change in live basal area due to primarily to spruce beetle mortality. These watersheds might have measurable increases in water yield since removal of standing dead trees may result in changes in snow accumulations and melting, especially in higher snow years in harvested areas. Snags, coarse woody debris, understory trees, and remaining other live trees would help retain snow on site and slow spring melt. Effects in unharvested areas would be similar to alternative 1 with standing dead trees still providing snow interception and shading. Any increases in water yield would decrease over time as understory trees and other vegetation increased.

Watershed disturbance -Based on the equivalent roaded area (ERA) calculations for this alternative, the following seven HUC 6 watersheds could exceed the fifteen percent disturbance level of concern, if all commercial timber harvest acres were implemented.

Table 27. Disturbance levels (in percent equivalent roaded area) under current conditions, alternative 2, and total.

HUC 6 Watershed	Current Disturbance Level (% ERA)	Alternative 2 – disturbance (% ERA)	Total Disturbance (% ERA)
California Gulch	7	15	22
South Fork Carnero Creek	6	13	19
North Fork Carnero Creek	7	11	18
Middle Fork Carnero Creek	6	11	17
Saguache Creek	7	10	17
Squaw Creek	5	11	16
Houselog Creek	5	10	15

Disturbance levels in Squaw Creek and Houselog Creek would likely to fall below concern levels since water influence zone buffers would not be harvested and other areas would likely be dropped prior to implementation to meet a variety of resource objectives. Disturbance levels were calculated assuming no winter logging. If winter logging was implemented in some project areas, calculations would be less. Disturbance levels in the remainder of the watersheds would remain well below fifteen percent.

In watersheds that exceed levels of concern, an onsite investigation would occur prior to any action that increased watershed disturbance levels. The investigation would evaluate current conditions and determine the impacts of planned actions on stream conditions. Management activities would not be constrained beyond normal limitations if stream and watershed health were good. However, if stream health has been diminished, impacted areas must be restored and new surface disturbance prevented disturbance that could degrade stream health further.

In the three HUC 7 sub-watersheds of concern, this alternative would have the most commercial timber harvest acres in these sub-watersheds, increasing disturbance greater than the 10 percent concern level. For Cave Creek, Miners Creek, and Hat Springs, stream health would be carefully assessed prior to implementation of each project. If stream health could not be assured, projects would need to be modified or additional mitigation or monitoring might be needed, as provided for the pre-implementation checklist process.

Middle Fork Carnero priority watershed – As part of the plan to move the Middle Fork Carnero Creek watershed toward proper functioning condition, road maintenance activities have been identified on three of the roads that would be used as haul routes for commercial harvest operations under this alternative; this maintenance would be required prior to use and following completing of hauling on each of these roads:

- National Forest System Road 652 – install up to ten waterbars;
- National Forest System Road 684 – install four waterbars;
- National Forest System Road 685 – install two waterbars and harden one quarter mile of the road.

Connected disturbed area - No new permanent roads are being proposed for this project and all temporary roads used will be closed and rehabilitated, following harvest completion, which will leave connected disturbed areas at current levels.

Prior to project implementation, any changes to connected disturbed areas would be monitored using the metric stream-road/trail-crossings per mile. Since existing system roads and old temporary roads which are likely to be re-opened have been included in this figure, only new temporary roads constructed that intersect drainages will need to be reviewed and evaluated to ensure project design criteria and other best management practices are properly implemented and the roads are rehabilitated sufficiently to disconnect the disturbed areas from the drainage

Stream channels and riparian condition - Though there are localized areas of concern on some stream channels and riparian areas due to other uses, overall stream and riparian health is good or has an upward trend. Minimizing management activities in water influence zone buffers and have been proven effective at protecting stream channels and maintaining riparian condition. No vegetation management activities are specifically proposed in riparian areas except cutting encroaching conifers in areas where it is more desirable to maintain or increase early seral aspen, willows, or other hardwoods. This activity would be implemented in selected areas by hand crews using chainsaws, which would result in little or no ground disturbance or loss of streambank-stabilizing vegetation; this activity should have no effect stream or watershed health.

Alternative 3

Less watershed disturbance would be expected compared to alternative 2 for this alternative.

Water quantity/yield – This alternative would result in the fewest acres harvested in the spruce beetle impact zone, so would have the least potential of change in acres of standing dead trees in the highest elevation vegetation zones in the analysis area. Under this alternative, about 87 percent of the high elevation spruce beetle affected stands would remain unharvested; large numbers of standing dead trees would continue to intercept precipitation and shade the ground. Effects would be similar to alternative 1 for changes in water quality or yield.

Watershed disturbance – The North Fork Carnero is the only HUC 6 watershed that may exceed fifteen percent levels of concern. This level of disturbance may be reduced depending on actual project implementation acres.

Table 28. Disturbance levels (in percent equivalent roaded area) under current conditions, alternative 3, and total.

HUC 6 Watershed	Current Disturbance Level (% ERA)	Alternative 3 – disturbance (% ERA)	Total Disturbance (% ERA)
California Gulch	7	6	13
South Fork Carnero Creek	6	4	10
North Fork Carnero Creek	7	9	16
Middle Fork Carnero Creek	6	4	10
Saguache Creek	7	1	8
Squaw Creek	5	7	12
Houselog Creek	5	6	11

Implementation of this alternative would likely not increase disturbance levels in the HUC 7 sub-watersheds of concern more than the ten percent concern level for sensitive watersheds. In the Miner’s Creek sub-watershed, salvage harvest would only occur adjacent to open roads or as needed to protect infrastructure. Commercial timber harvest activities in the Hat Creek and Cave Creek watersheds would be the least of all alternatives, though disturbance levels would need additional monitoring to ensure this during project implementation.

Middle Fork Carnero priority watershed - Unlike alternative 2, it is less likely that National Forest System Road 652, 684, or 685 would be used to haul substantial amounts of commercial forest products. Under this alternative needed road maintenance identified for the Middle Fork Carnero watershed would not be likely. Identified needs would be completed when funding becomes available.

Though aspen regeneration may be less than alternative 2, both willows and aspen should increase and help meet identified needs under this alternative.

Connected disturbed area – Fewer temporary roads would be needed since harvests in spruce-beetle-impacted areas would be along roads, trails, or near infrastructure. As described in alternative 2, any additional road-stream crossings needed would be reviewed at the project level to ensure project design criteria and other best management practices were properly implemented and the roads were adequately rehabilitated.

Stream channels and riparian condition - As described under alternative 2, this activity should have no effects on stream channel or riparian condition.

Alternative 4

Alternative 4 would have less impact to watershed condition than alternative 2 but more than alternative 3.

Water quantity/yield – This alternative has an intermediate number of acres proposed for harvest in the highest elevation spruce beetle impact zone. Under this alternative at least 44 percent of the high elevation spruce beetle affected stands would remain unharvested; large numbers of standing dead trees would continue to intercept precipitation and shade the ground. Any effects or changes in water quality or yield would be intermediate between alternatives 2 and 3.

Watershed disturbance - Under alternative 4, based on the equivalent roaded area (ERA) calculations, seven HUC 6 watersheds could exceed the fifteen percent disturbance level of concern, if all commercial timber harvest acres were implemented:

Table 29. Disturbance levels (in percent equivalent roaded area) under current conditions, alternative 4, and total.

HUC 6 Watershed	Current Disturbance Level (% ERA)	Alternative 4 – disturbance (% ERA)	Total Disturbance (% ERA)
California Gulch	7	9	16
South Fork Carnero Creek	6	6	12
North Fork Carnero Creek	7	9	16
Middle Fork Carnero Creek	6	9	15
Saguache Creek	7	5	12
Squaw Creek	5	9	14
Houselog Creek	5	8	13

California Gulch and North Fork Carnero watersheds could slightly exceed levels of concern at sixteen percent. The Middle Fork Carnero and Squaw Creek watersheds are very close to levels of concern at fifteen percent and fourteen percent respectively. Disturbance acres would probably be less since project implementation acres are generally less than planned due to a variety of factors, but this would be monitored prior to project implementation.

Levels of disturbance in the HUC 7 Miner’s Creek sub-watershed are not likely to exceed ten percent, though this would need to be monitored during project implementation. Disturbance levels in Hat Creek and Cave Creek would likely exceed ten percent. As with alternative 2, disturbance levels would need to be carefully assessed prior to implementation to determine if protection measures would be sufficient to maintain stream health. If stream health could not be assured, projects would need to be modified or additional mitigation might be needed.

In watersheds that may exceed levels of concern, an onsite investigation must occur prior to any action that increases watershed disturbance levels. The investigation would evaluate current conditions and determine the impacts of planned actions on stream conditions. Management activities would not be constrained beyond normal limitations, if stream and watershed health is good.

Middle Fork Carnero priority watershed –as with alternative 2, roads he following road maintenance would be required prior to use and after hauling on each of these roads:

- National Forest System Road 652 – install up to ten waterbars;
- National Forest System Road 684 – install four waterbars;
- National Forest System Road 685 – install two waterbars and harden one quarter mile of the road.

Planting willows adjacent to the stream and increasing aspen regeneration have also been identified as needed activities which would be met under this alternative.

Connected disturbed area - With fewer acres proposed for commercial timber harvest under alternative 4, there is less potential for increasing connected disturbed areas even over the short-term. Any new temporary roads that intersect drainages would need to be reviewed and evaluated to ensure project design criteria and other best management practices were properly implemented and the roads were rehabilitated sufficiently to disconnect the disturbed areas from the drainage.

Stream channels and riparian condition - As described under alternative 2, this activity should have no effects on stream channel or riparian condition.

Cumulative Effects

Past actions that have impact the watersheds in the analysis area include timber harvest activities, livestock grazing disturbance, road impacts, recreational activity, and some minor mineral activity. Most of the past harvest occurred over thirty years ago and has recovered over time. Recreation activities in the area include camping, hiking, fishing, and horse and ATV use. Past mineral activity is limited to small, retired gravel quarries that for the most part have been successfully remediated. Ongoing present activities include livestock grazing, recreational use, road uses, and firewood collection. These activities were analyzed and are not anticipated to increase equivalent roaded area or number of stream-crossings per mile. Future actions include all of the actions under ongoing present actions. No additional vegetation management or road construction activities are reasonably foreseeable.

Livestock grazing, recreational use, road use or maintenance, and firewood collection will all continue to occur. Some infrastructure protection and removal of hazard trees for health or human safety are expected to occur in limited quantities; continued removal of fallen trees is expected to occur as necessary to keep roads open. Other activities on adjacent lands include livestock grazing and some haying on private lands.

In most watersheds, cumulative effects from the action alternatives 2, 3, and 4 are expected to be minimal at the watershed scale, and disturbance amounts would remain well under the fifteen percent concern levels. For watershed with high levels of existing disturbance, alternative 2 would have the most potential to exceed the fifteen percent level of concern due to the large number of commercial harvest acres. Most activities might still be able to occur, but additional review and perhaps additional mitigation might be needed prior to implementation, depending on the acres harvested. The pre-implementation checklist process along with project design criteria and best management practices would be used to reduce major impacts and ensure monitoring of key areas of concern under any action alternative.

Treatments proposed under the action alternatives would aid in reducing the potential of a future uncharacteristically large high severity fire event in the drier vegetation zones at the watershed scale in the long term. In the drier vegetation zones, management actions would be part of establishing a more stable and resilient ecological condition in the watershed, by increasing forest diversity and moving toward more sustainable conditions. Alternatives 2 and 4 would allow completion of needed road maintenance to help improve the condition of the Middle Fork Carnero watershed. Relocating road segments out of wet areas would benefit watersheds in the long-term.

3.11 Soils

Scope of Analysis

Current soil conditions and potential soil disturbances were analyzed in relation to the proposed management activities. General analyses of potential disturbances were done because individual activity units have not been identified in full. This is an adaptive management proposal which lends itself to change. Individual project activities would be assessed by an onsite visit before activities occur. These assessments would be accomplished using a variety of methods including visual assessments and use of the forest soil disturbance protocol (Page-Dumroese 2009). Soil information, especially for the existing conditions, was taken from the soil survey (USDA 1996).

Erosion is used, in part, as a surrogate for other soil characteristics; however, erosion potential hazard is the most far-reaching of those characteristics and project design criteria are designed to account for all foreseeable soil disturbance characteristics.

Existing Conditions

On national forest system lands, there are forty-six different soil map units, and BLM lands have thirty-two different soil map units. These map units cover a wide range of acres, from less than five to approximately eighteen thousand acres. The majority of the analysis area is considered upland sites with approximately three percent being considered riparian or wetland soil sites.

Within land on Forest Service, forty-three percent of the soils have a high risk of soil erosion, fifty percent have a moderate risk and seven percent have a low or no risk of soil erosion. BLM lands have a more even distribution of risks over the land: thirty-two percent high, thirty-seven percent moderate, and thirty-one percent low or no risk. This is due, in large part, to the reduced slopes associated with BLM lands.

The fire damage risk ratings indicate that approximately 10 percent of the total area has a high risk of damage from fire (8 percent Forest Service and 18 percent BLM). Twenty four percent are rated moderate (20 percent Forest Service and 41 percent BLM), fifty-seven percent are rated low (sixty-six percent Forest Service and 31 percent BLM), and seven percent are not rated (8 percent Forest Service and 4 percent BLM). Areas not rated may include locations where not enough information is available to produce a rating. On-site investigation prior to prescribe burning operations would be done to verify information and assess current conditions and determine if additional project design criteria are needed to protect soil resources.

In the past, management activities, including timber harvest, livestock grazing and recreational sites, contributed to soil compaction in the analysis area and the effects persist. Increased erosion is also a result of some of these activities. In general, the impacts are isolated, limited instances. Isolated areas along streams and in areas such as Laughlin Gulch are a concern for soils.

Direct and Indirect Effects

Alternative 1

No additional soil-disturbing activities would occur beyond current permitted activities. Indirect effects would be related to no improvement to forest health due from activities like reforestation and road decommissioning. Indirect effects would also include a more natural recovery process which might take longer for compacted soils.

Effects Common to Alternatives 2, 3, and 4

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

Timber roads would be very limited in this project as the one of the criteria for determining suitable harvest areas was proximity to existing roads. Closed timber roads would be opened and existing roads would be maintained. Initial reopening and maintenance could lead to a short term increase in erosion and sedimentation into streams. This would be due to ground disturbance and also removal of vegetation which might be growing on the road prism. Best management practices associated with road construction and maintenance would mitigate and reduce erosion. In addition, road maintenance might improve drainage on roads and help improve current conditions.

Project design criteria would 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 and throughout harvest units, if needed, would help limit compaction, reduce and prevent erosion, and maintain soil nutrients throughout the unit. Soil nutrients would be maintained by spruce trees losing their needles and returning nutrients back to the soil. In areas where non-salvage harvests are undertaken, standard best management practices and project design criteria would be employed to maintain soil productivity.

Landings would be similar to skid trails. The amount of new compaction and disturbance would be limited by reusing existing landings, subsoiling landings when finished, installing water bars on skid trails, and spreading fine slash as needed.

Mechanical harvesting equipment could potentially cause impacts to soils. Current best management practices and project design criteria would help mitigate and protect the soils. Limitations of slope steepness and operating conditions (soil moisture level, frozen or snow-covered soil) would protect the soil resource from unacceptable levels of soil disturbance during mechanical harvest.

Thinning activities done by hand (chainsaws) would have very low potential to disturb soils. Masticators would have a higher potential and would have similar effects to mechanical harvesting equipment. Compaction would be somewhat less as they would usually not make repeated passes over the same place, but they could still compact soils, especially under moist or wet conditions.

Prescribed burns have the potential to detrimentally disturb soils. Burning large slash piles, which have a high intensity and long fire residence times, can create areas where detrimental soil heating occurs. This could lead to loss of nutrients and physical changes which could result in the soil repelling water and accelerated erosion. Prescribed broadcast burns would be planned to minimize residence time and soil heating. The overall danger to soils from fire would be relatively low (approximately ten percent). This includes areas which would not be treated. Proposed prescribed burns would receive site-specific evaluations prior to burning to assess risk and on-site evaluations, as needed, to provide mitigation and protective measures if required.

Riparian zones and upland meadows would be managed to reduce encroaching conifers. Work within the riparian zone would be done using hand crews. Upland meadows do not carry the same hazard of soil disturbance as riparian areas and limited amounts of mechanical equipment could be used

without adverse effects. These activities should not cause detrimental disturbance to the soil resource in riparian areas or upland meadows.

Road relocation/realignment would move roads out of riparian areas and away from streams to reduce sedimentation and erosion over the long-term.

Alternative 2

Effects to soils are generally analyzed by activity unit (for example, timber cutting unit or prescribe burn area unit). Treatment units would be located within the areas identified on the alternative map. As conditions change due to bark beetle mortality or wildfire, units could be adjusted and objectives adjusted or changed to meet the new conditions on the ground. As project units are delineated and finalized, on-site soil analyses would occur to confirm soil type and current disturbance levels, as needed. Additional project design criteria could be included during the pre-implementation process, if needed. This would prevent further detrimental disturbance or require mitigation or restoration activities to protect, maintain, or improve soil resources.

Soils with high erosion hazards are of greater concern for detrimental soil disturbance. This could be due to slope or due to soil characteristics. Implementation of best management practices would mitigate this issue: for example, spreading fine slash on skid trails to help prevent erosion. Table 30 shows the soils with high erosion potential and the approximate acreage. A complete list of soil map units can be found in appendix A of the soils specialist report.

Table 30. Soils map units with high erosion potential and approximate acres (percentage) of all soils in analysis area with high erosion potential.

Soils Location	Map Units	Acres (approx. %)
Forest soils	125, 165, 166, 168	50,795* (~80%)
BLM soils	73	8,595* (~79%)

* Values were rounded to the nearest five acres

These soils are rated as high erosion potential due primarily to slopes; as slope increases, the potential for erosion increases. Project design criteria would not allow mechanical treatments to take place on slopes steeper than forty percent which decrease the hazard considerably. Project design criteria would mitigate other activities such as skid trails which might also contribute to detrimental soil disturbance. Some hand thinning and prescribed burning could occur on slopes over forty percent. Hand thinning should not cause any detrimental soil disturbance. Prescribed burns would be planned and conducted when fuels are not too dry and fire intensity is low, when residence time is short, or both. This would ensure minimal soil heating and should not cause detrimental soil damage.

Non treatment areas would be considered the same as a no action alternative. No activities would occur in these areas, so no further analysis is needed. See discussion under alternative 1.

Table 31 and Table 32 show the acres of treatment proposed on soils with high, low, and moderate erosion potential. This information will be the basis for comparison between alternatives. All acres are rounded to the nearest five for this analysis.

Table 31. Forest Service acres by treatment type and erosion potential under alternative 2.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Salvage Harvest	10,205	10,390	5	190
Sanitation/Salvage Harvest	4,393	5,625	5	40
Intermediate-Sanitation/Salvage Harvest	4,725	6,235	15	40
Intermediate Harvest	8,120	5,370	355	45
Timber Stand Improvement (TSI)	400	380	75	20
Timber Stand Improvement/Prescribed Underburn	3,990	2,235	1,980	0
Prescribed Burn - underburn	3,890	7,180	895	80
Prescribed Broadcast Burn – mixed severity	4,880	2,610	195	15
Reduce conifer encroachment - meadow	1,775	5,100	1,480	90
Reduce conifer encroachment - riparian	120	540	105	0
Meadow – Prescribed fire fuel break	935	2,925	1,390	40
No Treatment	20,030	23,840	875	1,250

Table 32. BLM acres by treatment type and erosion potential under alternative 2.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Intermediate Harvest	20	590	0	0
Timber Stand Improvement (TSI)	0	35	0	0
Timber Stand Improvement/Prescribed Underburn	6,190	6,165	3,465	320
Prescribed Burn - underburn	4,260	3,300	1,950	490
Prescribed Broadcast Burn – mixed severity	5	185	5	5
Reduce conifer encroachment - meadow	65	65	165	0
Reduce conifer encroachment - riparian	0	0	0	0
Meadow – Prescribed fire fuel break	250	490	2,835	0
No Treatment	100	640	535	0

Alternative 3

In spruce-beetle-affected vegetation zones, alternative 3 focuses primarily on the removal of dead, dying, and other trees which might present a hazard to the public or Forest Service and BLM infrastructure. As a result, most acres would fall within the road and infrastructure protection buffer treatment and also in no treatment. These two treatment types would account for approximately 60 percent of the Forest Service area but would change very little on the BLM side. Table 33 and Table

34 show the acreage by erosion potential and treatment type. The analysis of the treatments that match those in alternative 2 will be the same.

The treatment proposed for road and infrastructure protection buffer would have little impact on the soils resources. With a large portion of the area designated to have no treatment, this alternative would likely have the least amount of impact on the soil resource; however, it would also have fewer opportunities for restoration activities.

Table 33. Forest Service acres by treatment type and erosion potential under alternative 3.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Salvage Harvest	*	*	*	*
Intermediate-Sanitation/Salvage Harvest	10	0	0	0
Intermediate Harvest	8,070	6,160	365	50
Timber Stand Improvement (TSI)	265	280	75	20
Timber Stand Improvement/Prescribed Underburn	4,380	2,500	1,975	0
Prescribed Burn - underburn	3,470	6,860	130	80
Prescribed Broadcast Burn – mixed severity	4,785	2,550	195	15
Reduce conifer encroachment - meadow	1,735	5,050	1,480	80
Reduce conifer encroachment - riparian	120	455	105	0
No Treatment	23,985	31,515	3,040	1,400

*The exact acres and erosion potential will be determined at implementation; total possible acres treated would be 5,390.

Table 34. BLM acres by treatment type and erosion potential under alternative 3.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Intermediate Harvest	20	590	0	0
Timber Stand Improvement (TSI)	0	0	0	0
Timber Stand Improvement/Prescribed Underburn	6,190	6,155	3,465	320
Prescribed Burn - underburn	4,260	3,300	1,950	490
Prescribed Broadcast Burn – mixed severity	5	185	5	5
Reduce conifer encroachment - meadow	65	65	170	0
Reduce conifer encroachment - riparian	0	0	0	0
Meadow – Prescribed fire fuel break	0	0	0	0
No Treatment	355	1,170	3,370	0

* Meadow –Prescribed fire fuel breaks are areas intended to be used as fire breaks and are okay if they burn but are not an actual planned activity.

Alternative 4

Alternative 4 is the middle ground in relation to alternatives 2 and 3. For BLM land, there would be little change from alternatives 2 and 3, which rely largely on prescribed burning and some thinning associated with wildland urban interface treatments. On Forest Service land, the potential salvage in high erosion potential soils would change from 10,205 acres to 8,640 acres, and intermediate treatment from 8,120 acres to 4,115 acres. The no treatment areas would increase from 20,030 acres to 36,505 in alternative 4. Fewer acres would be treated in alternative 4 than in alternative 2. Effects of the different treatments would be similar to those described under alternative 2. Table 35 and Table 36 show the acres by treatment type and by erosion potential, similar to those shown in the previous alternatives. Once specific activity areas are designated, more site-specific evaluations would be done to assess soils in the area for issues that might arise and adjustments that might be needed.

Table 35. Forest Service acres by treatment type and erosion potential under alternative 4.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Salvage Harvest	8,640	8,295	5	110
Sanitation/Salvage Harvest	2,965	3,840	5	20
Intermediate-Sanitation/Salvage Harvest	1,870	3,320	10	5
Intermediate Harvest	4,115	3,640	290	30
Timber Stand Improvement (TSI)	240	30	40	20
Timber Stand Improvement/Prescribed Underburn	3,875	2,170	1,980	5
Prescribed Burn - underburn	2,785	2,200	30	0
Prescribed Broadcast Burn – mixed severity	0	50	0	0
Reduce conifer encroachment - meadow	1,600	3,990	1,480	80
Reduce conifer encroachment - riparian	120	535	100	0
Meadow – Prescribed fire fuel break	745	1,555	895	0
No Treatment	36,505	42,810	2,555	1,540

* Meadow –Prescribed fire fuel breaks are areas intended to be used as fire breaks and are acceptable if they burn but are not an actual planned activity.

Table 36. BLM acres by treatment type and erosion potential under alternative 4.

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Intermediate Harvest	20	590	0	0
Timber Stand Improvement (TSI)	0	0	0	0
Timber Stand Improvement/Prescribed Underburn	6,190	6,130	3,465	320
Prescribed Burn - underburn	4,260	3,015	1,950	475
Prescribed Broadcast Burn – mixed severity	0	0	0	0

Treatment type	High erosion potential	Moderate erosion potential	Low erosion potential	NA
Reduce conifer encroachment - meadow	65	65	170	0
Reduce conifer encroachment - riparian	0	0	0	0
Meadow – Prescribed fire fuel break	240	270	2,835	0
No Treatment	120	1,390	535	20

* Meadow –Prescribed fire fuel breaks are areas intended to be used as fire breaks and are acceptable if they burn but are not an actual planned activity.

Cumulative Effects

Cumulative effects from no action are related mostly to natural recovery. Even though some activities like grazing and recreation, will continue, the cumulative effects will be limited to natural processes. Bark beetle killed timber will remain on the landscape and in time will fall, increasing the coarse woody debris on the forest floor. This will create micro climates for regeneration to occur, it will also increase fuel loading in these areas. This extra fuel loading may lead to an increase in residence time during a wildfire which would lead to more areas of detrimentally impacted soils due to severe burn conditions. Grazing will be limited due to inaccessibility and erosion will be limited to areas where soil is disturbed by tree falling but will be mitigated by coarse woody debris on the ground. Nutrient cycling will not be affected as no material will be removed from the site. No advanced recovery will take place as no activities will happen to improve previously impacted soils via road closing and rehabilitation, conversely no new soil disturbance will occur to increase soil effects due to activities. In addition, the money necessary to move parts of National Forest System Roads 673, 708, and 720 may not become available in the short-term. This will continue to cause erosion and sedimentation in the concern areas.

Alternative 2 proposes activities which can have varying impacts on soil resources. The majority of impacts will occur during timber harvest activities, primarily equipment operation. Soil compaction, displacement, and erosion leading to sedimentation to streams and localized nutrient depletions are the main areas of concern. Project design criteria have been developed to minimize and mitigate these issues, but impacts still occur. Soil compaction and displacement would increase across the landscape in relation to these activities. Minimal detrimental impacts occur when best management practices and project design criteria are implemented, especially when winter logging occurs. Slight increases in soil compaction and displacement are of little concern in most area, but will occur where timber harvest activities using mechanical equipment is used. These activities will reduce soil health slightly in the short term. Some areas that have begun the natural recovery process will be disturbed and the time table of this natural process will be extended or restarted. The response to soil disturbance may also lead to improved recovery in more favorable conditions for spruce regeneration and in relation to closed and treated roads and skid trails which are improvements over historical conditions left from previous activities.

When trees are harvested nutrients are lost via removal of trees. The majority of nutrients essential for new growth are found in the needles and small limbs of trees. Due to beetle kill, needles have fallen for to the forest floor and the small limbs will shatter off the tree when it is felled. As a result nutrient cycling is not expected to be significantly impacted. Carbon stocks will be reduced as trees are removed; soil carbon stocks and carbon levels will remain reduced overall due to the removal of

trees. Carbon stocks will recover over time through natural processes. This is occurring on a landscape scale as the spruce forest dies.

Fuel loading will also be reduced as trees are removed with harvest activities. This will reduce the amount of severely burned soils if a fire were to burn across the landscape.

Other activities which are included but are not expected to contribute to cumulative effects to soils, are reduction of conifer encroachment, timber stand improvement and road relocations. Hand thinning activities which include encroachment or conifers in riparian areas would not have detrimental effects on the soil. Reduction of conifer encroachment in riparian areas may lead to an improvement of conditions as less competition for water will allow for a more stable grass and forb habitat which is more resilient to multiple uses than the bare soil which may form under conifers. Riparian and stream health will improve if the specified road segments are moved; erosion will be reduced and detrimental soil impacts will be reduced by roads being located in more favorable location.

In general, cumulative effects from alternative 2 would be to increase soil disturbance over the landscape, with some areas of improvements associated with restoration actions, road closures, planting and other activities. The spruce-fir vegetation zone is unlikely to see any other activities for the foreseeable future so would begin to recover and have many decades in which to recover as the aftermath of the beetle kill. Other areas, which are not in the spruce zone, will also have very little foreseeable activities into the future. Areas not treated in this project for various reasons are unlikely to be treated unless there is a change in conditions.

In the spruce beetle impacted areas, alternative 3 limits treatments to along travel corridors and areas where public safety may be an issue. Cumulative effects for this alternative will be similar to the ones from alternative 2. The main difference is on scope and focus. The scope of the effects will be much less than those in alternative 2 as they will be implemented on much less ground. Effects will be focused more along roads and therefore proportionally will affect streams more than in alternative 2, as more roads are located close to waterways. This issue is of limited concern as water courses within the analysis area are limited. In general, the cumulative effects will be less and less far reaching across the analysis area.

Alternative 4 is a compromise between alternative 2 and 3. Cumulative effects from this alternative will also be the same or similar to those discussed in alternative 2. The difference is scope. Alternative 4 has reduced acres in most treatments compared to alternative 2, reducing potential effects. Cumulative effects, while the same as in alternative 2 will be reduced in relation to the reduction in treated acres in alternative 4.

Cumulative effects are of little concern for the soils resource for these treatments in a large part due to the dryness and rockiness of the soils within the analysis area. Timber harvest activities on the Saguache District can often be conducted in the winter since the area receives less snow; winter logging can mitigate concerns for detrimental soil effects. In addition due to the fact that it is unlikely that significant future actions will take place within this analysis area in the foreseeable future, it is not anticipated that cumulative actions will have an adverse impact on soils within the analysis area.

3.12 Air Quality

Scope of the Analysis

This section describes the effects to air quality in the vicinity of the La Garita Hills analysis area including nearby private lands or developments and the La Garita Wilderness Area, a Class I airshed (located less than 2 miles west of the analysis area boundary). The town of Saguache is located about 2 miles north from the northeast corner of the analysis area. The small community of La Garita is located about 5 miles southeast of the southern corner of the analysis area.

Existing Condition

Current conditions of air quality in Colorado are detailed in the Colorado Air Quality Control Commission: Report to the Public 2013-2014 (<https://www.colorado.gov/pacific/sites/default/files/2013-2014.pdf>). The project area is located in Colorado's San Luis Valley Air Quality Region which includes the San Luis Valley including Alamosa, Conejos, Costilla, Rio Grande and Saguache Counties. Recreation, including camping, fishing and hunting, and agriculture are the primary industries in this region. All of the area complies with federal air quality standards according to the Colorado air quality control commission report. In addition all the surrounding air quality regions, south central (Pueblo), South Western (Pagosa Springs, and Durango), and Central Mountains (Salida, Creede, Lake City) also comply with federal air quality standards. This is also true of compliance with the National Ambient Air Quality Standards. Air quality in the area is generally good, though occasional exceedance events do occur in adjacent areas.

Visibility is tracked using data from the IMPROVE monitoring system. The two closest IMPROVE monitoring stations area located at the Great Sand Dunes National Park Visitors Center approximately 40 miles to the east across the San Luis Valley and the second is within the Weminuche Wilderness area, located on the south end of Engineer Mountain at an elevation of about 9,070 feet approximately 65 miles to the west of the project area. Data collected from the Weminuche IMPROVE monitoring site over the ten year period 2001-2010 indicate a statistically significant ($p < 0.01$) improving trend on the clearest trends, and no trend on the haziest days.

Direct and Indirect Effects

Alternative 1

No harvest or burning activities would occur, except activities already approved under another decision, so no additional emissions would be produced in the analysis area.

Alternatives 2, 3, and 4

Under alternatives 2, 3, and 4, emission sources would be the same, since proposed activities are similar for all alternatives, though the scale of treatments are different. Activities with potential to affect air quality would be the combustion of fossil fuels from equipment used to cut, haul, and transport logs or masticate trees for thinning; burning of slash piles, prescribed broadcast burns, and road relocation, reconstruction, and maintenance.

Vehicle emissions from mechanized timber harvest operations or thinning using masticators would occur. Impacts from emissions would be short-term on an intermittent basis over the life the project. Gas or diesel powered equipment would result in sulphur dioxide, particulates, volatile organic compounds, carbon dioxide, and nitrogen oxide emissions. Operations that occur during the summer

could increase the amount of visible dust. Any dust abate used on Road 41G or other road, as needed, would reduce dust from all road traffic.

Road relocation, construction, and maintenance would generate fine dust particles, volatile organic compounds, soot, nitrogen oxides, sulfur dioxide, particulates, carbon dioxide, and carbon monoxide. After road work was completed, vehicles traveling the roads would emit these chemicals until the road is closed or is not used for project activities.

Slash pile burning is generally completed in the winter and would result in emissions typically associated with wood combustion: volatile organic compounds, nitrogen oxides, soot, particulates, carbon dioxide, and carbon monoxide. Fires could also emit hazardous air pollutants, such as polynuclear aromatic hydrocarbons and aldehydes (such as formaldehyde). All burning operations would require burn plans and a smoke permit issued by the Colorado Air Pollution Control Division prior to ignition. The smoke permit will include specific parameters that must be met to limit adverse short-term air quality impacts from smoke to Class I airsheds and local communities to ensure that adverse effects to local air quality are minimized.

Alternative 2 would have the potential for the highest cumulative emissions due to the number of acres proposed for treatment activities. Alternative 3 would have the least due to reduced amounts of harvest activity, pile burning, and equipment operation. None of the proposed alternatives should have a measurable long-term impact on local air quality since activities would occur in relative small areas over a ten to fifteen year time frame.

Cumulative Effects

Emissions generated by implementing an action alternative would contribute somewhat to local pollution, but all affects would be short-term and limited. Once individual project activities were completed in a particular area, any additional emissions, dust, or smoke impacts would cease and have no further overlap in time or space with other pollution sources.

As a result, proposed activities in the analysis area are not expected to contribute to any violation of national ambient air quality standards or to contribute measurably to any increase in visibility impairment at nearby Class I areas.¹⁰ Therefore, all alternatives would comply with the Clean Air Act.

3.13 Fire and Fuels

Scope of the Analysis

The analysis of the effects on fire and fuels includes the area within the La Garita Hills analysis area boundary.

Existing Condition

The existing fuels profile across the analysis area is quite diverse due to the full range of vegetation and elevational ranges in the project area. The dry, cool conditions in the analysis area create a short growing season, which is not conducive to producing heavy loads of fine fuels, the primary carrier of fire. As such, accumulations of fuels across all fuel types and sizes are typically less than similar fuel

¹⁰ Class 1 federal lands include areas such as national parks, some national wilderness areas, and national monuments. These areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act.

types in other parts of the western United States. See the “Background and Ecological Context” section for information on the vegetation zones and fire regimes.

The geography of the analysis area offers many natural fuel breaks in the form of rock outcrops, barren areas, drainages and riparian areas, which may inhibit fire spread. The lack of volume and continuity of fine surface fuels, due to soils, climatic conditions, and other land management actions, generally produces low intensity fire behavior. In areas with heavier fuel loading, higher fire intensities have been seen but these are often group torching or short duration runs, and are typically wind dependent. Fire control issues have been minimal, even during 90th percentile weather conditions, with fires typically being contained within the first operational period.

The analysis area has had 43 documented fires, from 1970 through 2012, with 56 percent being natural ignitions. Seventy-two percent of fires have been 2.5 acres or less. Ninety-three percent of fires have been 40 acres or less. Only three larger fires have occurred:

- The Hellsgate Fire, 78 acres, in 2011.
- The Coolbroth Fire, 252 acres, in 2006.
- The Poison Fire, 306 acres, in 1974.

While little is known about the Poison Fire, the majority of fire spread on the Coolbroth and Hellsgate Fires occurred over one day. These fires exhibited mixed severity fire behavior and effects; these fires burned in the ponderosa pine and mixed conifer transition zones, at elevations between 8,500 feet and 9,900 feet. In 2005, two natural ignition fires that started in July in similar vegetation located about five miles northwest of this analysis area were allowed to burn and over six weeks generally exhibited low to moderate intensities, and low to mixed severity. Some short duration runs occurred when low relative humidity and wind aligned, but the majority of fire behavior was smoldering and low intensity surface fire. With no containment or suppression actions taken on either fire, they reached 112 acres and 135 acres in size.

Wildland urban interface - No existing data on structure or housing density in and around the analysis area was available using aerial images. A visual assessment using aerial images was conducted and found an estimated 261 structures (houses, barns, out buildings, etc.) exist across these sites. This density of structures fits into the low density intermix category. A one and a half mile buffer was applied to these locations to represent the impact of potential spotting distance to represent the wildland-urban interface for the analysis area. The wildland-urban interface areas only identify acres that could be impacted by a wildfire, burning under extreme fire weather conditions, and help fire and fuels management identify areas where selective fuel treatments and suppression efforts would be successful at reducing potential fire behavior. There is no intent to treat all the acres within these areas.

Just over half of the low density intermix acres are vegetated with grass and piñon-juniper, the remaining low-density intermix is in the timber litter, and timber understory fuel models. Local fuel load surveys in and around the analysis area typically record fine fuel loads less than half of those represented in fire behavior fuel models. These lighter fine fuel loads, the discontinuity of fuels, and the areas natural fuel breaks, most likely result in fewer fire starts, slower rates of spread, and limited growth potential under most conditions. Nevertheless, fires burning during “very high” and “extreme” fire weather indices can exhibit higher intensities and extreme behavior in fuels throughout the analysis area.

The low-density intermix structures identified lie within the North Saguache Fire Protection District and are covered under the County wildfire protection plan. However, these areas are remote and have poor road access, increasing fire response times.

Direct and Indirect Effects

To assess the effects of each alternative, in regards to fuels, a common metric needed to be established. On a landscape scale, crowning index¹¹ can be used to quantify fuels characteristics, and it was used in this analysis.

Alternative 1

There will be no direct effects from alternative 1. The indirect effects of alternative 1 for each vegetation zone are as follows:

Aspen mix – Aspen stands with moderate to high rates of conifer encroachment would be less resistant to wildfire. Mature aspen stands would become decadent, with little chance for rejuvenation, due to lack of disturbance. Early and mid-seral aspen stands would continue to be overtaken by conifer encroachment and would eventually be replaced by conifers.

Douglas-fir mixed conifer – Fuel loads would continue to increase incrementally over time, increasing the risk of mixed to high severity wildfire at scales out of the range of natural variability. Stands would continue to be affected by western spruce budworm and dwarf mistletoe. Competition for moisture in dense stands would continue to stress all species making them more susceptible to disease and insects (Douglas-fir beetle and mountain pine beetle), which are currently effecting stands at endemic levels.

Grass – Meadow and grassland productivity would continue to be driven by climate, range management practices, and natural disturbance (wildfire). Wildfire has been an infrequent disturbance in these areas due to the non-continuous, sparse fuel load and would likely have little impact in the future.

Piñon-juniper – The lack of herbaceous surface fuels would inhibit wildfire ignitions, and fires that did start would likely effect stand structure on a very small-scale under low to high fire weather conditions. These stands would continue to encroach into interspaced openings. Crown continuity in denser stands would support independent crown fire in extreme fire weather conditions.

Ponderosa pine – Stand composition and structure would change over time. Interspaced openings in the ponderosa pine would gradually be encroached on by a mix of species. Understory species would increase and act as ladder fuels to the overstory. As these changes occurred, wildfires would most likely be of mixed to high severity during high to extreme fire weather conditions.

Riparian – Structure and composition of riparian areas would change over time, as conifer continued to encroach into these areas. This encroachment could lead to an increase in crown fire potential and higher severity fire during extreme fire weather conditions.

¹¹ Crowning index is the wind speed above which an active crown fire is possible for the specified fire environment. The wind speed is measured at twenty feet above the tallest vegetation. The higher the crowning index, the more resistant a stand will be to an active crown fire starting.

Shrubs – Shrubs would likely be unable to compete with other species as conifer encroached into interspersed openings between timber stands. Fire would have little effect on shrubs during low to moderate fire weather conditions due to lack of herbaceous and surface litter fuels.

Spruce/fir - The short-term effects of the spruce beetle mortality would be an increased risk of crown fire initiation and spread while the dead trees retained red or gray needles. Dead needles would drop from the trees within one to three years, which would drastically reduce torching and crowning potential. Surface litter fuels would increase. Herbaceous fuels would also increase as more sunlight and precipitation reached the forest floor. The increase in available fine fuel, along with the opening of the canopy, would allow stronger winds at ground level resulting in potentially higher rates of spread for surface fires. While the risk of crown fires would decrease, the rate of spread for surface fires would increase. As regeneration grew and filled in gaps, the potential for higher rates of spread would decrease as stand composition and structure slowly returned to a closed canopy. Over the long term, as more of the dead trees fell, coarse woody fuel loading of large diameter material would increase and result in hotter fires with longer residence times. These high intensity burns could increase soil heating at greater depths which could detrimentally affect soil microorganisms and nutrient cycling.

Spruce/mixed conifer – Stand structure and composition would vary depending on the amount of spruce present and would largely depend on aspect. The indirect effects would be very similar to those in the spruce/fir.

Crowning index – With the subsequent spruce mortality due to spruce beetles in 2015, there would be an increase in crowning indices in the spruce/fir, spruce mixed conifer, and aspen mix zones. From 2024 on, values would remain relatively steady over the next thirty years.

Alternatives 2, 3, and 4

The effects of the alternative 2 are addressed by activity type. The areas identified for treatment in alternatives 3 and 4 are smaller; however, they yield similar effects as alternative 2.

Salvage/sanitation and salvage/intermediate harvests

- Direct effects - These activities would reduce the amount of live and dead fuels (trees) in those areas. In spruce mix areas, the removal of dead boles would decrease the number of snags that would eventually fall and become coarse woody debris. There would also be a reduction in canopy continuity and canopy bulk density, providing openings for moisture and sunlight to reach the forest floor. There would be an increase in surface activity fuels from timber harvest activities, but this could be mitigated by the piling and burning of those fuels.
- Indirect effects – By reducing the amount of live and dead trees, with corresponding reduction in canopy bulk density and continuity, the potential for torching and crowning would be reduced. Removal of spruce snags would also reduce the amount of dead boles that would eventually fall and become large coarse woody debris, thus reducing the potential for high severity fire and detrimental soil heating.

Timber stand improvement or timber stand improvement with prescribed broadcast burning:

- Direct effects – These activities would primarily reduce the amount of live and dead fuels (trees) in the small diameter class (eight inches at diameter at breast height) through felling or mastication. This would reduce canopy continuity and canopy bulk density while retaining the mature characteristics of the stand. These treatments would also be designed to provide interspersed spacing between groups of trees. Surface activity fuels would increase with these

activities but would be used to help propagate fire during prescribed burning treatments. Prescribed fire would remove some natural fuels as well as thin immature trees that would not be treated as part of the timber stand improvement prescriptions. In wildland urban interface areas, thinning, masticating, or both would be designed to break up canopy continuity and bulk density, providing aerial fuel breaks to reduce the extent of potential crown fire.

- Indirect effects - By reducing the amount of live and dead trees, with corresponding reduction in canopy bulk density and continuity, the potential for torching and crowning would be reduced. Altering stand structure through these treatments would remove ladder fuels and create openings, while retaining older, more mature trees that are more resistant to fire and in turn reducing the potential for torching and crowning. These treatments would create openings, reduce competition for moisture, and allow more precipitation and sunlight to reach the forest floor, promoting shrub and herbaceous response.

Prescribed broadcast burning:

- Direct effects – Prescribed fire would reduce the natural fuel loads and alter stand structure to some extent. In areas prescribed for under burning, woody debris, surface litter, seedlings, and smaller trees would be reduced while canopy base height would increase. In areas prescribed for mixed severity burning, fire behavior that alters stand structure would be desired so larger groups of trees would be affected to create openings and reduce overall stand density.
- Indirect effects – By reducing natural fuel loads and altering stand structure, the ecosystem would be more resilient to future fires, droughts, and disease and insect outbreaks.

The proposed action treatments would all alter stand structure, composition, and fuel loading which would affect crowning indices and create more fire resilient stands. In some instances, more than one treatment might be needed to occur in a specific area to achieve desired results. The adaptive management approach would allow for flexibility in treatment options as monitoring reveals whether treated areas are moving towards desired conditions. The crowning index would nearly double in each vegetation type after treatments in 2015 and would gradually decrease over time as stands mature and crown bulk densities increased. However, this decrease in crown index would not reach current levels even after fifty years. Fire-adapted types (aspen mix, ponderosa pine, and piñon-juniper) would show the strongest long-term response because they do well in open stands and tend to self-prune as they mature. Non-fire-adapted types (spruce/fir, spruce mixed conifer, and Douglas-fir-mixed conifer) would show a strong initial response followed by a larger decrease in crown indices because they are typically shade-tolerant species that produce understory more rapidly.

Cumulative Effects

Fuels reduction treatments have occurred in the analysis area over the last twenty years, resulting in 10,700 acres treated with prescribed fire and 277 acres mechanically thinned. These treatments primarily occurred in ponderosa pine, returning fire to the ecosystem and acting as maintenance burns. Currently no fuel reduction projects are planned in the analysis area, other than what is being proposed by this project.

In all action alternatives, the use of prescribed fire and mechanical thinning would continue, with alternative 2 affecting up to 121,115 acres, alternative 3 affecting up to less than 89,000 acres, and alternative 4 affecting up to less than 83,000 acres. Crowning index would increase (indicating a reduced crown fire risk) in treated areas and would mostly remain higher than current values over the time modeled.

Under all action alternatives, best management practices would be employed as defined in the design criteria for this project, and negative impacts should be minimal. As the forested stands and grasslands respond to the treatments and vegetation becomes established, recovers, or both, the negative effects would fade and the forest condition would return to a natural functioning state.

3.14 Social-Economics

Scope of the Analysis

The social effects analysis focuses on Saguache County, Colorado. It discloses qualitative effects based on social habits, trends, and uses in the analysis area and Saguache County, Colorado.

The economic analysis focuses on the financial efficiency associated with mechanical and prescribed fire treatments in the La Garita Hills analysis area and compares the financial efficiency of each alternative. The financial efficiency analysis does not incorporate monetary values for all known market and non-market benefits and costs.

Existing Condition

Costs to implement timber stand improvement projects, administer timber sales, etc., and revenues from commercial timber sale receipts have been assigned dollar values based on current markets. Other resources such as watershed health, riparian health, wildlife abundance and diversity, long-term habitat improvement, social benefits, and scenic resources cannot easily be assigned dollar values.

The economic impacts of the various harvest volumes proposed by each alternatives were not directly analyzed due to the Forest's commitment to provide a stable supply of sawtimber to the local and regional timber industry. If alternative 1 was selected, no sawtimber would be harvested from the analysis area. The Forest would then shift to other areas in an effort to maintain a stable supply of wood fiber to the forest products industry. Alternatives 2, 3, and 4 would have a sustained economic impact rather than a changing economic impact because sawtimber volume is offered under a timber program with the objective of selling a steady and sustainable volume.

Farming, fishing, and forestry occupations are important for the local population, accounting for 14.8 percent of the county employment. This compares to 2.4 percent in the same sector for Colorado as a whole. Manufacturing jobs are also important for the county, accounting for 6.1 percent of the employment in the county, and generally providing more stable, year-round employment than other employment sectors. Saguache County had an individual poverty rate of 24.7 percent in 2013 (EPS Demographics 2015), one of the highest in Colorado.

Direct and Indirect Effects

Alternative 1

Alternative 1, the no action alternative, would not generate revenues through the sale of commercial forest products nor would it provide any avenues for active forest management (prescribed fire, timber stand improvement, etc.) that provide non-monetary benefits. Because costs have been incurred to complete the environmental impact statement and no monetary benefits would be derived from this alternative, the benefit to cost ration would be zero.

This alternative would not help support economic sustainability for the local communities or the forest products industry. This alternative would not provide means for site reforestation in timber

production areas infested with spruce beetles and lacking advanced regeneration, and it would not help with road maintenance or other needed road improvements. This might result in economic degradation to Rio Grande National Forest areas managed for forest products.

Alternative 2

Alternative 2 would generate a benefit to cost ratio of 0.25, the highest of the three action alternatives. The net present value of this alternative would be \$(6,018,806), which includes the cost of prescribed burning, timber stand improvement projects, timber sale preparation, and timber sale administration. Base rate commercial timber values were included as benefits. The present value of the forest products offered under this alternative and present value cost associated with this alternative would be \$1,983,043 and \$8,013,199, respectively. Under this alternative, approximately 596,835 one hundred cubic feet (CCF) of wood fiber would be offered, and approximately 64,125 acres could be pre-commercially thinned or treated using prescribed fire to provide non-monetary resource benefits.

This alternative would offer the greatest volume of sawtimber and would allow other treatments on the largest number of acres. This alternative could help support the economic sustainability of local communities and the forest products industry and would help accelerate regeneration in areas to meet future objectives. Making resources available to local and regional industry has potential to help sustain or boost the social structure of Saguache County. Forestry and milling or manufacturing jobs account for 20.9 percent of the employment in the county (EPS Demographics 2015).

Alternative 3

Alternative 3 would generate a benefit to cost ratio of 0.07, the lowest of the three action alternatives. The net present value of this alternative would be \$(6,030,155), which includes the cost of prescribed burning, timber stand improvement projects, timber sale preparation, and timber sale administration. Base rate commercial timber values were included as benefits. The present value of the forest products being offered under this alternative and present value cost associated with this alternative would be \$443,243 and \$6,507,397, respectively. Under this alternative, approximately 164,927 one hundred cubic feet (CCF) of wood fiber would be offered, and approximately 53,965 acres could be pre-commercially thinned or treated using prescribed fire to provide non-monetary resource benefits.

Under this alternative, the costs of project implementation would outweigh the monetary benefits by more than tenfold. This alternative could help support the economic sustainability of local communities and the forest products industry on a limited scale. The economic impact of this alternative would probably be much less than alternative 2 or alternative 4 due to the low commercial value. This alternative would do less than alternative 2 to make resources available to local and regional industry, and it would have less potential to help sustain or boost the social structure of Saguache County.

Alternative 4

Alternative 4 would generate a benefit to cost ratio of 0.23, the second highest of the three action alternatives. The net present value of this alternative would be \$(5,512,283), which includes the cost of prescribed burning, timber stand improvement projects, timber sale preparation, and timber sale administration. Base rate commercial timber values were included as benefits. The present value cost would be \$7,164,927, and the present value benefit would be \$1,652,644. Under this alternative, approximately 485,984 one hundred cubic feet (CCF) of wood fiber would be offered, and

approximately 45,821 acres could be pre-commercially thinned or treated using prescribed fire to provide non-monetary resource benefits.

This alternative would offer a scaled-back blend of commercial products and resource treatments compared to alternative 2. This alternative would make 18.5 percent less wood fiber available than alternative 3 and would allow prescribed fire or timber stand improvement projects on 28.5 percent fewer acres than alternative 2. Alternative 4 has potential to help sustain or boost the social structure of Saguache County.

Cumulative Effects

Past actions that have affected the existing condition in the analysis area include a diverse history of management decisions and actions. Some of the stands in the analysis area have previously undergone a system of silvicultural management, while other stands have remained relatively unmanaged. Past activities that developed road access, modified tree stocking, implemented prescribed fires, or suppressed natural fires have all shaped the economic and financial landscape that exists today.

Combined with other past activities in Saguache County on public lands, any of the action alternatives would help the Forest Service and BLM continue to provide forest products to local industries as part of moving toward desired conditions as described for this project. The alternatives would help support the local and area wood product industry, dependent service providers, and local economies to various extents. In addition, forest management activities that promote the long-term sustainability of the forested landscape would contribute to the sustainable use of the area for recreation, wildlife habitat, and meeting other future needs.

3.15 Recreation and Travel Management

Scope of the Analysis

This section addresses recreational and travel management within the La Garita Hills analysis area. The analysis area includes federal lands managed by the Rio Grande National Forest and BLM.

Existing Condition

The majority of the road system was developed to meet management needs; most of the roads in the project area are rated for high-clearance vehicles. Many of the roads on BLM lands are short spurs off system or county roads created by users for camping or other purposes.

On both the Rio Grande National Forest and BLM lands, recreation is primarily dispersed use: fall big game hunting, firewood gathering, some fall aspen viewing, and off-highway vehicle use. Off-highway vehicle use has probably been the fastest growing form of recreation over the past ten to fifteen years. For visitors familiar with the area, it is a popular, more remote area for hunting; visitor use increases dramatically in late August through November.

For BLM lands, recreation management is custodial in nature. BLM's general recreation management responsibility in the analysis area is to take care of dispersed recreation activities; visitor safety, visitor use, and user conflicts; and resource protection issues. Specific management direction is to "allow continued dispersed recreational opportunities on BLM-administered lands" (1-23 Resource Management Plan, BLM 1991).

All developed recreation sites in the analysis area are located on national forest system lands near Road 41G, This is the main road running north-south through the area; it is maintained for passenger vehicles. Occupancy in the campgrounds and picnic sites is low: ranging from four percent to twelve percent on average. The Carnero cabin can be rented year around; however, it is rented less than fifty percent of the time, though use has been increasing.

There are seven developed trails in the analysis area, all on national forest system lands. Four are pedestrian and horse trails, one is an ATV trail, and one is open to pedestrian, horse, and motorcycle use. The trails are used from May until snowfall. Visitation and use are relatively low. There are no developed trails on BLM lands. The West Branch of the North Fork of the Old Spanish Trail bisects the project area. This branch is currently being researched for inclusion into the Old Spanish National Historic Trail system, though it is currently undesignated by Congress. This trail is addressed in the *Heritage* section.

There are two outfitter-guide special use permits issued for the analysis area: one for winter mountain lion hunting and one for big game hunting.

There are currently no Forest Service wilderness areas or wilderness study areas in the analysis area. Management activities have been proposed in BLM lands with wilderness characteristics, so they were addressed in the analysis.

As shown in Figure 2, there are four Colorado Roadless Areas in the analysis area: Four Mile Creek, Sawlog, Deep Creek/Boot Mountain, and La Garita. There is one area with a backcountry designation (Management Area Prescription 3.3). Effects to the Four Mile Creek, Sawlog, and the backcountry areas were analyzed further because prescribed burning is proposed under alternatives 2 and 3.

National forest system roads are open to all motor vehicles (including off-highway vehicles) with a seasonal closure from mid-March to mid-May to protect the road surface during snow melt. Roads on BLM are open year-round and are also open to all motor vehicles. The majority of the open roads in the analysis area (about seventy-four miles) are not maintained for passenger vehicles; high-clearance vehicles are recommended.

Travel management on national forest system and BLM lands limits motorized travel to designated roads and motorized trails; BLM also limits mechanized travel to designated roads and trails. The Forest currently has a game retrieval policy that allows use of ATVs less than fifty inches wide to travel off some system roads and trails, outside of areas designated as backcountry, and only in the afternoon to retrieve downed game.

Direct and Indirect Effects

Alternative 1

Under this alternative, no new proposed management activities would be implemented and existing conditions would continue mostly unchanged over most of the analysis area.

Overall effects on dispersed recreation would likely be minimal. The effects of the spruce beetle epidemic could result in some change in visitor use patterns, but the areas most affected by spruce beetles (spruce-fir and spruce-mixed conifer vegetation zones) only include about twenty-five percent of the analysis area. The large numbers of dead trees could preclude the use of the spruce-fir and spruce-mixed conifer vegetation zones for some visitors, especially under windy conditions when safety hazards would increase. However, some firewood cutters are concentrating on these

areas due to the increase in available dead trees. Motorized travel would remain restricted to designated roads and trails; however retrieving game under the game retrieval policy could be hampered as down trees accumulate in some areas.

Alternatives 2, 3, and 4

Potential direct and indirect effects to recreation from implementing the action alternatives include:

- An increase in large truck traffic (and forest worker traffic) along relatively narrow roads being used for hauling forest products which could occur all year, except during spring snowmelt.
- Increase in noise from mechanized harvest, thinning, and hauling operations.
- Increase in dust primarily along national forest system roads being used for hauling forest products.
- Increase in smoke during prescribed burning. Slash piles would generally be burned in the winter when snow is on the ground which would likely have few effects. Prescribed broadcast burns would likely occur mostly in the spring or fall which may have some impacts to visitors.
- Increased traffic, mechanized equipment disturbance, and fall prescribed burning operations may have short-term effects to hunting and wildlife viewing opportunities adjacent to individual project areas.
- Winter timber harvest operations could have some effects on outfitter-guides depending on where the project is occurring.
- Popular dispersed camping sites might be impacted by forest management activities, and some dispersed camping sites might become less attractive due to adjacent forest management activities such logging slash, burned vegetation, or other signs of management activities.

Developed recreation improvements would be protected from damage during management activities. Noise, increased dust, or smoke from project activities could affect visitors using these sites. Any adverse effects would be short-term and should not affect all developed sites at the same time. Effects would be mitigated, to the extent possible, by notifying visitors of project activities prior to their arrival and having alternate camping options available. The Carnero cabin is the only facility that currently takes advanced reservations. Reservations might not be taken during periods when project implementation could affect use or enjoyment of the cabin, or visitors would be notified of project activities when making their reservations.

Noise and dust from the hauling operations would be a short-term impact to developed recreation, primarily occurring along Road 41G. Signs and public information would be used to increase visitor awareness of activities. At this time, dust abatement near campgrounds would not be included in project design criteria due to the relatively low amount of use and the opportunities to camp elsewhere. The situation would be monitored over time. If dust levels were unacceptable, dust abatement could be implemented near developed sites if approved by the district ranger.

Project design criteria would require dust abatement on Road 41G near private lands, if hauling occurs on that road during specified dry periods. Additional dust abatement could be approved by the district ranger, if concerns are identified during the life of this analysis.

Dispersed recreation uses could be affected by several of the proposed management activities, though impacts would generally be short-term and only effect relatively small portions of the analysis area at a time. The use or appeal of existing dispersed camp sites could be adversely affected by adjacent management activities. Maintaining their characteristics would have to be considered on

a project-specific basis. If the sites were well located with minimal adverse effects, adjusting project activities to maintain the site would be desirable, as feasible.

Project activities may affect outfitter-guide operations, depending on the activity and the location and timing of the project. Efforts would be made to minimize disturbance to operators by notifying them in advance and working to minimize conflicts. Any adverse effects would be short-term.

All alternatives have management activities proposed in the vicinity of the trails. Alternative 2 could implement activities near all the trails or parts of all the trails. Alternative 3 would have the fewest potential treatment acres adjacent to the trails. Under all alternatives, the trail surfaces would be protected from damage. If a trail or trailhead area is adjacent to a vegetation management treatment area, trail safety would be incorporated into the management by closing the trail, if necessary, during project implementation. If management activities are occurring immediately adjacent to the trail or trailhead, there would be an opportunity to improve or maintain safety by removing hazards or improving access.

Travel management restrictions and regulations would not change. Recreationists utilizing the game retrieval policy on national forest system lands would likely benefit from alternatives 2, 3, and 4 because they would reduce the extent of down dead trees over time in the spruce-beetle-impacted areas. Alternatives 2, 3, and 4 would have temporary effects on roads and road use, especially during active timber sales with heavy truck traffic. Increased information efforts and signs warning travelers of harvest activities and heavy truck traffic would be required on some roads. This would reduce, but not totally eliminate, the risk to the public.

Under alternatives 2, 3, and 4, prescribed broadcast burning is the only management activity proposed in the Colorado Roadless Areas and backcountry designated areas. Minor amounts of trees could be cut in areas to create fire lines. Use of prescribed fire in these areas would be consistent with the Forest Plan for backcountry designated areas and the Colorado Roadless Rule for the roadless areas. Effects of the alternatives on the nine roadless characteristics were evaluated. The following is a summary of effects. The complete discussion is in the recreation and travel management specialist report on file in the project record.

There would be no effect on sources of public drinking water; on habitat for threatened, endangered, sensitive, or proposed species or species dependent on large, undisturbed areas of land; on classes of dispersed recreation, or on locally unique characteristics.

High quality or undisturbed soil, water, or air – proposed prescribed burn activities would have low potential to affect soils and water since project design criteria and site-specific burn plans would be used to protect sensitive areas such as water influence zones. There would be short-term effects on local air quality over several years that would last during burn operations. Fire crews would be required to obtain a smoke permit from the state of Colorado that would allow burning only under less adverse conditions.

Diversity of plant and animal communities – the reintroduction of low to moderate intensity fires in these vegetation types would be consistent with past disturbance regimes and would be expected to increase understory diversity in both conifer- and grassland-dominated areas. This increase in diversity would likely benefit some of the animal communities.

Reference landscapes – Fire is part the past disturbance regimes for these vegetation zones and the effects of the prescribed fires could be used for reference and monitoring.

Natural appearing landscapes with high scenic quality – scenic quality would be maintained or improved over the life of the project. Any noticeable changes would be gradual, occurring over

several years. Prescribed burning may have short-term effects depending on the burn intensity, but it should increase diversity over the long-term. More diversity, especially in aspen dominance, could improve visual quality.

Traditional cultural properties and sacred sites – there is evidence of past Native American use in the Sawlog roadless area. Part of the goal of implementing prescribed fire would be to protect the known sites from the effects of future wildfires.

For BLM lands with wilderness characteristics, there could be minor short-term changes to the character of activity areas, but the natural character would be maintained in the long-term. Prior to project implementation, there would be an opportunity to defer or modify activities, as needed, if additional concerns are identified.

Cumulative Effects

Implementation of any of the action alternatives could result in short-term temporary impacts to visitors recreating near any timber harvest, thinning, or prescribed burning operation areas. Any adverse effects would be short-term and mitigated by project design criteria, to the extent feasible. Most of these activities would not affect large portions of the analysis area at one time, so overall impacts would remain small. There would be no changes to the existing road network under this project. Since one of the primary uses of the area is big game hunting, vegetation management activities that maintain or improve habitat for species will benefit this program. Vegetation management activities that increase aspen, especially in areas visible from the main roads would also improve the recreational experience for many fall visitors.

There are no plans to add additional recreation facilities in the analysis area, since use rates are relatively low and numbers are not expected to increase substantially over the 15-year life of project implementation. However, any road maintenance activities needed for timber hauling operations may incrementally improve road conditions temporarily, improving access for the casual visitor. It is likely that future decisions regarding travel management may occur within the life of the project, but it is unknown how the transportation system in the analysis area may be changed. The major roads providing general access to the area will likely remain open. Any changes to the transportation system would be made in a separate decision, following additional analysis. Cumulatively, based on the current uses in the analysis area, there is may be a small benefit to the recreation resource.

3.16 Transportation

Scope of the Analysis

The scope of the transportation analysis is the analysis area boundary. This section focuses on primarily roads in the project area needed to accomplish proposed timber activities for each action alternative, so focuses primarily on national forest system roads. Other proposed activities would not additional road work.

Existing Condition

Based on GIS calculations and aerial photo interpretations of unidentified routes, there are currently about 365.5 miles of existing system roads within the analysis area boundary; approximately 90.8 miles of these are closed to public vehicle use, mostly on the national forest.

Recurrent road maintenance is expected to occur annually on roads county road 41G, national forest system roads 671.1A, 675, 676, 690.2A, 710, and 730. This annual maintenance is due to an agreement between the Forest Service and Saguache County. All other National Forest System roads

are maintained by the forest on a seven-year average schedule. Routes that are not part of the National Forest System are maintained by the applicable owner and users.

Typical maintenance required prior to use in timber harvest operations on open roads includes: cleaning culverts and catch basins, removing or clearing vegetation or debris, shaping or grading the road surface to improve drainage, if needed. Spot application of gravel may be required on roads suitable for passenger cars. On closed roads, additional vegetation removal and culvert cleaning or replacement is often needed. Roads are also maintained during by timber purchasers during their use of the road. Cleaning catchments and removing culverts on temporary roads is generally required following harvest completion, as needed.

If system road segments need re-construction to safely accommodate log truck traffic, additional equipment is usually needed and may require adding drainage or straightening a road section or improving visibility. These activities would require more detailed engineering plans to develop specifications and are over seen by certified engineers.

Direct and Indirect Effects

Alternative 1

Under the no action alternative, no changes would be made to the existing transportation network in the project area. Closed (gated) roads in the project area would not be opened and would continue to be monitored for major problems. Natural grass and forb establishment would continue to occur to help stabilize roads, though tree seedling establishment might make vehicle travel more difficult over time. Roads would continue to be maintained on the current schedule. Existing maintenance issues would be addressed as time and funding permits.

Alternatives 2, 3, and 4

The following tables show the transportation network that would be needed to implement all proposed harvest acres for alternatives 2, 3, and 4 along with the estimated average cost for maintenance, reconstruction, or construction. Actual costs would be developed prior to individual project implementation. Alternative 2 would have more miles of road work for system and old temporary roads and the highest costs. Alternative 3 would have the fewest miles of road work and the lowest costs. New temporary road segments that may be needed to implement the alternatives are not included and would be developed as each timber sale area plan is developed. Since much of the analysis are has been previously harvested to some level, new temporary roads could be needed in unharvested acres; alternative 2 would likely need the most total new temporary roads.

As described elsewhere, a segment of NFSR 720 (Big Dry Gulch Road) needs to be re-routed away from the Houselog Creek to meet resource objectives and improve its usability as a haul route and NFSR 673 (Cave Creek) road may also need re-construction along a short segment. Depending on the amount and types of use, NFSRs 678 and 684 may require re-construction on a few segments.

Table 37. Miles of road work and estimated average cost under alternative 2.

Road type	Length (miles)	Work required	Estimated average cost
System roads	284.8	Reconstruction or maintenance	\$324,672
Old temporary roads re-used	52.2	Reconstruction or construction	\$59,508
System road relocation	Up to 10 miles	Reconstruction	\$2,650 per mile

Table 38. Miles of road work and estimated average cost under alternative 3.

Road type	Length (miles)	Work required	Estimated average cost
System roads	192.4	Reconstruction or maintenance	\$219,336
Old temporary roads re-use	24.0	Reconstruction or construction	\$27,360
System road relocation	Up to 10 miles	Reconstruction	\$2,650 per mile

Table 39. Miles of road work and estimated average cost under alternative 4.

Road type	Length (miles)	Work required	Estimated average cost
System roads	275.1	Reconstruction or maintenance	\$313,614
Old temporary roads re-used	47.2	Reconstruction or construction	\$53,808
System road relocation	Up to 10 miles	Reconstruction	\$2,650 per mile

Cumulative Effects

Activities such as logging and recreation affect the roads in direct proportion to the amount of use on the roads. More use wears the road surface away; increases sediment and dust production (depending on the road surface); develops ruts or mud holes during wet weather; etc. Effects of road use is typically more than the amount of road maintenance funding available and maintenance is concentrated on the main routes with the secondary routes being maintained as needed for resource protection or as forest management activities direct.

Forest travel management activities will continue to control unmanaged recreation. 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 general improvements in the condition of open roads and provides opportunities fix some known problems, which can be beneficial to several resources. The benefit of additional maintenance is usually most apparent on the roads currently 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 Forest or Saguache County during the life of the timber sale(s).

3.17 Scenic Resources

Scope of the Analysis

This analysis reviews the visual or scenery resource of the lands managed by the Saguache Ranger District of the Rio Grande National Forest and the San Luis Valley Field Office, BLM. This analysis examines scenic resource considerations in the project area and describes how scenery or visual quality may be affected by proposed treatments.

Existing Condition

The analysis area is a mix of managed and naturally appearing landscapes. The landscapes are dynamic and some areas no longer contain mixed conifer canopies that visitors are accustomed to viewing. Loss of foliage from bark beetles or other insect and diseases have changed the views. Large viewsheds are red or grey in color but still mimic natural patterns of change on the landscape. These changes are a function of natural processes; they are not evaluated as negative or positive. The

Forest Service and BLM only evaluate human alterations on the landscape to measure change in the scenic resources for visitors.

The Forest Service and BLM use slightly different systems to describe the visual or scenic characteristics. Both agencies established scenic integrity ratings based on inventorying and evaluating landscapes. Landscapes were evaluated based on public concern levels, scenic quality or attractiveness, and distance zones. Scenic integrity is the measure of the degree to which a landscape is visually perceived to be complete. The highest scenic integrity class ratings are given to those landscapes with little or no deviation from the character valued by constituents for its aesthetic appeal.

Approximately 56 percent of the Forest Service acres in the analysis area currently have a scenic integrity rating of high and 44 percent have a scenic integrity rating of moderate. For the BLM, 73 percent of the area is Class II-which is similar to high and the remaining 27 percent has a designation of Class III which is similar to moderate.

Concern level is used to express the degree of public importance placed on landscapes viewed from travel ways and high use areas (USDA Forest Service 1995). For the scenery analysis, concern routes were considered to be the primary travel ways maintained for passenger vehicles, the system hiking trails, and the developed recreation sites located off Road 41G. The following concern routes were mapped as high and moderate:

High

- Carnero Pass Road (41G)
- South Carnero Road (National Forest System Road 675)
- County Road 42K to Crystal Mine BLM Interpretive Site
- Campgrounds/Picnic Grounds/Rental Cabin-Poso, Storm King, Big Springs, Carnero Cabin

Moderate

- Big Springs Road (National Forest System Road 710)
- Non-Motorized Trails - North Carnero #773; Bear Creek #778, Trough Gulch #902

Direct and Indirect Effects

Alternative 1

No direct effects to scenery would result in the short-term from selection of this alternative. Increasing numbers of dead and dying trees primarily in spruce beetle affected stands would continue to change the landscape character of the analysis area. Visitors would continue to see dead and dying trees and more of the ground surface becoming visible. Insect and disease activity would continue in other forest types. Successional processes would continue to reduce aspen, willow, and other visually desirable species. Landscape patchiness would continue to decline due to conifer expansion into upland meadows. Overall, this alternative would not change the landscape character, landscape character will continue to be dynamic in nature and change over time.

Alternative 2

Implementation of alternative 2 would have short-term effects to scenery during project implementation and vegetation recovery phases, though these effects would not be occurring across

the entire analysis area at the same time. For activities like prescribed burning, there would be short-term effects to scenic integrity objectives. Large scale salvage and smaller scale sanitation and salvage would change the current landscape character in areas designated for these treatments. This alternative would move more area to the next lowest scenic integrity objective than alternatives 3 and 4. Topographic variability, patterns created by other vegetation, and project design criteria would prevent activities from dominating the landscape and would be used to avoid distinct lines or abrupt changes and contrasts.

Due to the extent of tree mortality and the potential extent of the tree removal, scenic integrity objectives would be reduced in salvage harvest areas in the spruce-fir vegetation zone and perhaps a portion of the spruce-mixed conifer vegetation zone, depending on the amount of spruce present (national forest system lands only). For the purpose of this analysis, it is assumed these salvage and sanitation/salvage harvested areas would drop one scenic integrity objective, as provided for in forest plan standards (appendix D) to address insect and disease situations. Conversely, this alternative could also have the most opportunity to blend changes in form, line, color, and texture so they would look more natural over time. About fifty-eight percent of these salvage and sanitation/salvage acres would be in areas with high scenic integrity objectives and forty-two percent would be in areas with moderate scenic integrity objectives.

After intermediate/sanitation/salvage and intermediate harvests, more of the ground surface would be visible, and visitors could expect to see changes to color, pattern, form and texture in most areas. In the areas where visitors could view the landscape from foreground to middleground, there could be observable signs of management activities such as stumps or slash piles which could result in some short-term effects to scenic integrity objectives. Project design criteria and the site-specific pre-implementation review process would be used to help mitigate some of the effects of harvesting activities. About fifty-six percent of the intermediate/sanitation/salvage and intermediate harvest acres would be in areas with high scenic integrity objectives and forty-four percent would be in areas with moderate scenic integrity objectives.

Old and new temporary roads, skid trails, and landings could be visible from different points on the landscape depending on topography and vegetation screening. They might be most visible in the spruce salvage activity areas due to the reduction in screening vegetation. Rehabilitated landings might not meet the intended scenic integrity objectives upon project completion, but they would begin to regenerate and revegetate over time.

Poorly located road segments on high value roads would be moved out of wet areas onto benches or ridges to reduce negative effects and maintenance needs. If a constructed bench is needed with a road cut greater than a couple of feet, the disturbed cut would be apparent until it became revegetated. After it revegetated, it would be less noticeable but would still be a linear pattern on the landscape. Since the segments of road needing relocation should be short and scattered, they should not dominate the landscape. Old segments of road would be rehabilitated and would blend back into the landscape once revegetation occurs.

Salvage harvest is proposed adjacent to National Forest System Road 675 west of Moon Pass. In this area, scenic integrity objectives would drop one class to moderate or low to accommodate these activities. Proposed commercial harvest activities adjacent to north Road 41G are a mix of salvage, sanitation, and intermediate harvests in a primarily high scenic integrity objective corridor. Activities in these units would be designed to maintain this objective during the pre-implementation review process (appendix D.4). In the winter, newly created openings would be visible from foreground and middleground distances to a lesser degree. Some the harvest activities might be visible beyond these

concern routes because snow would exaggerate the ground surface in newly created openings. However, snow cover would hide activities in the foreground.

South of Carnero Pass, timber stand improvement or prescribed underburning could occur on the west side of Road 41G. This activity would be in the immediate foreground and might be visible. Proposed activities on the southeast side of the analysis area might be very visible from the Crystal Mine interpretive site. Mixed severity burns would occur in a middleground distance; changes in tree canopy and any additional dead trees should blend with vegetation patterns. Timber stand improvement and prescribed underburning treatments in the piñon-juniper would be in a moderate scenic integrity objective area and should be designed to blend treatments and avoid creating unnatural lines. This area could provide an opportunity to interpret vegetation treatments.

Timber stand improvements, timber stand improvements/prescribed low severity burns, and low severity broadcast burns would have short-term effects on scenic integrity objectives. These activities would reduce vegetation on the ground plane and visitors would see blackened areas over many acres. However, the recovery to scenic resources as the result of low severity fires can be relatively fast (within one to two years). Fire scars have the ability to leave a more natural pattern effect on the landscape overall. At a foreground and middleground distances, short-term effects such as blackened tree boles, burnt understory vegetation, or activity slash could be visible. About twenty-seven percent of timber stand improvement and timber stand improvement/prescribed low severity burn acres would be in areas with high scenic integrity objectives and seventy-three percent would be in areas with moderate high scenic integrity objectives. About twenty-six percent of the low severity broadcast burn acres would be in areas with high scenic integrity objectives areas and seventy-two percent would be in areas with moderate scenic integrity objectives.

Mixed-severity broadcast burning would be designed to kill a portion of the overstory trees over time. There would be some increase in dead trees and blackened tree boles in treated areas, which might be visible in the foreground from nearby areas and portions of hiking trails. However it would take place in a Colorado Roadless Area so large portions would not be visible from most areas, and recovery of blackened understory vegetation would occur within one to two years. At a foreground and middleground distances, short-term effects such as blackened tree boles, burnt understory vegetation, or activity slash might be visible. Background views of these burning techniques should reveal more of the ground surface and color changes, as well as overstory vegetation loss on the landscape over time.

Cutting conifers that are encroaching in meadows would have some effect on scenic integrity objectives. In the foreground visibility zone, there could be a short-term increase in surface slash and some evidence of smaller diameter cut stumps. Signs of activity would remain subordinate to the meadow opening by following the project design criteria. Maintaining these grass/forb openings would help maintain the project objectives of the current landscape pattern. About thirty-seven percent of the acres of conifer removal in meadows would be in areas with high scenic integrity objectives and sixty-three percent would be in areas with moderate scenic integrity objectives.

Cutting conifers in riparian areas might have some effects on scenic integrity objectives. In the foreground visibility zone, there could be a short-term increase in surface slash and some evidence of cut stumps. These signs of activity might remain subordinate to the riparian vegetation due to the limited nature of this activity. Maintaining early seral aspen and willows in riparian zones would help meet project objectives and would be part of the landscape character. About ninety-two percent of the acres of conifer removal in riparian areas would be in places with high scenic integrity objectives and eight percent would be in places with moderate scenic integrity objectives areas.

Alternative 3

Effects from implementing alternative 3 would be similar to alternative 2, but at a reduced level, especially in the spruce-fir and spruce mixed conifer vegetation zones. For activities like prescribed burning, there would be short-term effects to scenic integrity objectives. This alternative would move fewer areas to the next lowest scenic integrity objective than alternatives 2 and 4. Topographic variability, patterns created by other vegetation, and project design criteria would prevent activities from dominating the landscape and would be used to avoid distinct lines or abrupt changes and contrasts.

This alternative would remove dead and dying spruce along linear roads, fences, trails, or other improvements; it should have fewer impacts to the overall scenery than alternative 2. Project design criteria would be incorporated to reduce abrupt edges; for example, tying boundaries into openings and using topography to minimize any linear appearances. For the purpose of this analysis, it is assumed these harvested areas would drop one scenic integrity objective. About 60 percent of the salvage harvest acres would be in areas with high scenic integrity objectives and 40 percent would be in areas with moderate scenic integrity objectives.

Where aspen sprouting occurs, scenic recovery would be accelerated due to the relatively rapid growth rate compared to conifer seedlings. A variety of snag densities across the landscape and down woody material would also maintain current texture.

Effects from intermediate harvest activities would be similar to alternative 2; activities would blend into the characteristic landscape through the use of project design criteria. The potential to increase aspen regeneration would also increase scenic attractiveness over time. About thirty-eight percent of the intermediate harvest acres would be in areas with high scenic integrity objectives areas and sixty-two percent would be in areas with moderate scenic integrity objectives.

Effects from temporary roads would be less than alternative 2, and some disturbance would likely be visible from different viewpoints on the landscape. As in alternative 2, variation in topography and vegetation would help to screen these areas to minimize visual impacts. Rehabilitated landings might not meet the intended scenic integrity upon project completion but would within five years following slash disposal.

Most commercial harvest activities on national forest system lands adjacent to the developed recreation sites, non-motorized trails, and the two major roads would be limited to salvage of dead and dying trees to protect infrastructure and reduce risk to visitors. This would be a limited activity but would be in the immediate foreground where extensive dead trees occur. These areas are generally in the higher elevations west of Moon Pass and in the vicinity of Carnero Pass. This activity would need to be carefully designed to avoid unnatural linear corridors. In these areas, scenic integrity objectives would drop one class to moderate to accommodate these activities. Project design criteria and a pre-implementation checklist would be used to minimize adverse effects in the immediate foreground adjacent to campgrounds, hiking trails, and concern routes.

Effects from timber stand improvement, timber stand improvement/prescribed low severity burning, and low severity broadcast burning activities would be the same as described under alternative 2, but the impacts might be in different locations. There would be slightly more low severity burning in the mixed conifer and less in the aspen. This might reduce the aspen regeneration which is considered more desirable on the landscape by visitors. About 29 percent of the timber stand improvement and timber stand improvement/prescribed low severity burn acres would be in areas with high scenic integrity objectives and 71 percent would be in areas with moderate scenic integrity objectives.

About 27 percent of the low severity broadcast burning activities acres would be in areas with high scenic integrity objectives and seventy-three percent would be in areas with moderate scenic integrity objectives.

Mixed severity broadcast burning is proposed in the same vegetation types and locations as alternative 2, so effects would be the same. About 58 percent of the mixed severity broadcast burning acres would be in areas with high scenic integrity objectives and 42 percent would be in areas with moderate scenic integrity objectives.

Under alternative 3, cutting conifers that are encroaching in meadows and riparian areas would have the same effects as alternative 2. About 37 percent of acres of conifer removal in meadows would be in areas with high scenic integrity objectives and 63 percent would be in areas with moderate scenic integrity objectives. About 95 percent of the acres of conifer removal in riparian areas would be in places with high scenic integrity objectives and 5 percent would be in places with moderate scenic integrity objectives.

Alternative 4

Implementation of alternative 4 would have more impacts to scenic resources than alternative 3, but slightly less than alternative 2. There would be effects to scenery during project implementation and vegetation recovery phases, though these effects would not be occurring across the entire analysis area at one time. For activities like prescribed burning, there would be short-term effects to scenic integrity objectives. Large scale salvage and smaller scale sanitation and salvage would change the current landscape character in areas designated for these treatments. This alternative would move fewer acres to the next lowest scenic integrity objective than alternative 2.

Cumulative Effects

Past and current management activities such as previous vegetative treatments have had some effects on scenic or visual resources since the majority of the analysis area is in multiple-use management area prescriptions. The analysis area is still considered natural appearing overall and evidence of management activities do not dominate the landscape.

The only vegetation management activity currently approved under a separate Decision is a sanitation or salvage harvest of about 550 acres remaining off National Forest System Road 706 that was completed in the spring of 2016. This activity was a partial harvest to decrease the density of live trees. There are no other vegetation management activities planned in the reasonably foreseeable future on federal or other land ownerships.

There would be an increase in visible disturbance for all planned activities near concern routes. However, there would be opportunities to blend the activities implemented to provide the appearance of a more intact landscape. All activities are expected to change this landscape to some extent, though some effects would only be noticeable for a short period. The bark beetle epidemic is moving the parts of the landscape from a forested to non-forested condition, dominated by changes in color and texture. All action alternatives would meet the next lowest intended scenic integrity objective for the identified analysis area as provided for in the Forest Plan.

3.18 Heritage

Scope of the Analysis

A Class I literature overview search was conducted for the analysis area (Krall 2015). The search utilized records of the Colorado State Historic Preservation Office, the cultural resource atlases of the Rio Grande National Forest and the San Luis Valley Field Office area BLM, all relevant cultural resource management reports, and general land office plat maps. Much of the project area (twenty-five percent) has been surveyed for cultural resources. Previous heritage resource inventories have resulted in a great deal of data on the site types and site distribution across the landscape, as well as high potential versus low potential areas.

Because of the landscape-scale nature of the project and the fact that the record of decision will be signed before any on-the-ground analysis can occur, a programmatic agreement has been developed with the Colorado State Historic Preservation Office (SHPO). When individual project activity areas are identified for implementation, a pre-implementation checklist will be employed; it will guide how project activities (tiered undertakings) will comply with the programmatic agreement. Therefore, full Section 106 consultation with the SHPO is still required for each tiered undertaking (see Sections IV and V of the programmatic agreement, appendix E).

Existing Condition

The analysis area contains a moderately high density of a variety of heritage resources. There are currently forty-six documented sites that are eligible to the National Register of Historic Places, forty-six sites that need data, and forty-six sites that are not eligible. One hundred and twenty isolated finds have also been documented. The literature search suggests variable degrees of site density across the analysis area depending on proximity to water. Previous inventories suggest heavily timbered areas have very low potential for heritage resources while tree lines along watercourses have the highest potential.

Most eligible prehistoric sites cluster around the more permanent water sources such as Mill Creek, Mountain Lion Creek, California Gulch, House Log Creek, Tracy Canyon, Biedell Creek, North Carnero Creek, and Carnero Creek at the mid to lower elevations. A GIS (geographic information system) predictive model closely mirrors existing site densities revealed by past surveys. Fire-sensitive prehistoric and contact-era features (for example, culturally modified trees, wickiups and burial scaffolds) likely exist in patches of old growth of ponderosa pine, Douglas-fir and limber pine stands that have not experienced stand-replacing fires or been harvested in the last two centuries. Many of these features likely burned, died from insect or disease activity, or have been harvested by woodcutters. However, all three feature types exist in or very near the project area and will receive special consideration in project design and design criteria developed for their protection. The current forest condition consisting of high fuel loads and attendant potential for catastrophic fire places these features (documented and undocumented) at great risk. Eligible historic sites such as homestead sites also cluster around permanent water sources but are not at the same high risk of loss as most sit in open meadow areas. However, they still fall into the category of fire sensitive sites.

Some heritage resources have experienced cumulative impacts from wildlife, sheep, and cattle over the last century. Overall, sixty percent of the significant archaeological sites are stable, twenty-seven percent are in better condition than the previous recordings, especially in the House Log, Mountain Lion and California Gulch allotments, in the north end of the Cow Camp pasture, and along West Park Creek. A small portion of the sites were more impacted (thirteen percent), predominantly in the Mill Creek and California Gulch allotments.

In 2009, thirty-nine sites were re-visited during the South Saguache range analysis. The cumulative negative effects of livestock grazing were evident on many sites. However, disturbances noted on the earlier site forms often did not take into account all effects. Heritage resources have been negatively impacted by historic and unmanaged livestock grazing, ungulate grazing, unmitigated soil erosion, historic contour furrowing (Civilian Conservation Corps), illegal roads, and dispersed recreational activities. The area has also experienced rampant illegal artifact collection excavation. It is possible heritage resources have been previously impacted by past logging within the project area. 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 of 1966 or the National Environmental Policy Act of 1970.

Direct and Indirect Effects

Alternative 1

Since this alternative includes no additional ground-disturbing activities, the potential for inadvertent discoveries of, and damage and destruction to, surface and buried cultural deposits or aboriginal human remains would be negligible. This alternative would have no direct effect on heritage resources, and no design criteria or monitoring activities would be necessary. However, the fuel loading that would occur under the no action alternative could result in negative direct effects to fire-sensitive cultural resources, if large scale, catastrophic wildfires sweep over the region.

Effects Common to Alternatives 2, 3, and 4

Direct negative effects to heritage resources from commercial and non-commercial treatments could include the potential destruction or alteration of unidentified heritage resources through ground disturbance and inadvertent impacts to standing structures. Direct effects from prescribed burning include consumption, smoke damage, and heat damage. While wood resources such as culturally modified trees, wickiups, and cabins are the most susceptible to fire; other resources such as prehistoric open camps with stone artifacts are much less so. However, stone artifacts, ceramics, metal, and glass can be damaged by smoke and heat, depending on the intensity and severity of the fire (Oster 2002).

Potential direct effects from suppression, rehabilitation, and fuels reduction activities could include damage from heavy equipment and hand tools used to build fire containment lines and in manual or mechanical fuel reduction projects, especially to buried cultural deposits. Indirect effects to cultural resources could include erosion potential from the removal of vegetation and increased resource visibility, which might make the resource vulnerable to vandalism. Conversely, vegetation removal could allow resources to be more easily inventoried and understood by researchers. Beneficial indirect effects from fuels reduction around fire sensitive heritage resources could be greater protection from intense wildfires. Fuels reduction could mitigate the potential negative effects to heritage resources from 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 could have negative direct effects on unidentified buried cultural deposits. Indirect effects from project activities could include the erosion of buried cultural deposits caused by temporary road construction and the removal of trees and vandalism to heritage resources perpetrated by individuals associated with project activities.

If landings and skid trails are reused from past harvests and if natural breaks are used in lieu of constructed fire lines, the potential effect to heritage resources is reduced. In areas proposed for non-commercial thinning and prescribed burning where there is higher potential for fire-sensitive sites, the potential effect to heritage resources is higher. If the heritage pre-implementation checklist process and the stipulations outlined within the programmatic agreement are followed, there should be no adverse effects to significant heritage resources. If the heritage staff is involved in the design of fuels reduction projects in the lower elevation-high heritage resource potential areas, it could mitigate future adverse effects to fire-sensitive sites by reducing fuel loads around those sites.

Alternative 2

Under this alternative, the potential for effects to heritage resources is high because it proposes the greatest number of acres to be potentially treated. However, the potential effects from commercial harvest activities in higher elevation spruce-fir stands are lowest because these stands have the lowest potential for heritage resources.

Alternative 3

Under alternative 3, the potential for effects to heritage resources is highest of all of the action alternatives because more of the proposed activities take place in lower elevation stands (70,275 acres) with higher potential for heritage resources

Alternative 4

Under alternative 4, the potential for effects to heritage resources is the most moderate of all of the action alternatives; it proposes fewer acres for implementation overall

Cumulative Effects

In conjunction with the proposed project, previous logging activities, recreation activities such as hunting, and livestock grazing have the potential to cause erosion and lead to cumulative, long-term, irreversible, adverse effects to heritage resources. The loss of archaeological resources has happened in the past and will happen in the future. The cumulative effect is that over time fewer archaeological resources would 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.

Past actions that have likely negatively affected heritage resources include historic and unmanaged livestock grazing, ungulate grazing, soil erosion, historic contour furrowing, illegal roads, dispersed recreation use, and illegal artifact collection and excavation. Unmanaged recreation and illegal collection and excavation are likely still happening in 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 negatively impact heritage resources, especially within riparian areas.

Grazing will continue into the foreseeable future. The grazing program should 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 in the short-term. As the spruce die, the timber activities are likely to slow and shift out of the spruce zone for an extended period, perhaps 100 to 200 years. Recreation use is likely to remain constant, though there may be changes in the distribution of activities, due to dead trees.

3.19 Climate Change

Scope of the Analysis

The following analysis includes both qualitative and quantitative discussion commensurate with Council on Environmental Quality's climate change and National Environmental Policy Act guidance (CEQ, p. 9; 2014), as well as climate change consideration in project level analysis (USDA Forest Service 2009). 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. Smoke from wildfires affects public health; watershed conditions impacts tourism and drinking water; and precipitation and snowpack affect water availability for downstream agriculture.

Existing Condition

As concentrations of greenhouse gases increase, temperature is expected to also increase. Warmer temperatures and the proliferation of destructive insects are important management concerns to national forests in Colorado. Forests in the analysis area have been severely damaged by insects and disease. While most are native to these forests, many insects and diseases have expanded to epidemic levels.

[Colorado Climate Change Vulnerability Study](#) (Colorado Energy Office, 2015) summarized observed and predicted impacts specific to Colorado including, but not limited to, the following:

- 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.

Forest health and resiliency are important considerations on the Rio Grande National Forest, and they have become increasingly susceptible to insects and disease, exacerbated by climate change impacts. Smoke from wildfires affects public health; watershed conditions impacts 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. Droughts and temperature fluctuations are natural events but are well-documented as being exacerbated by climate change.

Direct and Indirect Effects

Alternative 1

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 would likely be at higher risk from uncharacteristically large or severe wildfires. Stands would burn, causing an immediate release of stored carbon. As stands re-establish after wildfire, carbon sequestration would increase as trees grew. Some intense wildfires could damage soil conditions and limit reforestation. While highly speculative, the potential for carbon sequestration would be limited under this alternative. Both emissions and sequestration have a cumulative effect on atmospheric concentrations of greenhouse gases.

Smoke from wildfires affects public health; watershed conditions impacts tourism and drinking water; and precipitation and snowpack affect water availability for downstream agriculture.

Alternatives 2, 3, and 4

Vegetation management activities associated with the action alternatives for this project would initially add to atmospheric concentrations of greenhouse gases. However, as trees re-establish, increase in vigor, or as stands mature, carbon sequestration will reduce atmospheric concentrations of greenhouse gases.

Both commercial and non-commercial treatments would result in an initial loss of stored carbon through vegetation loss, soil disturbance, and emissions associated with equipment and machinery. As stands re-established, from thinning or planting, carbon would be sequestered as part of the terrestrial carbon cycle. These stands could burn and trees would still die or decompose and release carbon.

Under alternative 2, direct emissions would be greater and more carbon would be retained in wood products or biomass than under alternatives 3 and 4. If a market developed, use of biomass products from projects could offset emissions from fossil fuel sources. Alternative 2 would facilitate resiliency and increase stand vigor. Watershed health would also be improved with the relocation of up to ten miles of roads.

Under alternative 3, landing areas impacted would be less than half (740 acres) of those impacted under alternative 2. This would result in less disturbance and emissions from landing sites. Fewer commercial harvest acres would also result in few emissions from machinery, skid trails, and other activities associated with a commercial operation.

Under alternative 4, disturbance and associated greenhouse gas emissions from landing sites would be roughly in between alternatives 2 and 3. This alternative would retain more carbon in wood products or biomass than alternative 3 but less than alternative 2.

Cumulative Effects

Under all three action alternatives, greenhouse gas emissions would cumulatively add to atmospheric concentrations. However, as trees re-establish and thinned stands mature, carbon would be sequestered, reducing atmospheric concentrations.

3.20 Compliance with Other Relevant Laws, Policy, Direction

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (National Environmental Policy Act, Section 101).

The relationship between the short-term uses of the environment and the maintenance and enhancement of long term productivity is complex. For this analysis, it was assumed short-term uses were those generally occurring on an annual basis (for example, livestock grazing use of forage,

timber harvest use of available wood resources, and recreation uses) or activities with effects that last less than 5 years. Mid-term to long term was used to refer to longer than 5 years, depending on the resource.

Productivity refers to the capability of the land to provide market and non-market outputs and values for future generations. Soil and water are the primary factors of land productivity and represent the relationship between short-term uses and long-term productivity.

All action alternatives considered in detail, incorporate sustained yield of resource outputs in varying degrees, while maintaining resource productivity. Standards and guidelines, best management practices, project design criteria, the project pre-implementation review process, and monitoring are included in all alternatives to ensure long-term productivity would not be impaired by short-term uses. Therefore, for every alternative, the long-term productivity is assured. This conclusion is based on disclosures for each resource in chapter 3.

Unavoidable Adverse Effects

This section describes adverse effects that are unavoidable with implementation of the action alternatives. For further discussion, see the resource topics in chapter 3.

No action could have adverse effects on local forest products industry. The large number of spruce-beetle-killed trees could increase risks to visitors and firefighters. Increasing conifer density in the drier forest types is reducing the potential for maintaining a sustainable forest and is increasing the potential for uncharacteristically intense or large wildfires.

Unavoidable adverse effects that might occur from proposed silviculture and other management activities include: an increase in watershed disturbance, reductions in ground cover, compaction resulting from the use of heavy equipment during timber harvest operations, detrimental effects to soils from burning machine piles, incidental damage to understory trees during logging operations, which might decrease habitat quality for snowshoe hare which are the primary prey for Canada lynx.

Local air quality would be adversely affected on a temporary or short-term, seasonal basis from broadcast burning or burning of hand or machine piles. Prescribed broadcast burning could also damage overstory trees, temporarily decrease ground cover, grasses, forbs, and shrubs, and have a potential to increase invasive plant establishment.

Standards and guidelines, best management practices, project design criteria, the project pre-implementation review process, and monitoring would be used to minimize adverse effects caused by management activities.

Federal Permits, Licenses, or Other Entitlements

No federal permits or licenses would be required.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources describes the loss of future options and applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time.

Irretrievable commitment applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is

serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Two types of irreversible resource commitments would occur as a result of implementation of any of the action alternatives:

- **Energy resources:** Fossil fuels used in processing wood products which would result from an action alternative would be an irreversible loss.
- **Other resources:** There could be a limited irreversible loss in soil/rock resources used in road reconstruction by use of existing and potential borrow pits.

No other irreversible resource commitments were determined as a result of the implementation of an action alternative.

Irretrievable commitment of resources includes:

- **Vegetation:** Where temporary roads, skid trails and landings are needed, vegetation is re-established on the disturbed areas, but the type of vegetation may be changed from trees to grasses and forbs in these areas, at least in the mid to long-term.
- **Social/economic:** Where there is no commercial wood fiber recovered (the no action alternative), there would be an irretrievable loss in income and employment in the local economy for a short period of time or until new sources of supply could be found. As dead trees deteriorate, they also have fewer product uses locally.
- **Wildlife habitat:** Loss or modification of habitat for some species of wildlife is likely under the action alternatives (see *Wildlife* section). As vegetation recovers, habitat would eventually recover or improve over various periods of time depending on the amount of tree mortality, stand composition, or stand structure, and alternative implemented.

Other Required Disclosures

The National Environmental Policy Act (40 CFR 1502.25(a)) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with ...other environmental review laws and executive orders.”

Land Management Plan Consistency

All alternatives would be consistent with the agency land resource management plans and other laws and regulations.

Clean Water Act

The Clean Water Act requires each state to implement its own water quality standards. Designated uses include agriculture, domestic water source, recreation primary contact, and aquatic life cold water. Status is listed as good for all designations, except aquatic life which has not been assessed. The beneficial uses and good quality of water in the streams in the project area would be maintained during and following project implementation through the proper implementation of best management practices, project design criteria, pre-implementation review, and monitoring (see appendix D).

Clean Air Act

Based on discussions in chapter 3 concerning air quality, it has been determined that there would be no measurable effects to air quality in Class I or II airsheds relative to any of the alternatives. Dust

from harvest activities and smoke from pile burning or broadcast burns would be short-term and temporary. Project design criteria would require dust abatement on Road 41G during dry periods, if it was used as a haul route for log trucks. Burning would also be conducted only as approved by the state of Colorado. This project would fully comply with the Clean Air Act.

Executive Order 11990

This order requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In compliance with this order, Forest Service direction requires that an analysis be completed to determine whether adverse impacts would result.

All action alternatives would be compliance with this executive order since no ground-disturbing activities would occur within one hundred feet of any wetland, seep, or spring. These areas will be identified prior to any project implementation. Impacts from adjacent or nearby areas will be prevented through implementation of project design criteria, pre-implementation review, and monitoring.

Endangered Species Act

Based on discussions in chapter 3 concerning threatened, endangered, and proposed wildlife species and analysis contained in the draft Biological Assessment, it has been determined that:

For the North American wolverine, project activities “*will not jeopardize*” the wolverine or influence any future options for achieving a self-sustaining population in the Southern Rocky Mountains;

For the southwest willow flycatcher, proposed activities may have some effects on habitat suitability under all action alternatives; with implementation of project design criteria so project “*may affect, but is not likely to adversely affect*” the southwest willow flycatcher.

For the Canada lynx, on Forest Service lands, effects of the action alternatives would be in compliance with the 2008 *Southern Rockies Lynx Amendment* and incidental take statement and will “*may affect, likely to adversely affect*” lynx habitat due to the scale of proposed activities in lynx habitat along with the compounding factor of the loss of food for red squirrels, an important secondary lynx prey, resulting from ongoing spruce beetle activity. All effects would 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, and biological opinion requirements.

On BLM lands, proposed activities would be managed for consistency with conservation measures identified in the *Canada Lynx Conservation Assessment and Strategy* (LCAS 2013). As applicable to BLM, the pre-implementation process will be used 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 analysis area. The determination for proposed activities on BLM lands is *may affect, not likely to adversely affect*” lynx habitat on BLM lands.

The biological evaluations for sensitive plants and wildlife, located in the project record, determined that the project alternatives would not adversely impact any regional sensitive species to any extent that would cause a trend toward federal listing.

Executive Order 13186 - Migratory Bird Treaty Act (2001)

As described in chapter 3, wildlife under the migratory bird subsection, there may be potential effects to five birds on the list of Birds of Conservation Concern for this area due to proposed activities in their general habitats. In salvage harvest areas, conifer snag numbers would be decreased, but project design criteria and standards would require a minimum number of snags are retained. Though weather conditions often preclude many management activities during at least part of the spring nesting period, due to the wide elevation range in the analysis area, some activities could occur during this period which could disturb or displace adults and could have some potential for do

Roadless Area Conservation

All action alternatives comply with the current Forest Plan inventoried roadless areas and Colorado Roadless Rule management direction, since there would be no tree harvesting activities proposed in a designated Colorado Roadless Areas (CRAs). Prescribed broadcast burning to meet land management objectives is fully consistent with CRA management guidelines.

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 and low income populations.

Based on scoping and public involvement, there are no other indications that the proposed action or any of the alternatives would have a disproportionate adverse effect any low-income or minority populations. Based on information provided in this section and the Air Quality section, no adverse impacts are expected on any populations. No concerns have been identified by any minority populations.

The action alternatives would provide more potential for economic benefit and diversity that could benefit local populations in a variety of ways (Social-Economics section). The no action alternative might not provide direct or indirect benefits, but it would be unlikely to cause measurable harm.

Saguache County would not be considered low income but does have a minority population, as defined by Executive Order 12898 (CEQ 1997; Romero et al. 2001). However, the population composition of Saguache County is very similar to the entire San Luis Valley and does not actually have a distinctly different minority population (see Table 40). The San Luis Valley is comprised of the six local counties; it was used as the geographic area of comparison for the Saguache County analysis area. The median household income in Saguache County is \$34,600 and 18.7% of the families are below the poverty level. The median household income in the San Luis Valley is \$35,634 (U.S. Census Bureau, 2009-2013).

Table 40. Population information, Saguache County and the San Luis Valley.

Race or Ethnicity	Saguache County	San Luis Valley
White	56.7%	50.1%
Hispanic origin	40.9%	47.3%
Other races	2.9%	2.6%
American Indian	<1%	<1%
Total population	6,108	46,027

Source: San Luis Valley Statistical Profile, April 2015. San Luis Valley Development Resources Group and San Luis Valley Council of Governments.

Cumulatively, the additional commercial forest products and firewood from salvaging dead and dying trees on suitable timber lands in the analysis area would continue to provide economic opportunities to area residents.

Plans and Policies of Other Jurisdictions

As evidenced from responses to scoping and other public involvement solicitations, no conflicts have been identified between the objectives of other federal, state, and local governments and Indian tribes and the four alternatives associated with this project.

Chapter 4. Preparers, Contributors, Notice of Availability Contacts

The Forest Service consulted the following individuals, federal, state, and local agencies, tribes and other organization and individuals during the development of this environmental impact statement:

4.1 Interdisciplinary Team Members

Table 41. Interdisciplinary team members

Core IDT	Education	Years Professional Experience	Position Title IDT Role
Diana McGinn	BS Range-Forest Management; BS Wildlife Biology, Colorado State University	30	Natural Resource Planner/Silviculturist <i>IDT Leader, Silviculture, Recreation</i>
Mary Nelson	BS Forestry, Utah State University	27	Supervisory Forester <i>Data Analyst, FVS, Forest Products</i>
Dwight Irwin	BS Wildlife Biology, Cal Poly-San Luis Obispo	20	Wildlife Biologist (retired) <i>Wildlife - Non-TES</i>
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	Forest Soil Scientist <i>Soils, Air Quality</i>
Kent Smith	Oregon Institute of Technology	15	Forest Fuels Technician <i>Fire and Fuels</i>
Joseph Old Elk	BS Environmental Science, Soil and Water Science, Montana State University	5	Physical Scientist <i>Hydrology, Watershed, Aquatics</i>
Dayle Funka	BS Natural Resource Management & Range Ecology, Colorado State University	9	Supervisory Range Management Specialist <i>Range, Noxious Weeds</i>
Paul Minow	MA Fine Arts, Adams State University BA Fine Arts, Red Rocks College BA Liberal Arts, University of Colorado	27	Fire Management Specialist, BLM <i>Fire and Fuels</i>
Supporting IDT			
Doug Middlebrook	BS Wildlife Management, Colorado State University	23	Wildlife Biologist, TEAMS Enterprise Unit <i>Wildlife – T & E section</i>
Randy Ghormley	BS Wildlife Management, Humboldt State University BA Forestry, Feather River College BA Wildlife Biology, Feather River College	30	Forest Wildlife Biologist <i>Fisheries, BA review</i>

Core IDT	Education	Years Professional Experience	Position Title IDT Role
Angie Krall	MA Applied Anthropology, Northern Arizona State University BA Anthropology, Colorado College	23	Archeologist <i>Heritage</i>
Kevin Duda	MS Forestry, Colo. State University BS Forestry, Colo. State University	9	Forester <i>Social, Economics</i>
Jacob Conners	B.S. Rochester Institute of Technology, Civil Engineering Technology	5	Civil Engineer <i>Transportation</i>
Beth Jones	MS Forestry, Southern I Illinois University BS Botany, Eastern Illinois University	11	Range Management Specialist/ Botanist <i>TES Plants</i>
Trey Schillie	MS Yale University, Environmental Management	13	Regional I&M, Roadless, Climate Change Coordinator <i>Climate Change</i>
Kelly Ortiz	BA Literature, Syracuse University MLA Landscape Architecture, State University N.Y.	21	Forest Landscape Architect <i>Scenic Resources review</i>
Sean Noonan	BS Parks & Recreation Management (wildlands), Northern Arizona University BA Cultural Anthropology, BA Social Science, Colorado State University	11	Outdoor Recreation Planner, BLM <i>Recreation, Scenic Resources review</i>
Jeff Williams	BS Natural Resource Management – Range Ecology, Colorado State University	15	BLM Range Specialist <i>Range, Noxious Weeds review</i>
Gary Frink	BS Geology, Adams State College	28	Engineer/ Transportation planner <i>Transportation Support</i>
Cheryl O'Brien	BS Biology Ft. Lewis College	18	GIS Coordinator/Biologist <i>GIS support</i>
Sid Hall	Technical Fuels Management, Applied Science-Animal Health, Adams State College	15	Prescribed Fire & Fuels Specialists <i>Fire and Fuels support</i>

4.2 Agencies and Tribes Consulted

The Forest Service consulted the following Federal, State, and local agencies and groups, Tribes, and non-Forest Service persons during the development of this document.

Table 42. Agencies and Tribes consulted¹

Colorado Parks and Wildlife	Taos Pueblo
Environmental Protection Agency	Pueblo of Nambe
US Fish and Wildlife Service	Pueblo of Laguna
Colorado State Historic Preservation Office	Pueblo of Picuris
Saguache County Commissioners	Pueblo of Zuni
Uintah & Ouray/Northern Ute Tribe	Ohkay Owingeh Tribe
Navajo Nation	Hopi Tribe
Pueblo of Santa Ana	Santa Clara Pueblo
San Ildefonso Pueblo	Pueblo de Cochiti
Jicarilla Apache Tribe	Southern Ute Tribe
Ute Mountain Ute Tribe	

¹ Also received a draft environmental impact statement notification letter

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 43. Draft environmental impact statement notice of availability contacts

Contact	Format	Contact	Format
Glen Alexander	letter	Robert McFarland	letter
Dick Artley	letter	David Montgomery	letter
Henry Bowles	letter	Lauren McCain	letter
Walter Brandenburg	letter	Faith O'Reilly	letter
Andrew Hurd, Hurd Brothers Logging	letter	Rocky Smith,	letter
Ed Bryant	letter	Steven Reynolds	letter
Kenneth Canaday	letter	Van Romney, Poso Creek Ranch	letter
Jim and Ruth Christy	letter	WildEarth Guardians	letter
Robert and Carol Lee Dugan	letter	Adam Moore, Colorado State Forest Service	letter
Mark Hess	letter	Rick Basagoitia, Colorado Parks & Wildlife	Letter/email
Donald Jennings	letter	Kurt Broderdorft, US .Fish & Wildlife Service	letter
Clark and Deborah Johnson	letter	Jason Surface, Colorado Parks & Wildlife	letter
Daniel Johnson	letter	J. Wenum, Colorado Parks & Wildlife	letter

Contact	Format	Contact	Format
Patricia La Farge	letter	Director of Planning, Rocky Mountain Regional Office	letter
Fredrick Loomis,	letter	Director Renewable Resources, Rocky Mountain Regional Office	letter
Thomas Penka, Sanderson Gulch Lodge	letter	Tom Troxel, Intermountain Forest Industry Association	letter
Montrose Forest Products	letter	Taylor/Cebolla District Ranger	letter
John Tschirky	letter		
Office of Honorable Cory Gardner	CD, letter	US Fish & WL Service	letter
Office of Honorable Michael Bennet	CD, letter	U.S. Environmental Protection Agency, Region 8	paper copies, CD
Office of Honorable Scott Tipton	CD, letter		
Office of Honorable Larry Crowder	CD, letter		
Office of Honorable Edward Vigil	CD, letter		
Acquisitions & Serials Branch, National Agricultural Library	CD, letter	U.S. Army Corps of Engineers, South Pacific Division CESPDP-CMP	letter
Chief of Naval Operations (N45), Energy and Environmental Readiness Division	letter	U.S. Coast Guard, Environmental Impact Branch G-MEP	letter
Deputy Director APHIS PPD/EAD	letter	National Environmental Coordinator, NRCS	letter
Director OEPC	letter	Regional Director, Northwest Mountain Region, Federal Aviation Administration	letter
Director, NEPA Policy & Compliance, DOE	letter	U.S. Army Corps of Engineers, Northwestern Division	letter
Director, Planning and Review, Advisory Council on Historic Preservation	letter	U.S. Army Corps of Engineers, South Pacific Division CESPDP-CMP	letter
Federal Highways, Colorado HDA-CO	letter	U.S. Army Corps of Engineers, South Pacific Division CESPDP-CMP	letter
Libraries - Documents Processor, Colorado State University	Hardcopy	U.S. Coast Guard, Environmental Impact Branch G-MEP	letter
National Environmental Coordinator, NRCS	letter		
Regional Director, Northwest Mountain Region, Federal Aviation Administration	letter		
U.S. Army Corps of Engineers, Northwestern Division	letter		

Appendices

Appendix A – Definitions

Term	Definition
Adaptive management	A system of management practices based on identified outcomes and monitoring to determine if management actions are meeting desired outcomes, and if not, to facilitate management changes that will best ensure outcomes are met or reevaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain (FSM 1905; FSM 2020.5)
Aquatic Management Zone (AMZ)	An administratively designated zone adjacent to stream channels and other waterbodies. Similar in concept to the Water Influence Zone often used in Region 2 of the Forest Service.
Artificial regeneration	A group or stand of young trees created by direct seeding or by planting seedlings or cuttings.
Basal area	Cross-sectional area, in square feet, of a tree measured at diameter at breast height (4.5 feet above ground).
Board Foot	Measure of an amount of timber equivalent to a piece of lumber 12 inch by 12 inch by 1 inch.
Canopy base height	The Forest canopy base height layer describes the average height from the ground to a forest stand's canopy bottom. Specifically, it is the lowest height in a stand at which there is a sufficient amount of forest canopy fuel to propagate fire vertically into the canopy.
Coarse woody debris	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 public lands.
Commercial thinning	An intermediate harvest with the objective of reducing stand density primarily to improve growth, enhance forest health, and meet other resource objectives.
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.
Crowning index	The twenty-foot wind speed (mph) at which active crown fires are possible. Higher index values indicate less susceptibility to active crown fires.
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 intended end results for all actions taken within it. Desired conditions for each specific management area prescription are outlined in chapter IV of the <i>Revised Land and Resource Management Plan of the Rio Grande National Forest</i> .
Endangered plant	A plant that is likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range.

Term	Definition
Equivalent road disturbance	<p>During forest planning, disturbance area factors or values were established for different types of surface disturbances that may occur in watersheds (for example, road building, livestock grazing, clearcuts, partial timber harvests, pipelines, railroads, impoundments) to evaluate the percent disturbance for each watershed.</p> <p>Each type of disturbance was given a relational disturbance area 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 disturbance area factor 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 disturbance area factor and added together to give total road equivalent disturbance acreage for each watershed.</p>
Even-aged management	<p>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 twenty 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.</p>
Existing scenic integrity	<p>Current state of the landscape considering previous human alterations (see definition for scenic integrity).</p>
Fine slash	<p>Branches, leaves, and limbs less than 3 inches diameter.</p>
Fire behavior	<p>The manner in which a fire reacts to the variables of fuel, weather, and topography.</p>
Fuel break	<p>A wide strip or block of land where the fuels have been modified so fire burning into it can be more readily contained.</p>
Fire intensity	<p>The rate of energy or heat release per unit time per unit length of fire front, regardless of its depth.</p>
Fuel loading	<p>The amount of fuel on site expressed in tons per acre.</p>
Fuel profile	<p>The representation of various fuel characteristics (size class, loading, volatility, density, etc.) in terms of vertical and horizontal arrangement, amount, and continuity.</p>
Fire regimes	<p>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.</p> <p>Fire Regime I – 0-35 year frequency: low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);</p> <p>Fire Regime II– 0-35 year frequency: 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);</p> <p>Fire Regime III– 35-100+ year frequency: mixed severity (less than 75% of the dominant overstory vegetation replaced);</p> <p>Fire Regime IV– 35-100+ year frequency: high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);</p> <p>Fire Regime V– 200+ year frequency: high (stand replacement) severity</p>
Fire severity	<p>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; loosely related to fire intensity and residence time.</p>
Fuels	<p>Available vegetation, both live and dead, that is capable of combustion and can contribute to fire spread.</p>

Term	Definition
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.
Heritage resources	Sites, features, and values having scientific, historical, educational, and/or cultural significance including concentrations of artifacts, structures, landscapes, or settings 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 Colorado cultural resource site forms which include determination of the significance of individual sites.
Historic properties	Those properties that are listed or eligible for listing in the National Register of Historic Places or properties designated as historic under a statute of the appropriate State or local government body (3 CFR 102.103)
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 harvest	Improvement cuts which remove the less desirable trees of any species in a stand to improve composition and quality and commercial thinning with the objective of reducing stand density primarily to improve growth, enhance forest health and other resources objectives.
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.
Invasive species	Includes non-native plants that did not evolve in a particular region of particular concern are those species that invade native ecosystems and alter system dynamics; these may or may not include the listed noxious weeds.
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.
Landscape character	A combination of physical, biological, and cultural images that gives an area its visual and cultural identity and helps to define a sense of place. Landscape character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity.
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. Landtype associations are an appropriate ecological unit to use in forestwide or areawide planning and watershed analysis. On the Rio Grande National Forest, soil mapping units were aggregated into thirteen distinct landtype associations.
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.

Term	Definition
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	Defined in Colorado as non-native invasive plants that displace desirable vegetation and degrade natural and agriculture lands. Levels of required control for different species are refined by county governments. https://www.colorado.gov/pacific/agconservation/county-weed-programs
Operational maintenance level	<p>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 define the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria.</p> <p>Level 1. Closed roads that have been placed in storage between intermittent uses. The period of storage must exceed one 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.</p> <p>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 expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor.</p> <p>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.</p>
Overstory removal harvest	Cutting of all or most of the trees constituting an upper canopy layer to release understory trees. The primary source of regeneration is advanced reproduction existing in the understory.
Preparatory cut	An optional type of cut that enhances conditions for seed production and establishment applied under the shelterwood regeneration methods.
Pre-commercial thinning	Cutting of trees not for immediate financial return but to reduce stocking.
Prescribed broadcast burning – low severity	Fire is intended to affect primarily ground and surface vegetation or fuels (for example, litter, duff, herbaceous or shrub layers, seedlings, smaller down woody debris), with minimal intended effects on mid-story or overstory canopy cover. Soil surface remains covered by partially charred organic material.
Prescribed broadcast burning – mixed severity	Fire is intended to affect both ground and surface vegetation or fuels (for example, litter, duff, herbaceous/shrub layers, seedlings, smaller down woody debris) and also affect a portion of the mid or overstory canopy cover (for example, decrease canopy cover, create openings), depending on objectives. Soil surface remains covered by a mix of partially charred organic material and patches of where more organic matter is burned away from the surface or deeply charred. Below surface organic matter is unaffected.
Prescribed fire	Planned ignition to meet specific management objectives considering environmental factors such as air temperature, wind direction and speed, fuel moisture, and soil moisture under which an ignition can occur to meet objectives.

Term	Definition
Reforestation	The re-establishment of forest cover, either naturally or artificially and with or without site preparation. This process usually maintains the same forest type and is done promptly after the previous stand or forest was removed.
Regeneration harvest	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.
Restoration	Process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. Focuses on establishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystem sustainability, resiliency, and health (FSM 2020.5)
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: 1) block entrance, 2) revegetation and water barring, 3) remove fills and culverts, 4) establish drainageways and remove unstable road shoulders, and 5) full obliteration, recontouring, and restoring natural slopes.
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)	An activity that results in the addition of forest classified (system) or temporary road miles (36 CFR 212.1).
Road reconstruction	An 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).
Road spot reconstruction	Road reconstruction activities on very short sections of road. Generally involves 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; either an Intermediate or regeneration harvest depending on the stand mortality level.
Sanitation	Intermediate treatment. Removal of trees to improve stand health by stopping or reducing actual or anticipated spread of insects and disease.
Scenic class	A numerical measure of the relative value or importance of scenery in discrete landscape areas having similar characteristics of scenic attractiveness and landscape visibility. Scenic classes are a product of the inventory process that is used during forest planning to compare the value of scenery with the values of other resources.
Scenic integrity	The state of naturalness or a measure of the degree to which a landscape is visually perceived to be complete. The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the landscape character valued by constituents for its aesthetic quality.
Seral stage	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.

Term	Definition
Shelterwood harvest system	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 all or part of the sheltering wood and permits the new stand to develop in the open as an even-aged stand.
Shelterwood establishment cut	A type of harvest that removes trees except those needed for the purpose of shelter, seed production, or for other reasons. Prepares the seed bed and creates a new age class in a moderated microclimate.
Single tree selection harvest	An uneven-age regeneration method where individual trees of all size classes are removed more or less uniformly throughout the stand creating or maintaining a multi-age stand structure to promote the growth of remaining trees and provide space for regeneration. Multiple entries will result in an uneven-aged stand of three or more age classes.
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 (for example, even-aged, two-aged, uneven-aged) or regeneration method used (for example, clearcutting, seed tree, shelterwood).
Soil compaction	Soil that has a fifteen percent increase in bulk density over natural undisturbed conditions..
Soil erosion hazard	A rating of a soil's 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 by which an area becomes successively occupied by different plant communities.
Suitable timber lands (suitable base)	Determined broadly as part of the national forest planning process. National forest system lands that are: 1) not withdrawn from timber production; 2) capable of producing industrial wood products; 3) where irreversible damage is unlikely to occur; 4) have reasonable expectation of being restocked; 5) located in management areas that permit timber harvest; 6) and are not located in areas that are highly financially inefficient to manage.
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.
Timber stand improvement	Several treatments focused on the removal of smaller diameter, less desirable trees of any species in a stand. Generally refers to pre-commercial thinning, release and weed; can also include pruning or fertilization.

Term	Definition
Torching Index	Twenty foot wind speed (mph) at which a surface fire is expected to ignite the crown layer. Higher values indicate more extreme conditions would be needed to initiate a crown fire.
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.
Water influence zone	The land next to water bodies where vegetation plays a major role in sustaining long-term integrity of aquatic systems. It includes the geomorphic floodplain, riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is one hundred feet or the mean height of the mature dominant vegetation, whichever is most.
Wildfire	A fire that burns uncontrollably in a natural setting; for example, a forest or grassland).

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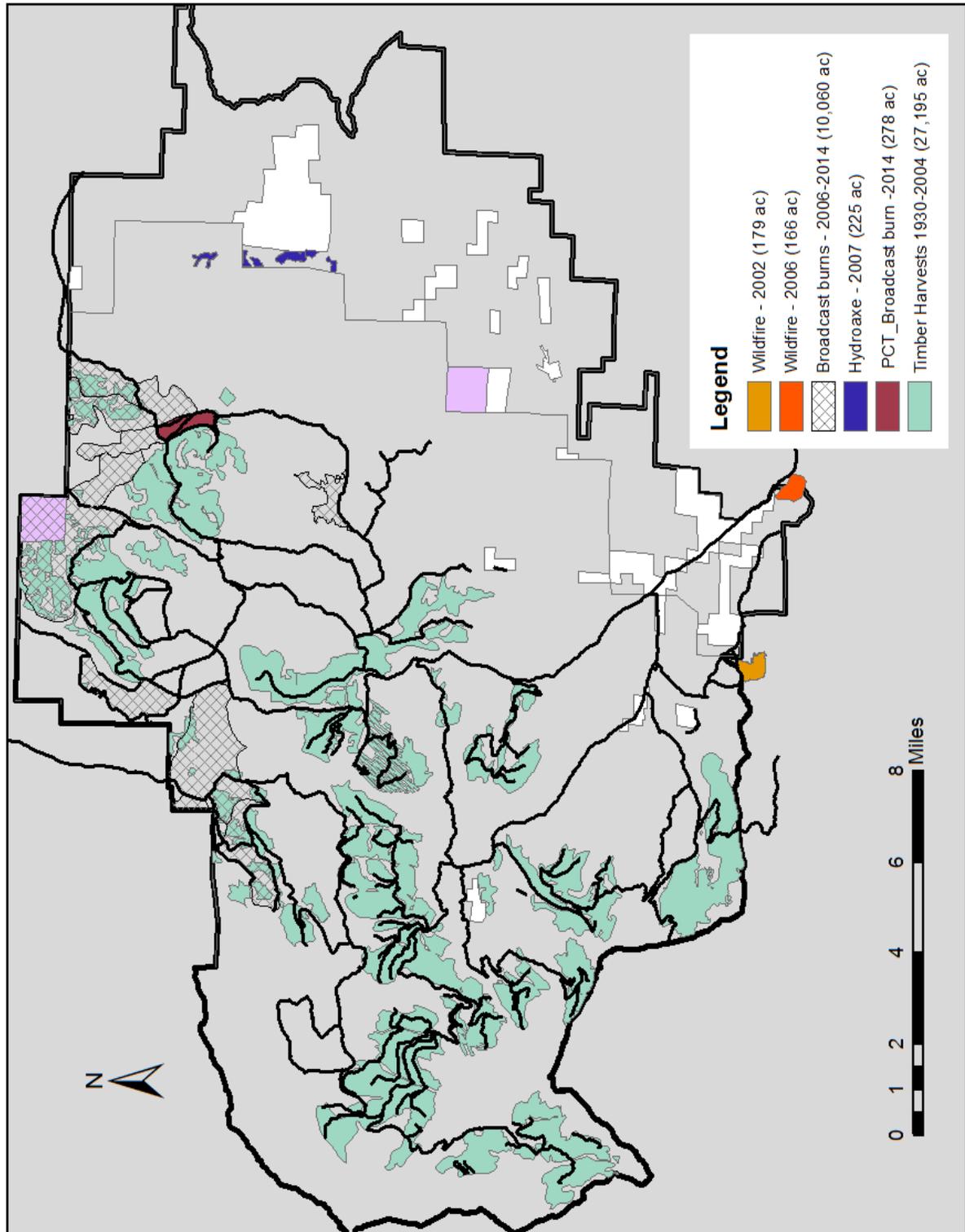
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Appendix C – Supporting information

Appendix C.1. Past Disturbances in Analysis Area



Appendix C.2. Rio Grande National Forest Desired Conditions (Goals) and Project Objectives

Desired conditions are listed first, followed by the associated forestwide objectives.

Air quality remains excellent...visibility distances are among the best in the country. Forest activities do not affect long-term changes.

- 1.1 Protect the environment from air pollution, at least to the extent required by law.

Soils are maintained or improved to healthy conditions...

Healthy watersheds operate in a dynamic equilibrium between extreme natural events. Surface-disturbing activities are managed so that floods, droughts, sediment loads, bank erosion, rills, gullies, and landslides are not markedly increased.

Stream health is maintained...streams have the expected range of habitat features (...healthy riparian vegetation, stable banks, overwintering pools and healthy aquatic organisms).

Riparian areas and floodplains are healthy, fully functioning ecosystems. Vegetation is diverse and generally in a later seral condition to provide site stability.

- 1.2 Maintain or improve long-term soil productivity, and protect against significant or permanent impairment of the land.

- 1.3 Maintain or improve the integrity of aquatic ecosystems to provide for good water quality, stream-channel stability, water yield, and aquatic resources. Manage for sustained water flows...Improve watershed conditions to restore favorable soil relationships and water quality.

- 1.4 Maintain sport-fishing opportunities by providing quality fishery habitat. Support the maintenance of native fish species by protecting existing suitable habitats for both natural and re-introduced populations

Habitat composition (including seral stage), structure, pattern (including connection), and disturbance frequencies similar to those that result from natural disturbances (insects, disease, and fire) are maintained to the extent possible, given legal and policy limitations, and the desired condition for the area.

Habitats for federally listed, T, E, & P species and R2 Sensitive species are protected, restored, and enhanced. Habitat...is managed to help assure that those species whose viability is a concern survive throughout their range, and that habitat conditions improve or stabilize.

Fire's role in ecosystem dynamics is recognized and sponsored where it does not threaten human life, property, or resources needed to support long term human industries. Prescribed Natural Fire is common in MAPs 3.3 (Backcountry) and 1.5 (Eligible Wild Rivers).

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.

- 2.1 Allow natural processes to function with little or no human influences in areas designated as Backcountry...

- 2.2. Manage the Forest to maintain or improve the health and vigor of all native plant associations.

2.3 Ensure the sustainability of viable populations of all native wildlife species through the maintenance or improvement of habitat conditions.

2.5 Supply ample forage to sustain wildlife and permitted-livestock populations without damaging range condition.

2.7 Protect, conserve, and restore important terrestrial and aquatic habitats... riparian areas, wetlands, and the lands immediately next to them, and representative examples of native plant and animal communities; Protect, conserve, and improve habitat for T, E, and Sensitive species.

2.8. Treat aspen stands to maintain or improve wildlife and scenic values

2.9 Use Prescribe Natural Fire and Management-Ignited Fire where forest ecosystems evolved under the influence of wildfires.

2.10 Use appropriate vegetative-management methods to modify unacceptable fuel profiles and reduce potentially unacceptable future high-intensity wildfires.

Vegetative structure on the Forest is capable of sustaining timber harvest that supplies wood products for humankind while providing for biological diversity of those forested areas.

Harvest operations are designed to emulate smaller-scale disturbance events or processes.

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.

Management is focused on maintaining this high scenic integrity especially of areas seen from road and trail corridors, developed recreation sites, administrative sites or towns and cities...

Provide for scenic quality and a range of recreational opportunities that respond to the needs of Forest customers and local communities.

Encourage vegetative diversity and feature scenic attractions...

4.1 Provide natural appearing landscapes with diverse scenery, and increase access to recreation opportunities in attractive settings. Meet scenic integrity objectives as described in the Forest Plan.

4.4 Protect the integrity of any eligible Wild and Scenic Rivers.

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.

Noxious weeds are managed using an integrated pest management approach. All control methods...will be evaluated to reduce potential adverse effects on human health and the environment, and designed to meet management objectives.

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, cooperate in the management of noxious weeds, protect heritage resources, and reduce loss of wildlands and structures to wildfires.

7.4. -Cooperate with federal and state agencies and private landowners to establish wildlife and habitat objective;

7.6. Encourage cost sharing as part of cooperative efforts.

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.

Forest work programs are conducted within the guidelines of the National Health and Safety Codes and the Occupational Safety and Health Administration.

Conserve and promote Canada lynx recovery.

Manage vegetation to mimic or approximate natural succession and disturbance processes while maintain habitat components for lynx conservation (VEG O1).

Provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare. Provide snowshoe hare habitat in both the stand initiation structural stage (SISS) and mature, multi-story conifer vegetation (VEG O2).

Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (VEG O4).

Appendix C.3. Silvicultural Projected Landscape Effects Alternatives 1 and 2

Basal area – Existing condition and alternative 1

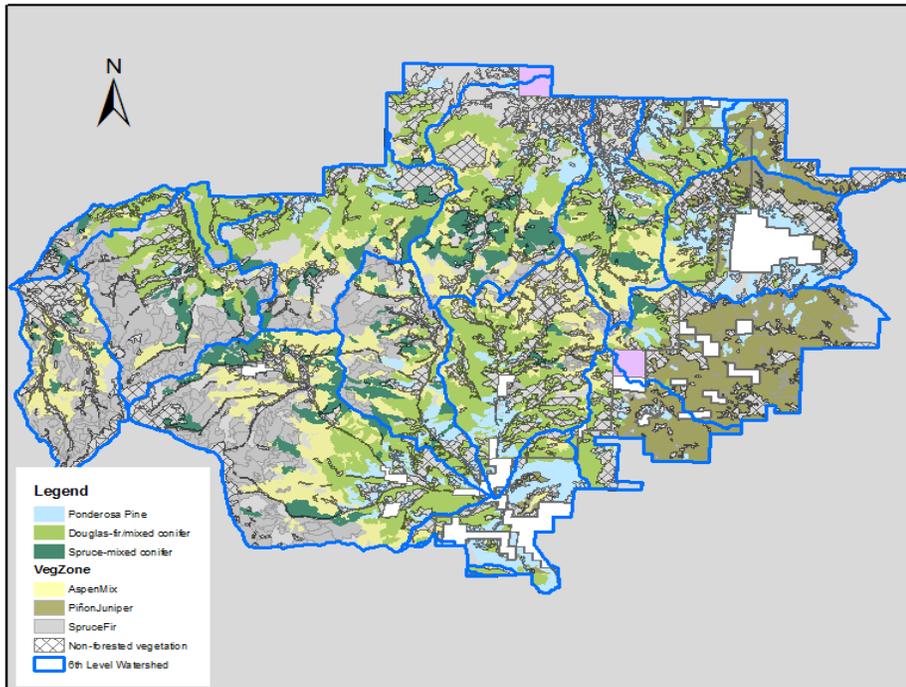


Figure 13. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired basal area across watersheds in 2015 which represents existing conditions.

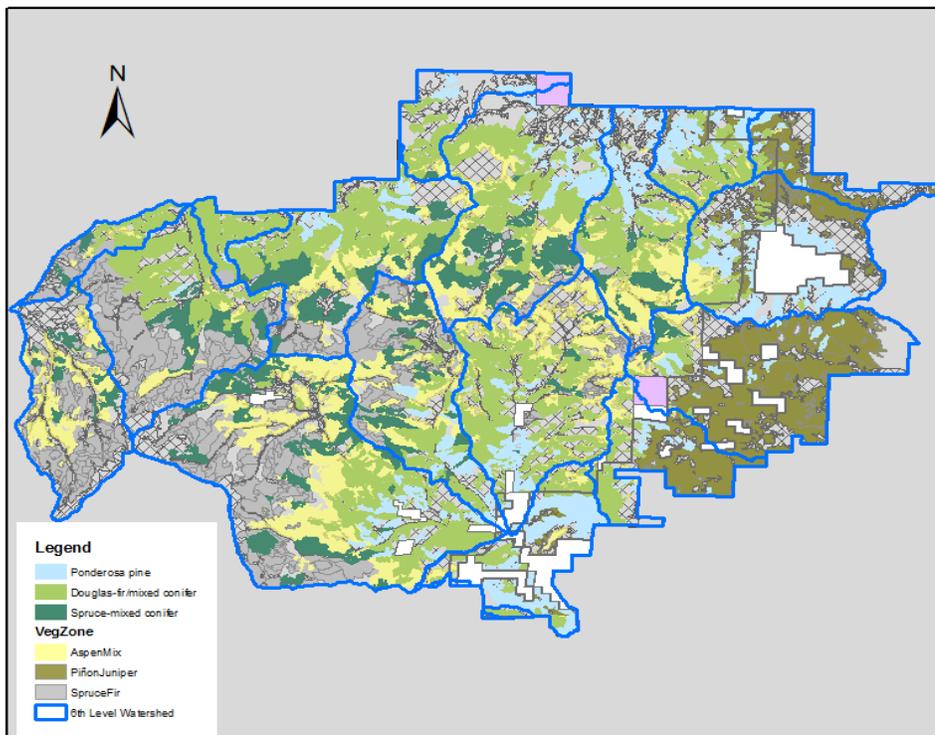


Figure 14. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired basal area across watersheds in 2024, Alternative 1 – no action.

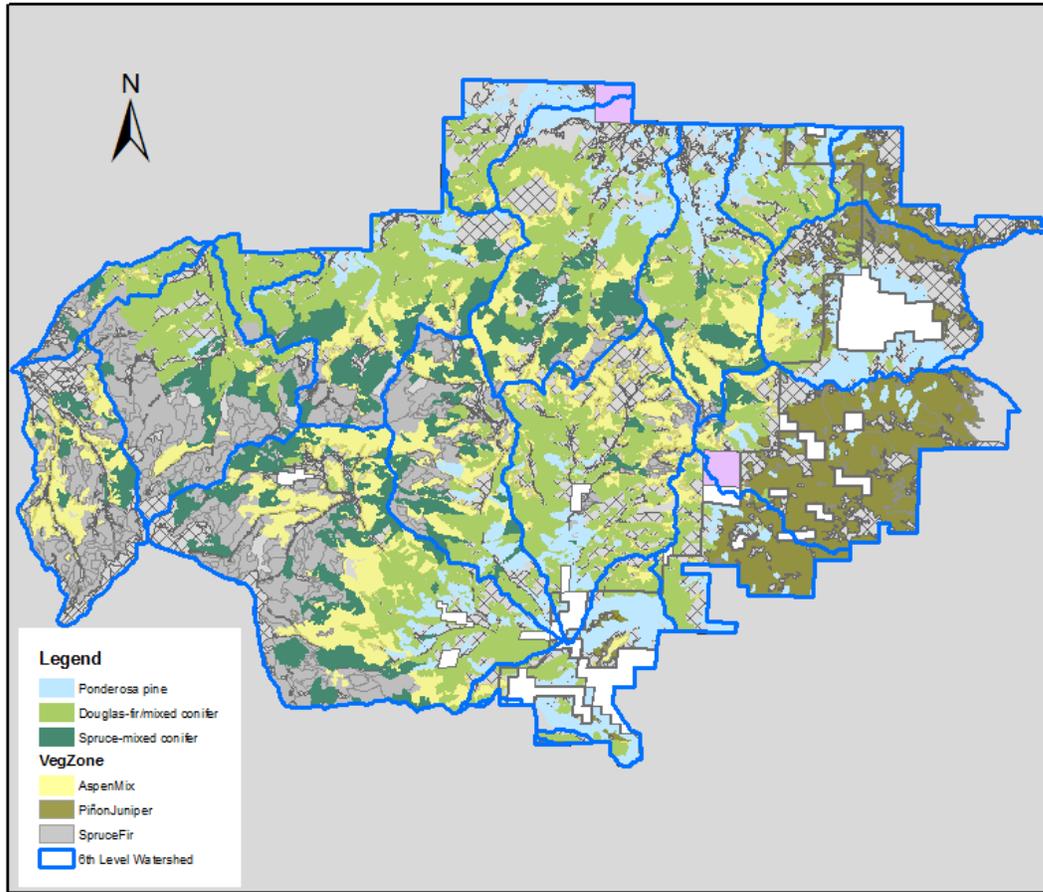


Figure 15. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired basal area across watersheds in 2044, Alternative 1 – no action.

Stand Density Index – Existing condition and alternative 1

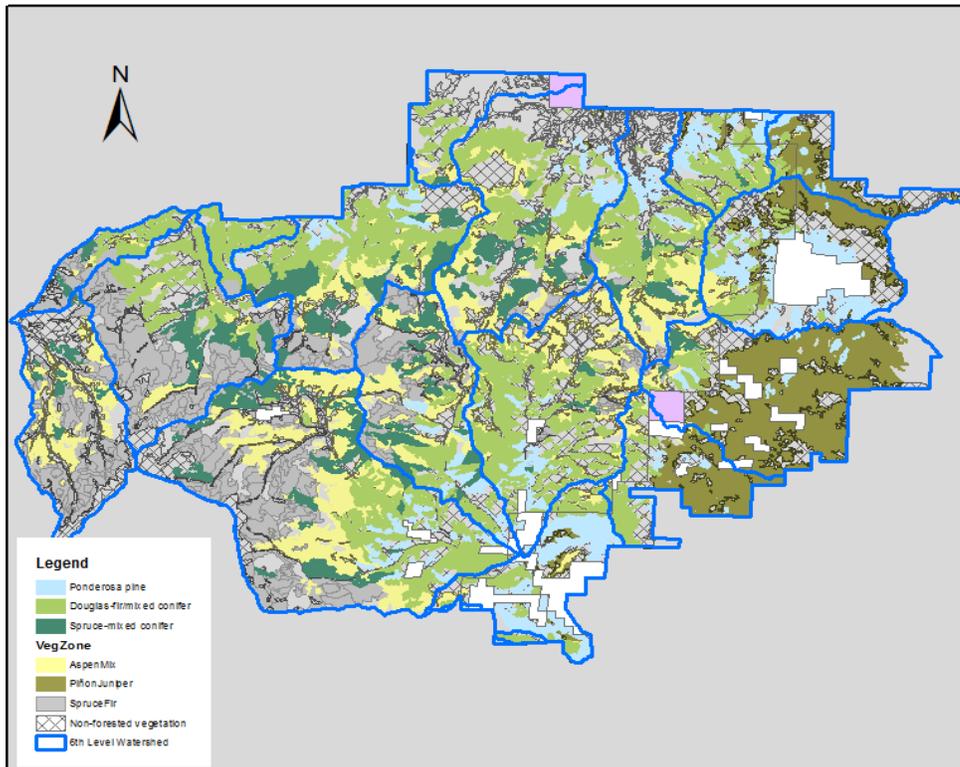


Figure 16. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired 30 percent SDI_{MAX} across watersheds in 2015.

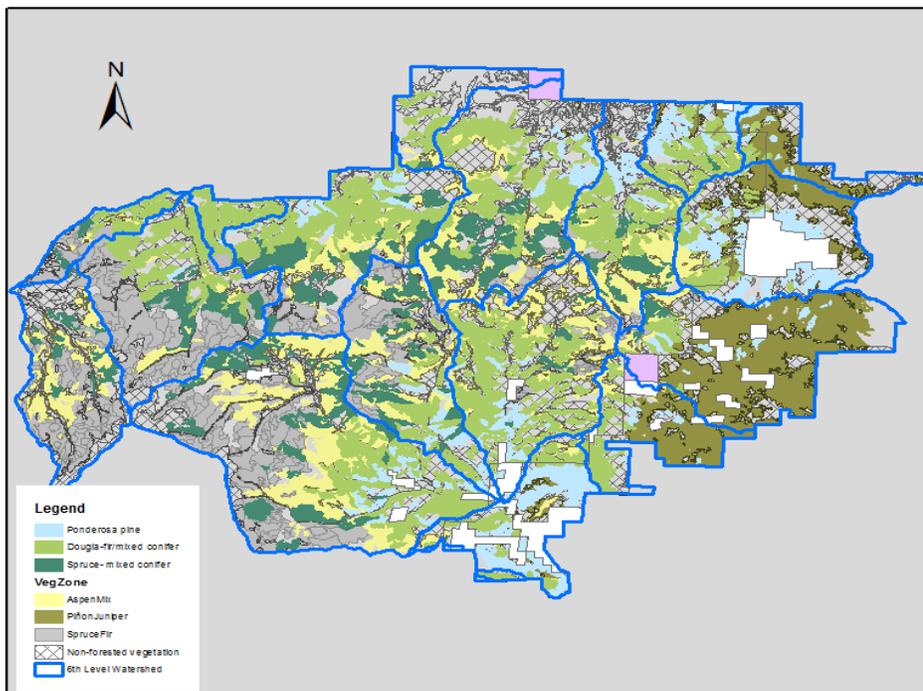


Figure 17. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired 30 percent SDI_{MAX} across watersheds in 2024, Alternative 1 – no action.

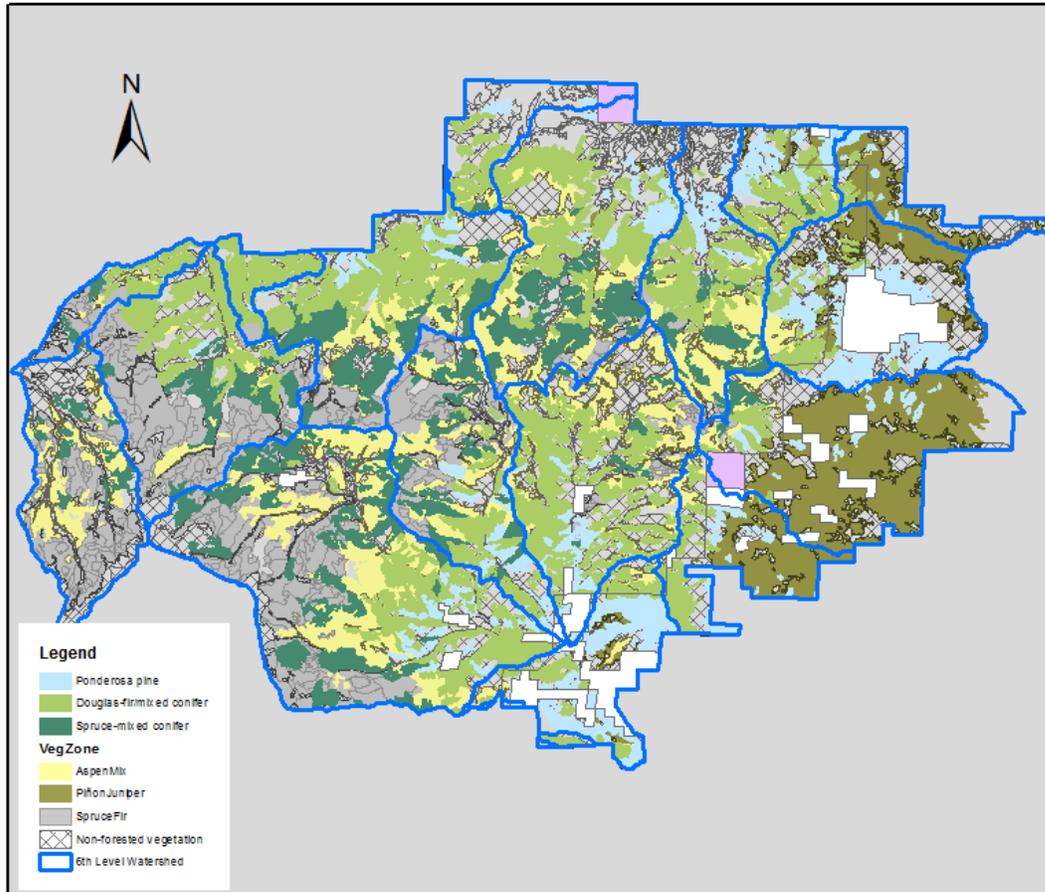


Figure 18. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired 30 percent SDI_{MAX} across watersheds in 2044, Alternative 1 – no action.

Canopy closure – Existing Condition and alternative 1

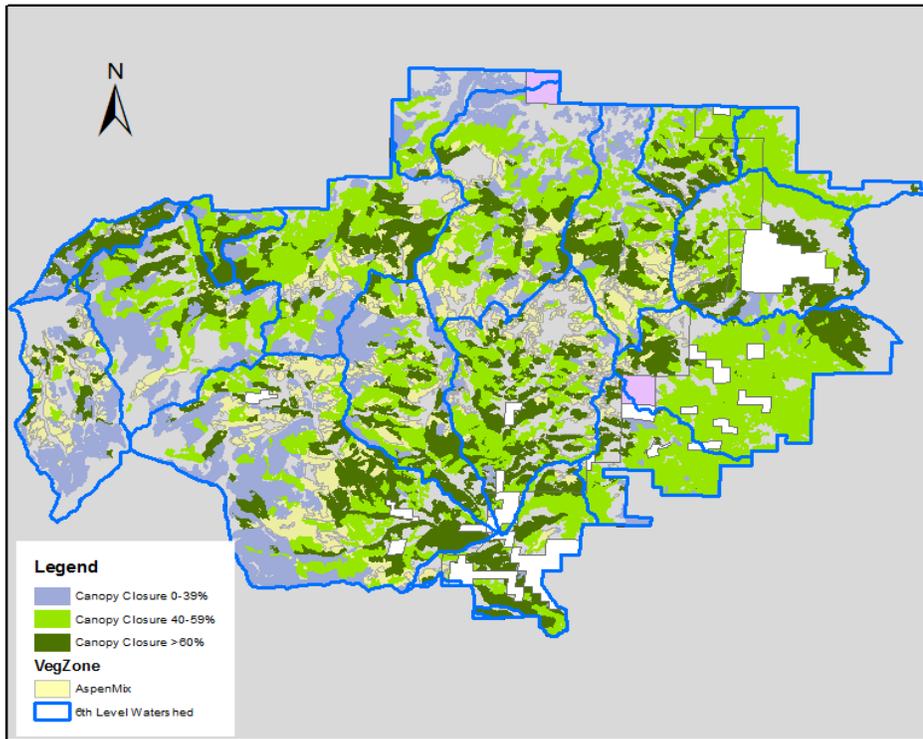


Figure 19. Percent canopy closure across watersheds in 2015 which represents existing conditions.

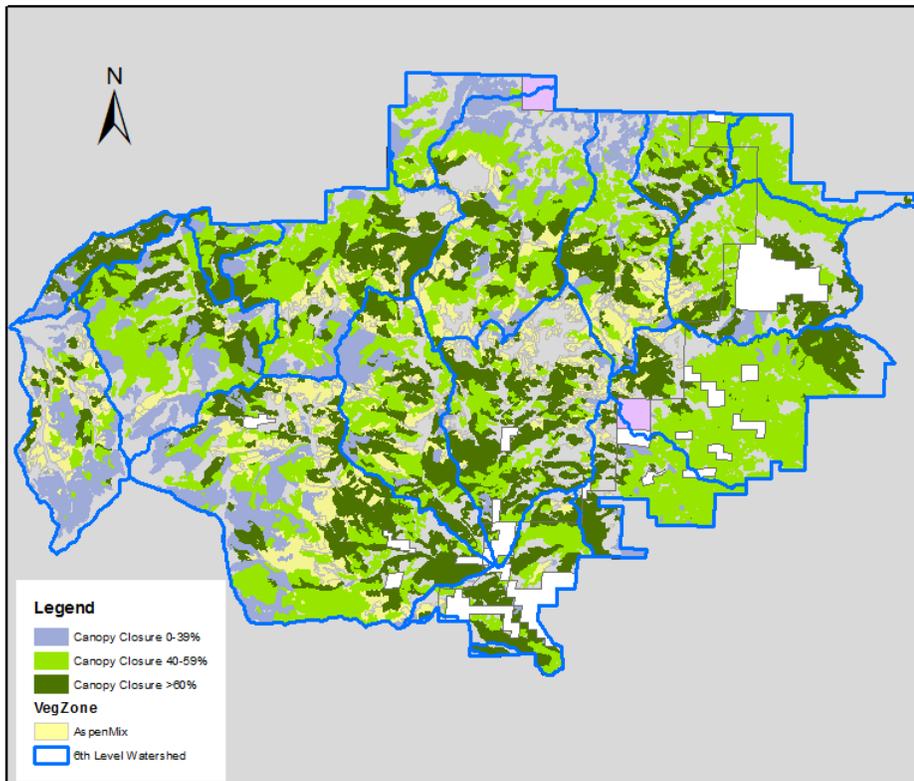


Figure 20. Percent canopy closure across watersheds in 2024, Alternative 1, no action.

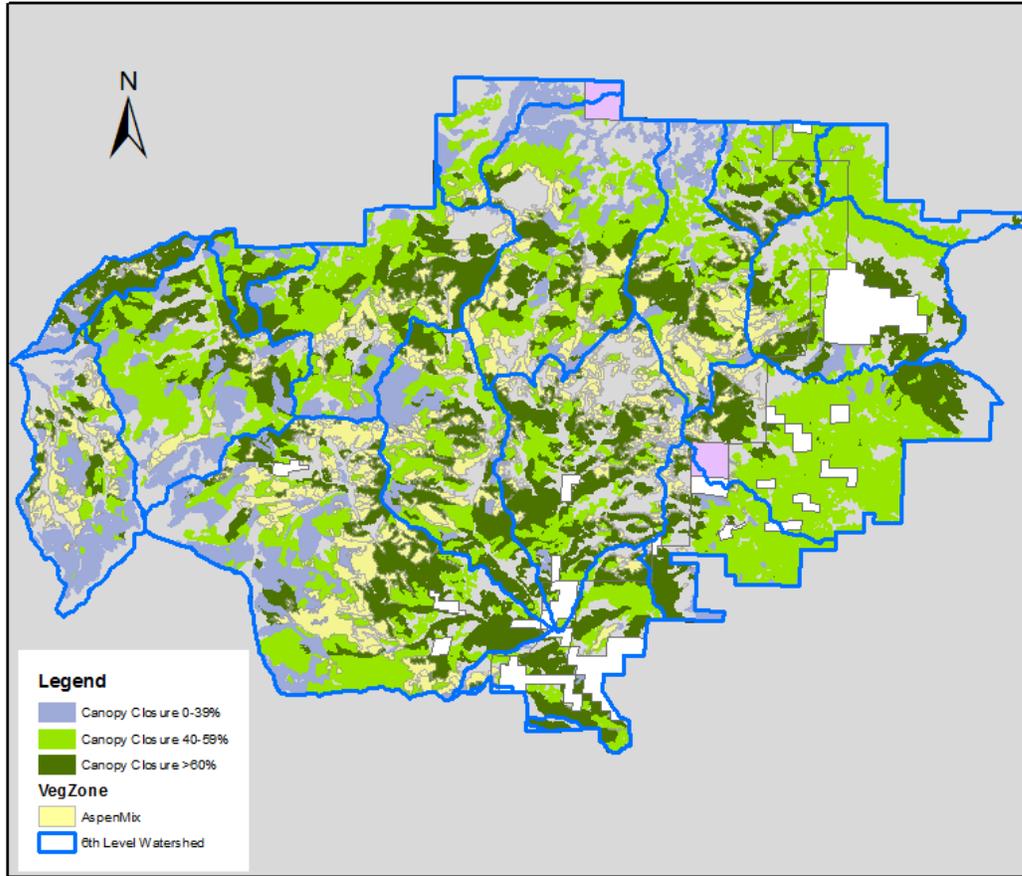


Figure 21. Percent canopy closure across watersheds in 2044, Alternative 1, no action.

Canopy layers (even vs. uneven-aged) – existing condition and alternative 1

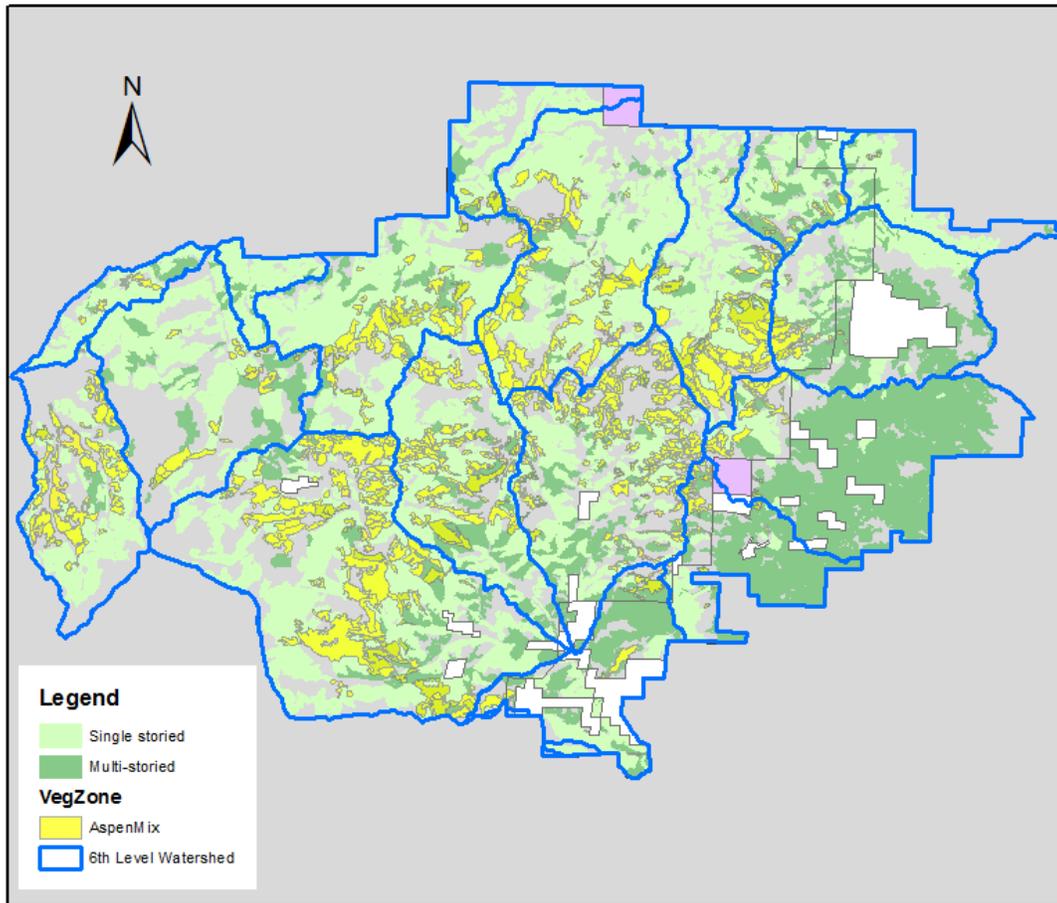


Figure 22. Single and multi-storied stands across watersheds in 2015 which represents existing conditions.

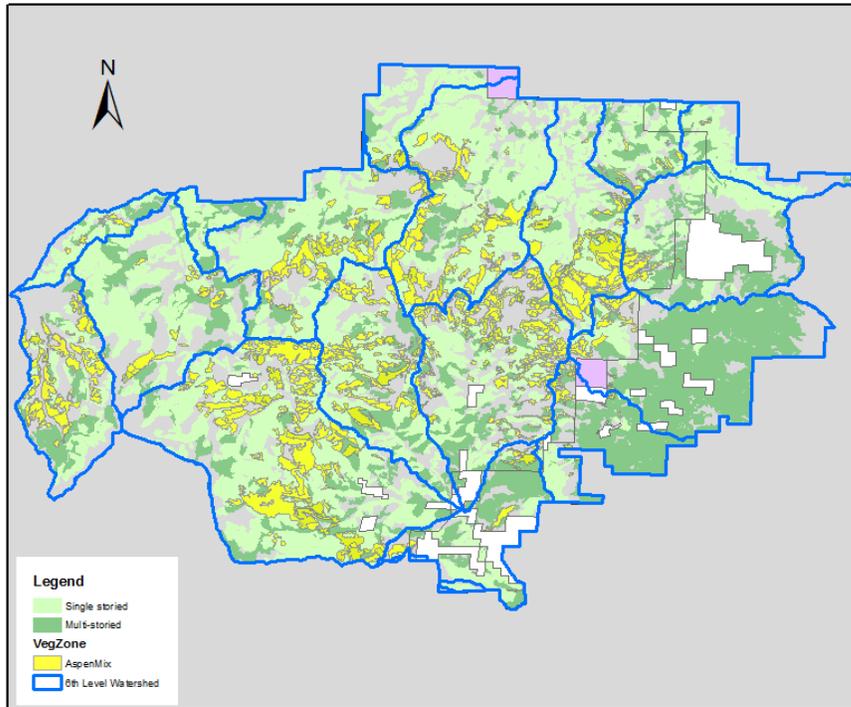


Figure 23. Single and multi-storied stands across watersheds in 2024, Alternative 1, no action.

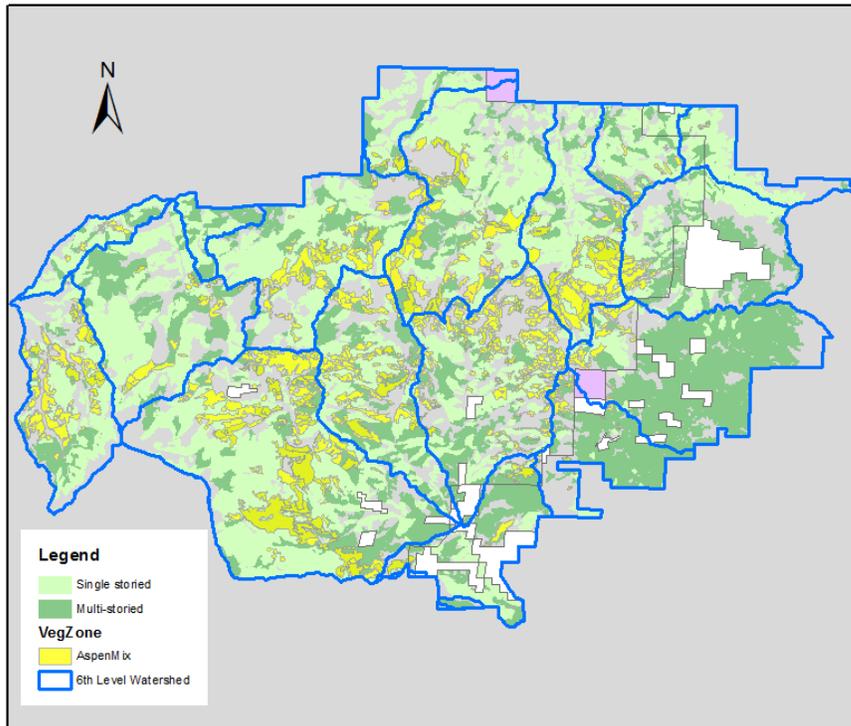


Figure 24. Single and multi-storied stands across watersheds in 2044, Alternative 1, no action.

Vegetation Structural Stages – existing condition and alternative 1

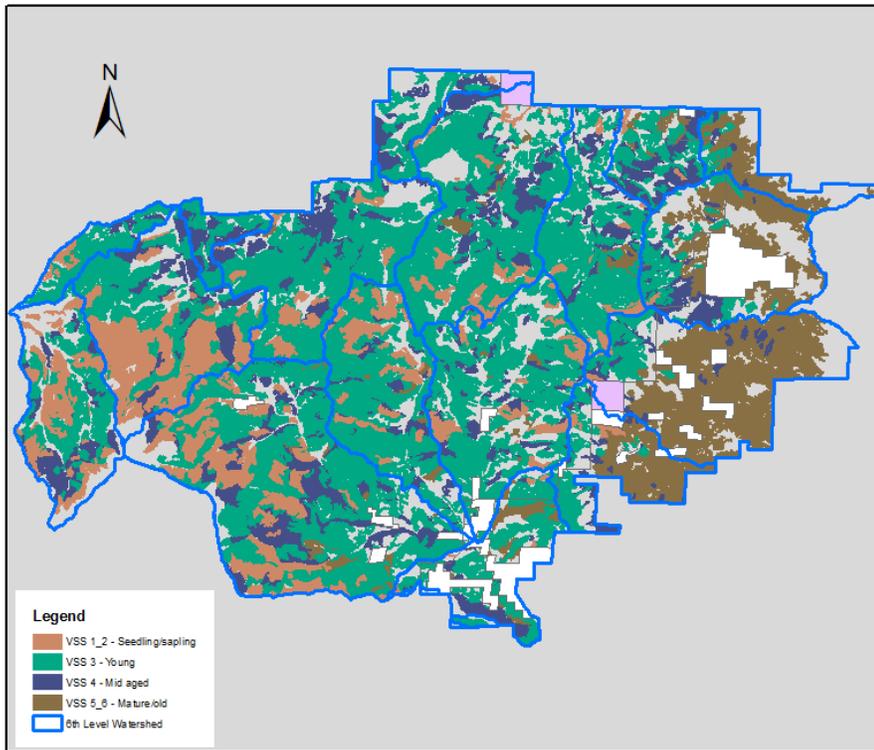


Figure 25. Vegetation Structural Stage, all forest types across watersheds in 2015 which represents existing conditions.

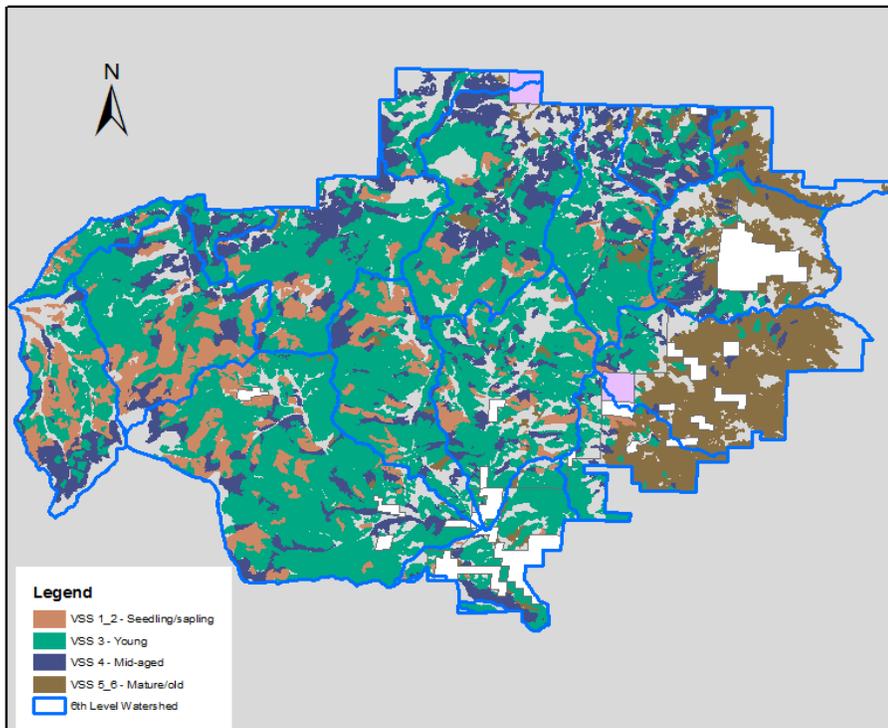


Figure 26. Vegetation Structural Stage, all forest types across watersheds in 2024, Alternative 1, no action.

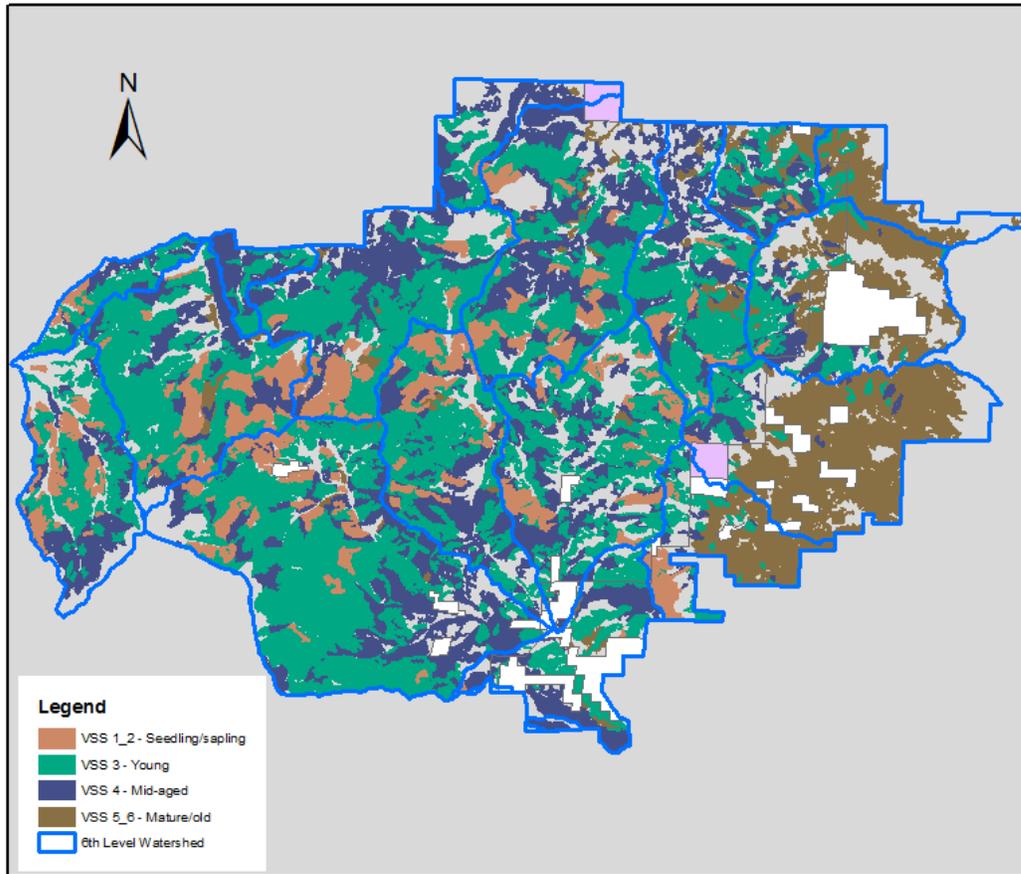


Figure 27. Vegetation Structural Stage, all forest types across watersheds in 2044, Alternative 1, no action.

Basal area –alternative 2

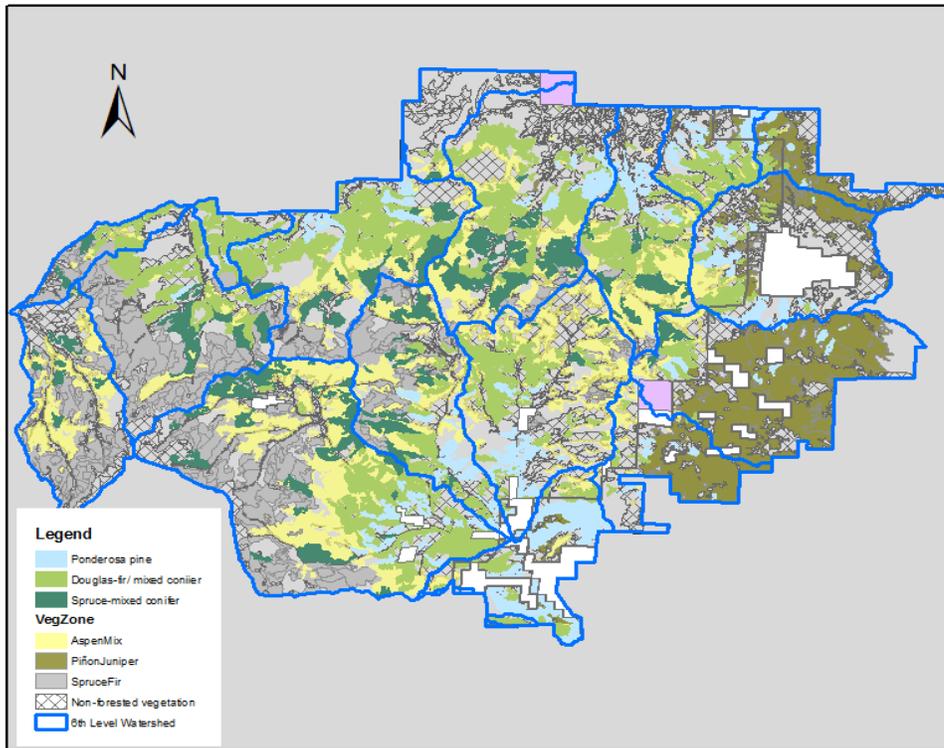


Figure 28. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired basal area across watersheds in 2024, Alternative 2.

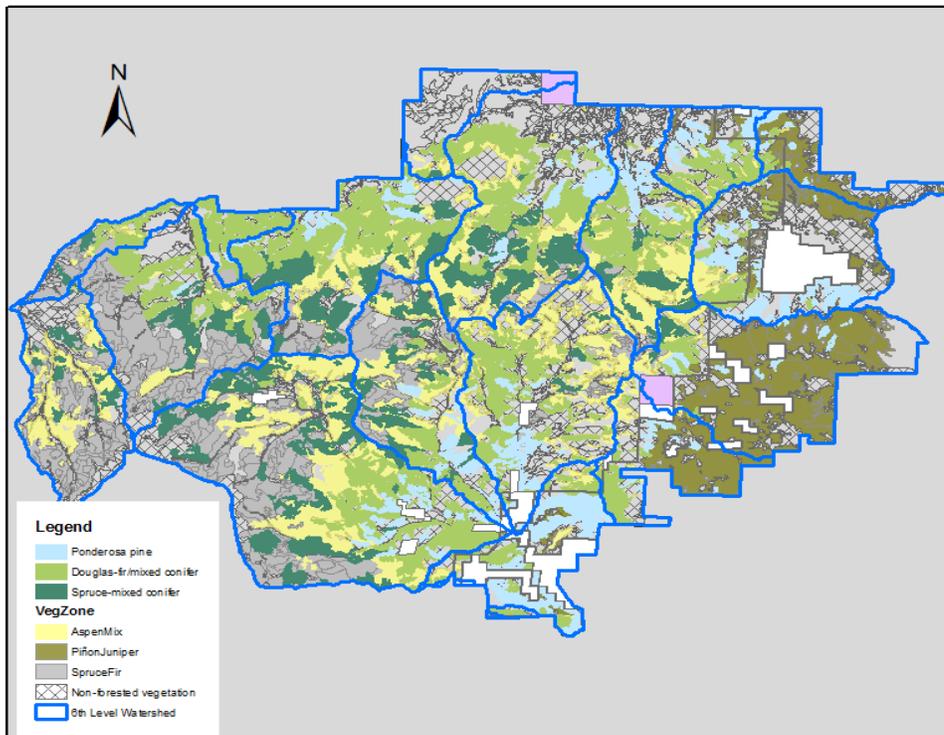


Figure 29. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired basal area across watersheds in 2044, Alternative 2.

Stand Density Index –alternative 2

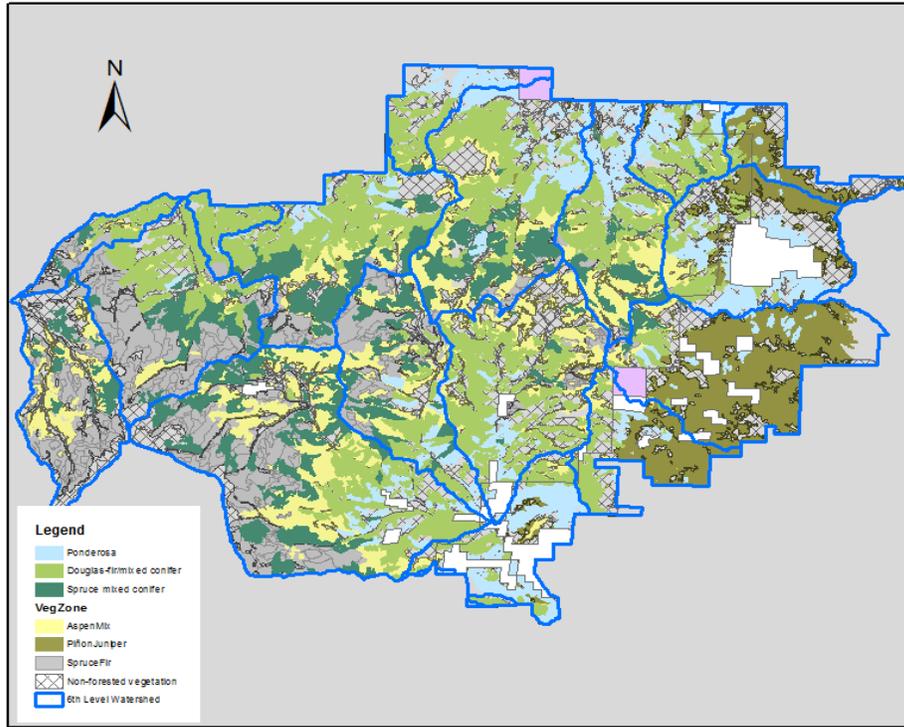


Figure 30. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired 30 percent SDI_{MAX} across watersheds in 2024, Alternative 2.

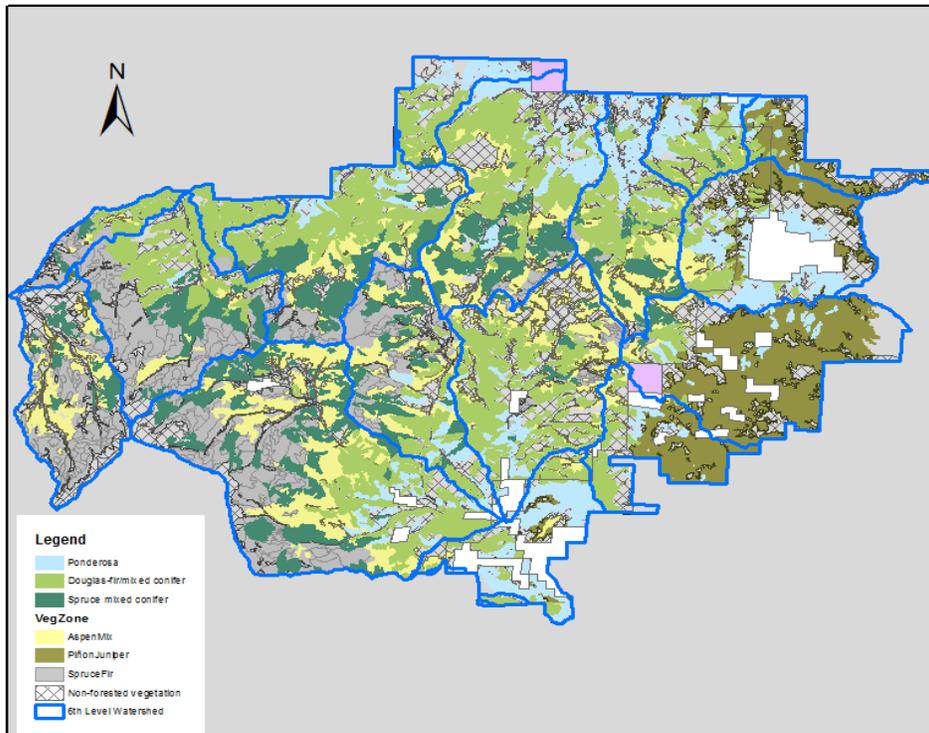


Figure 31. Ponderosa pine, Douglas-fir/mixed conifer, and spruce-mixed conifer stands that exceed desired 30 percent SDI_{MAX} across watersheds in 2044, Alternative 2.

Canopy closure – alternative 2

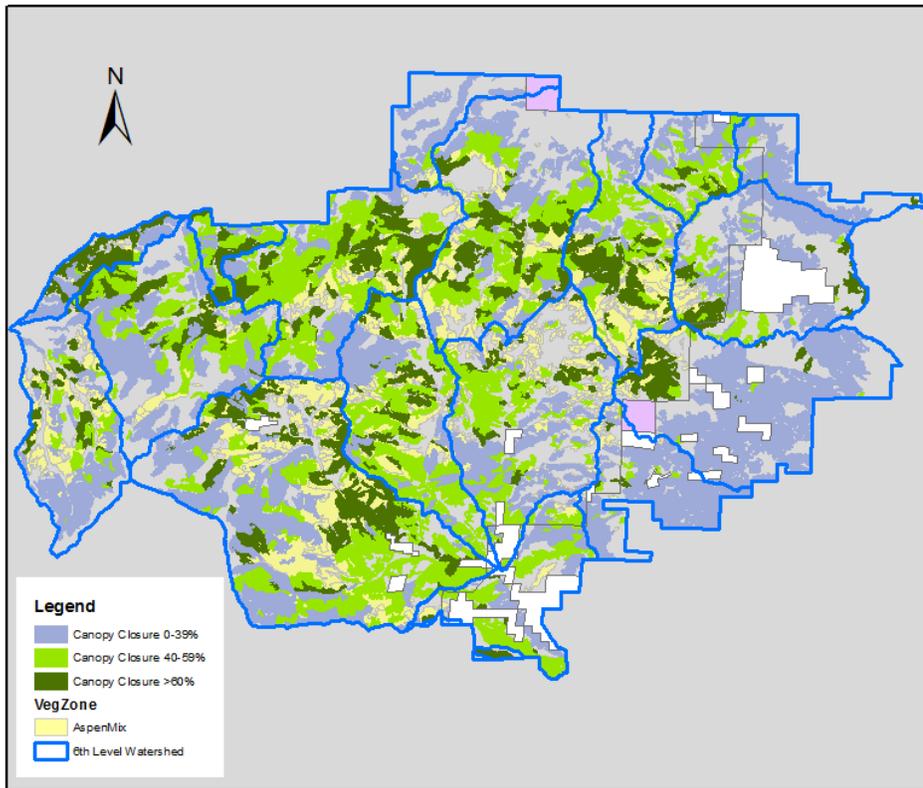


Figure 32. Percent canopy closure across watersheds in 2024, Alternative 2.

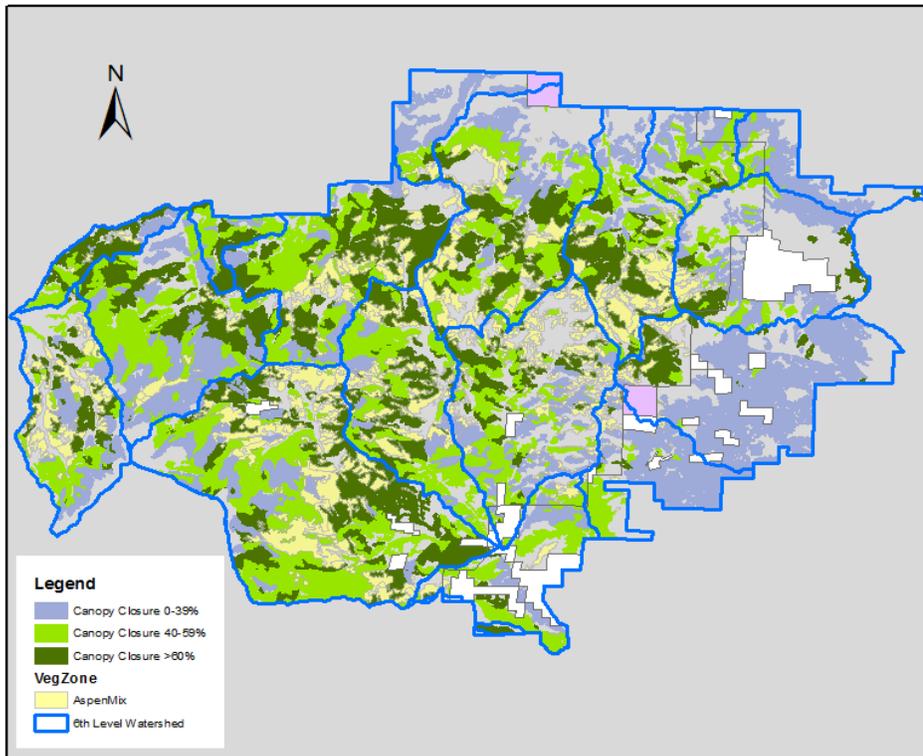


Figure 33. Percent canopy closure across watersheds in 2044, Alternative 2.

Canopy layers (even vs. uneven-aged) –alternative 2

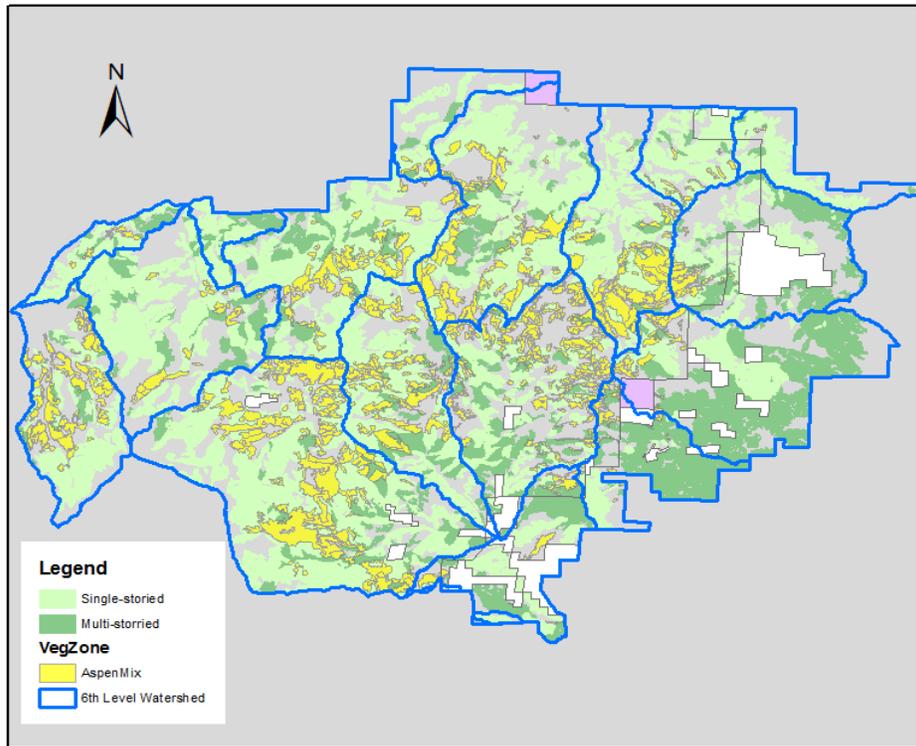


Figure 34. Single and multi-storied stands across watersheds in 2024, Alternative 2.

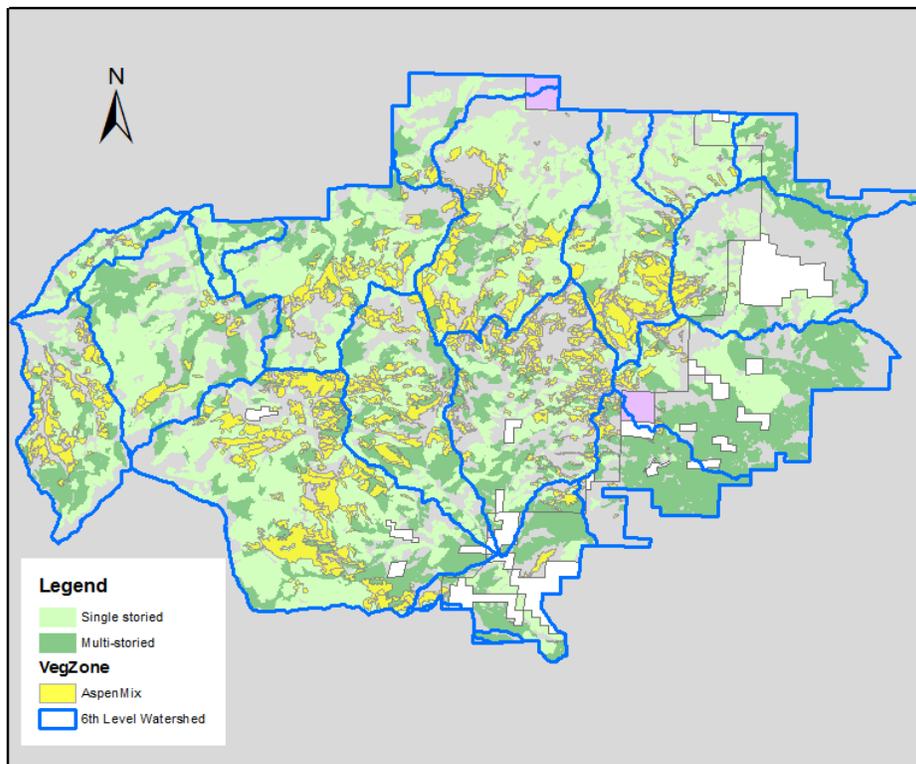


Figure 35. Single and multi-storied stands across watersheds in 2044, Alternative 2.

Vegetation Structural Stages –alternative 2

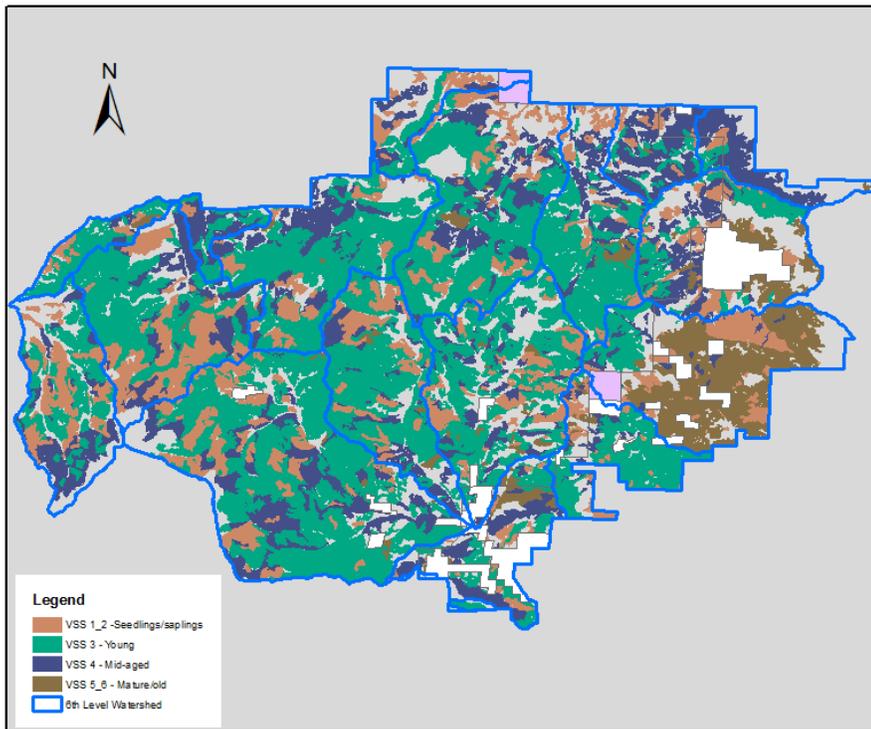


Figure 36. Vegetation Structural Stage, all forest types across watersheds in 2024, Alternative 2.

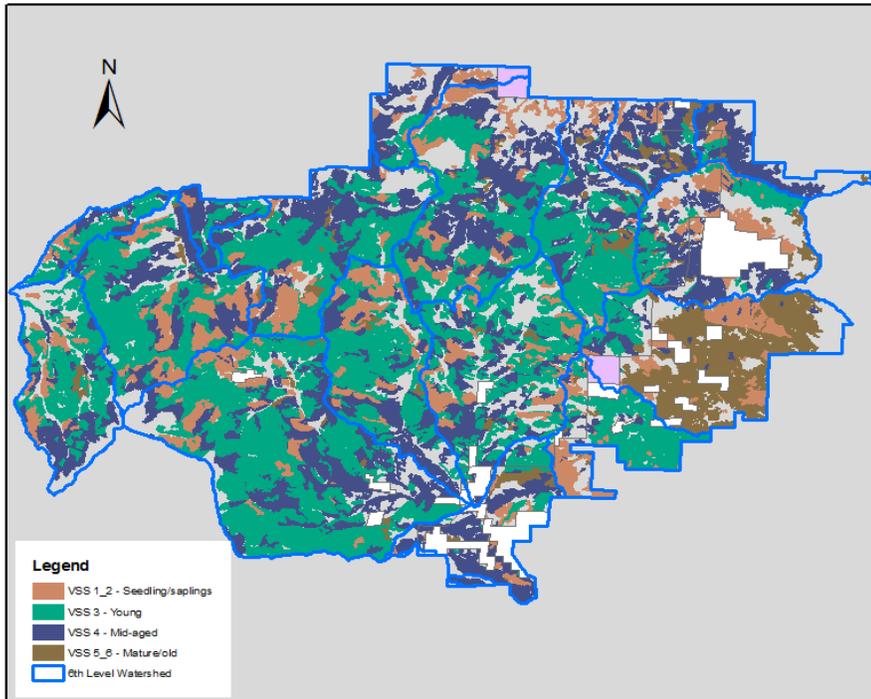


Figure 37. Vegetation Structural Stage, all forest types across watersheds in 2044, Alternative 2.

Appendix D – Project Implementation Process

Appendix D.1. Applicable Forest-wide Standards and Guidelines

AIR RESOURCES

A-S1	Standard: Conduct all land management activities in such a manner as to comply with all applicable federal, state, and local air quality standards and regulations, including: Federal Clean Air Act, as amended, 1991, (P.L. 95-95), Colorado Air Quality Control Act, Colorado Statutes 25-7-101 through 25-7-505.
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WATERSHED (soil, water, aquatic, fish, riparian/wetlands)

Hydrologic Function

H-S1	Standard: Manage land treatments to conserve site moisture and protect long-term stream health from damage by increased runoff.
H-S1_G1	Guideline: In each 3rd-order and larger watershed, limit connected disturbed areas so the total stream network is not expanded by more than 10%. Progress toward zero connected disturbed area, as much as feasible. Do not add connected disturbed area to Class III watersheds (FSM 2521).
H-S1_G2	Guideline: Design the size, orientation, and surface roughness of forest openings to prevent snow scour and site desiccation.
H-S2	Standard: Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff.
H-S2_G1	Guideline: Maintain the organic ground cover of each land unit so that pedestals, rills, and surface runoff from the land unit are not increased.
H-S2_G2	Guideline: Restore the organic ground cover of degraded land units within the next Plan period, using native vegetation as feasible

Riparian Areas

R—S1	Standard: In the water influence zone (WIZ) next to perennial and intermittent streams, lakes, and wetlands, allow only those land treatments that maintain or improve long-term stream health.
R—S1_G2	Guideline: Allow no land treatments that will cause long-term change to a lower-stream-health class in any stream reach. In degraded systems, progress toward robust stream health within the next Plan period.
R—S1_G2	Guideline: Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work; or if protected by at least 1 foot of packed snow or 2 inches of frozen soil. Keep heavy equipment out of streams during fish spawning, incubation, and emergence periods.
R—S1_G3	Guideline: Ensure at least one-end log suspension in the WIZ. Fell trees in a way that protects vegetation in the WIZ from damage. Keep log landings and skid trails out of the WIZ.
R—S1_G4	Guideline: Situate new concentrated-use sites outside the WIZ, if feasible and outside riparian areas always. Harden or reclaim existing sites in the WIZ to prevent detrimental soil and bank erosion
R—S1_G9	Guideline: Maintain the extent of stable banks in each stream reach at 80% or more of reference conditions. Consider the degree of livestock trampling on stream banks when determining the timing of livestock moves between units. As a general rule, stream banks can receive a maximum of 20–25% alteration while continuing to maintain their health and integrity, as long as the alteration will recover in one season.
R—S1_G10	Guideline: Do not excavate borrow material from, or store excavated borrow material in, any stream, swale, lake, wetland, or WIZ.
R—S2	Standard: Design and construct all stream crossings and other instream structures to pass normal flows, withstand expected flood flows, and allow free movement of resident aquatic life.
R—S2_G1	Guideline: Install stream crossings to meet Corps of Engineers and State permits, pass normal flows, and be hardened to withstand floods as follows: Design life = 1 year; design flood = 10 years Design life = 2 years; design flood = 10 years Design life = 5 years; design flood = 25 years Design life = 10 years; design flood = 50 years Design life = 20 years; design flood = 100 years Design life = 50 years; design flood = 225 years
R—S2_G2	Guideline: Size culverts and bridges to pass debris. Install trash racks upstream if needed. Engineers should work with hydrologists on site design.

R—S2_G3	<u>Guideline:</u> Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as feasible, to provide passage of fish and other aquatic life.
R—S2_G4	<u>Guideline:</u> Install stream crossings in this order of preference, as feasible, to keep stream beds and banks intact: bridge, hardened ford, bottomless arch, culvert.
R—S3	Standard: Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.
R—S2_G1	<u>Guideline:</u> Add or remove rocks, wood, or other material in streams or lakes only to maintain or improve their health. Leave rocks and portions of wood that are embedded in beds or banks, to prevent channel scour.
R—S2_G2	<u>Guideline:</u> Install fish migration barriers only if needed to protect Threatened, Endangered, Sensitive, or unique native aquatic populations, and only where natural barriers do not exist.
R—S2_G3	<u>Guideline:</u> Do not relocate natural stream channels, if avoidable. Return flow to natural channels, where feasible. Construct channels and floodways with natural stream pattern and geometry, and stable beds and banks.
R—S4	Standard: Do not degrade ground cover, soil structure, water budgets, or flow patterns in wetlands.
R—S4_G1	<u>Guideline:</u> Keep ground vehicles out of wetlands unless protected by at least 1 foot of packed snow or 2 inches of frozen soil. Do not disrupt drainage patterns into wetlands with roads, trails, or ditches and geometry, and stable beds and banks.
R—S4_G2	<u>Guideline:</u> Keep roads and trails out of wetlands if feasible; use bridges or raised prisms with diffuse drainage in wetlands. Set crossing bottoms at natural levels of channel beds and wet meadow surfaces.
R—S4_G3	<u>Guideline:</u> Do not build firelines in or around wetlands, unless needed to protect life, property, or wetlands. Use hand lines with minimum feasible soil disturbance. Use wetland features as firelines, if feasible.

Sediment Control

SC-S1	Standard: Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography, and climate.
SC-S1_G1	<u>Guideline:</u> Construct roads on ridge tops, stable upper slopes, or wide valley terraces if feasible. Stabilize soils on-site. End-haul soil if full-bench construction is used. Avoid slopes steeper than 70%.
SC-S1_G2	<u>Guideline:</u> Avoid soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water.
SC-S1_G3	<u>Guideline:</u> Install cross drains to disperse runoff into filter strips and minimize connected disturbed areas. Harden cuts, fills, and surfaces between stream crossings and the top of the vertical curve on both sides.
SC-S1_G4	<u>Guideline:</u> Where feasible, construct roads with rolling grades instead of ditches and culverts.
SC-S1_G5	<u>Guideline:</u> Retain stabilizing vegetation on unstable soils. Avoid new roads or heavy-equipment use on unstable or highly erodible soils.
SC-S1_G6	<u>Guideline:</u> Use existing roads unless other options will produce less long-term sediment. Reconstruct for long-term soil and drainage stability.
SC-S1_G7	<u>Guideline:</u> Avoid ground skidding with blades lowered or on highly erodible slopes steeper than 40%. Conduct logging to disperse runoff, as feasible.
SC-S2	Standard: Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes, and wetlands.
SC-S2_G1	<u>Guideline:</u> Design all roads, trails, and other soil disturbances to the minimum standard for their use and to "roll" with the terrain as feasible.
SC-S2_G2	<u>Guideline:</u> Use filter strips, and sediment traps if needed, to keep all sand-sized sediment on the land and disconnect disturbed soil from streams, lakes, and wetlands. Disperse runoff into filter strips.
SC-S2_G3	<u>Guideline:</u> Key sediment traps into the ground. Clean them out when 80% full. Remove sediment to a stable, gentle upland site and revegetate.
SC-S2_G4	<u>Guideline:</u> Keep heavy equipment out of filter strips, except to do restoration work or build hardened stream or lake approaches. Yard logs up out of each filter strip with minimum disturbance of ground cover.
SC-S2_G5	<u>Guideline:</u> Build firelines outside filter strips, unless tied into a stream, lake, or wetland as a firebreak with minimal disturbed soil. Retain organic ground cover in filter strips during prescribed fires.
SC-S2_G6	<u>Guideline:</u> Design road ditches and cross drains to limit flow to ditch capacity and prevent ditch erosion and failure.

SC-S3	Standard: Stabilize and maintain roads and other disturbed sites during and after construction, to control erosion.
SC-S3_G1	Guideline: Do not encroach fills, or deposit or sidecast soil, into streams, swales, lakes, or wetlands.
SC-S3_G2	Guideline: Properly compact fills and keep woody debris out of them. Revegetate cuts and fills upon final shaping, to restore ground cover. Control sediment until erosion control is permanent.
SC-S3_G3	Guideline: Do not disturb ditches during maintenance, unless needed to restore drainage capacity or repair damage. Do not undercut the cut slope.
SC-S3_G4	Guideline: Space cross drains, from no more than 120 feet in highly erodible soils on steep grades, to no more than 1,000 feet in resistant soils on flat grades. Do not divert water from one stream to another.
SC-S3_G5	Guideline: Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created.
SC-S3_G6	Guideline: Harden rolling dips as needed to prevent rutting damage. Ensure that road maintenance creates stable surfaces and drainage.
SC-S3_G7	Guideline: Remove or breach berms that would concentrate runoff, without disturbing the original road surface and drainage features.
SC-S3_G8	Guideline: Build firelines with rolling grades and minimum downhill convergence. Outslope or backblade, permanently drain, and revegetate firelines immediately after the burn.
SC-S4	Standard: Reclaim roads and other disturbed sites when use ends, as needed, to prevent resource damage.
SC-S4_G1	Guideline: Site-prepare, drain, revegetate, and close temporary and intermittent-use roads and other disturbed sites within one year after use ends. Use natural drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Use native vegetation as feasible.
SC-S4_G2	Guideline: Remove all temporary stream crossings (including all fill material in the active channel), restore the channel geometry, and revegetate the channel banks, using native vegetation as feasible.

Soil Productivity

SP-S1	Standard: Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (FSH 2509.18).
SP-S1_G1	Guideline: Restrict roads, landings, skid trails, developed recreation, livestock-gathering areas, and similar soil disturbances to designated sites.
SP-S1_G2	Guideline: Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil.
SP-S1_G3	Guideline: Conduct prescribed fires when soil, humus, and large fuels are moist.
SP-S2	Standard: Maintain or improve long-term levels of organic matter and nutrients on all lands.
SP-S2_G1	Guideline: On soils with topsoil thinner than 1 inch, topsoil organic matter less than 2%, or effective rooting depth less than 15 inches, retain 90% or more of the fine (less than 3 inches in diameter) logging slash in the stand after each clearcut and seed-tree harvest, and retain 50% or more of such slash in the stand after each shelterwood and group-selection harvest, considering existing and projected levels of fine slash.
SP-S2_G2	Guideline: If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows.

Water Purity

WQ-S1	Standard: Place new sources of chemical and pathogenic pollutants where such pollutants will not reach surface or ground water.
WQ-S1_G2	Guideline: Put vehicle service and fuel areas, chemical storage and use areas, and waste dumps and areas on gentle upland sites. Perform mixing, loading, and cleaning on gentle upland sites. Dispose of chemicals and containers in state-certified disposal areas.
WQ-S2	Standard: Apply runoff controls to disconnect new pollutant sources from surface and ground water.
WQ-S2_G1	Guideline: Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use areas, and waste dumps, to fully contain spills. Use liners as needed to prevent seepage to ground water.
WQ-S2_G5	Guideline: Inspect chemical equipment daily for leaks. If leaks or spills occur, report them and install emergency traps to contain them and clean them up.

BIODIVERSITY

B-S1	<p>Standard: Prescriptions will be developed prior to timber harvest to identify the distribution of coarse woody debris and snags to be left on-site, as well as live green replacement trees for future snags. The following list is the <u>minimum</u> requirements for adequate wildlife habitat and ecosystem function. The amounts are to be calculated as a per-acre average over a project area. A wide variety of CWD size classes is preferred. On forested sites, snags and CWD should be retained (when materials are available) in accordance with the average minimums below. Retain the largest-diameter snags possible. All soft snags should be retained unless they are a safety hazard. If minimum- diameter snags cannot be found, use the largest available snags.</p> <p>Retain the following minimum snags/acre in various stages of decay and distribution (both in clumps and individuals). All soft snags should be retained unless they are a safety hazard.</p> <p>Spruce/fir: Retain 2 snags per acre, minimum diameter = 12 inches, maximum diameter = 25 inches. For downed logs, retain 10 to 15 tons per acre.</p> <p>Lodgepole pine: Retain 2 snags per acre, minimum diameter = 10 inches, maximum diameter = 25 inches. For downed logs, retain 5 to 10 tons per acre.</p> <p>Aspen: Retain 2 snags per acre, minimum diameter = 12 inches, maximum diameter = 25 inches. For downed logs, retain 3 to 5 tons per acre.</p> <p>Douglas fir: Retain 2 snags per acre, minimum diameter = 12 inches, maximum diameter = 25 inches. For downed logs, retain 5 to 10 tons per acre.</p> <p>Ponderosa pine: Retain 3 snags per acre, minimum diameter = 14 inches, maximum diameter = 25 inches. For downed logs, retain 4 to 9 tons per acre.</p> <p>If the preferred minimum diameter with a minimum height of 25 ft. is not present, select snags with a larger-than-average diameter for the stand, as available.</p>
B-S2	<p>Standard: Local populations of native plant species (at the subsection level) will be used for revegetation efforts where technically and economically feasible. Seed mixtures should be weed free. To prevent soil erosion, nonnative annuals or sterile perennial species may be used while native perennials are becoming established.</p>
B-S3	<p>Standard: On suitable lands, an inventory/reconnaissance will be conducted early in the timber sale planning process to determine if old growth is present, and make assessments of quality and distribution. The inventory/reconnaissance will be conducted for the landscape/watershed being proposed for harvest using Mehl's (1992) description as the basis for identifying old growth. On the remaining portions of the Forest, general information on the presence of old growth (using Mehl's description) will be collected using various techniques, such as review of plot data or walk-throughs during routine work by Forest personnel. This information will be collected over the life of the Plan to provide better information for future planning.</p>
B-S3-G1	<p>Guideline: Some old-growth/late-successional forest stands may be preserved or deferred from harvesting to maintain biotic diversity within the landscape/watershed. Size, distribution, abundance, and degree of habitat variation between old- growth stands will be assessed. The following will be considered in selecting old-growth stands that may be retained: Older stands that have not been manipulated are more desirable than younger ones; Stands with limited uses and access by humans are better to maintain old-growth characteristics; Stands that are habitat for species listed as TES or Colorado Natural Heritage Program Species of Special Concern; Stands exhibiting a greater variety of attributes, such as diverse canopy layers, decadence in live trees, standing and/or downed dead, patchiness, etc. (see Mehl 1992).</p>
B-S3-G2	<p>Guideline: Aspen will be maintained in the environment. Analyze aspen's spatial and structural occurrence in the landscape during project design. Use landscape spatial analysis in aspen project design to assist in selecting which existing and future old-growth stands are retained, maintaining habitat composition and structure, and providing habitat connectivity. Spatial analysis allows a project area to be compared with reference areas, and considers a variety of attributes (e.g., composition, structure, patch-size distribution, etc.). The intent is to use the reference areas as baseline information to guide project design. The project interdisciplinary team will suggest how quickly or closely to approximate the reference areas... To keep within the parameters of the approach, the Analysis Area should contain at least 15,000 acres or more of LTA 1. It is recommended that the area boundaries follow watersheds and remain fixed for the duration of the Plan. For those projects in the other forested LTAs, the reference conditions will have to be inferred from the literature, experts, and local knowledge. Comparisons should be made within the same ecological LTA.</p>
B-S3-G2	<p>Guideline: If aspen regeneration is considered, prioritize treatment within seral aspen clones using the following criteria: <i>Identify stands with large standing and down dead basal area (20% dead) that are single-storied and showing signs of animal barking (gnawing and bark stripping) or disease. Stands which are multi-storied, have several hundred sapling-size suckers per acre under them, or show little sign of canker diseases or animal barking would be a lower priority for any management intervention; Identify conifer stands that contain a small minority of live aspen basal area (less than 10% live basal area). (Aspen is likely to disappear from these stands within several decades without intervention.);</i></p>

	<p><i>Identify isolated clones and stands in heavy-animal-use areas and riparian areas, and those at low elevations. Any stands in these situations that meet the criteria above should be given the highest priority for regeneration. (These stands will be at greatest risk of disappearing and will be the toughest to regenerate successfully. Protection of treatment areas from browsing animals may be needed to achieve successful regeneration.); Identify stands that are more cost efficient to treat and contribute positively to aspen's distribution. .</i></p>
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RANGE (Range Management)

RG-S2-G1	<p>Guideline: Develop site-specific vegetation utilization and residue guidelines during rangeland planning, and document them in allotment management plans. In the absence of updated planning or an approved allotment management plan, the utilization and residue guidelines in Tables III-2 and III-3 will apply. <i>Rangeland Condition - The RGNF does not have an ecological classification for rangeland vegetation on the Forest. The inventory process must concentrate on existing vegetation. Specifically, the inventory process will involve delineation of existing plant communities according to Integrated Resource Inventory (IRI) procedures, and comparison of the existing community to a desired plant community. The degree of similarity between existing and desired plant communities gives an estimate of vegetation management status. Those communities within 65% of desired- plant-community similarity are in satisfactory condition. Those not meeting 65% similarity are in unsatisfactory condition. (See Rangeland Analysis and Management Guide, 1996)</i> Satisfactory Residue Allowances: Spring - 3 inches; Summer/fall – 4 inches</p>
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SILVICULTURE

Silv-S1	<p>Standard: Forty acres is the maximum allowed opening for the Forest types. Exceptions to this maximum are stipulated in 36 CFR 219.27 (A6)(A7), and 219.27(d)(2)(i) through (iii). The regulations at 36 CFR 219.27(d)(2)(ii) allow for size limits exceeding those established at 36 CFR 219.27(d)(2) and CFR 219.27(d)(i). Exceptions are permitted on an individual timber sale basis after a 60-day public notice and a review by the Regional Forester. The regulations at 36 CFR 219.27(d)(2)(iii) provide that the established limit shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm.</p>
Silv-S2	<p>Standard: The scientifically defined silviculture systems shown by forest cover type in Table III-4, which meet the Management Objectives for the landscape or individual stands of trees within a landscape setting, are acceptable. Both even-aged and uneven-aged management systems can be used and applied at scales ranging from a few acres to many hundreds of acres. These silvicultural systems are to be applied in a manner that will ensure natural regeneration where artificial regeneration is not necessary for other resource objectives. Tree-stand vegetation management treatments are to be approved by certified silviculturists. The silvicultural systems identified in Table III-4 can be used to convert uneven-aged stands to even-aged management and even-aged systems</p>

Table III-4. Silvicultural systems by forest cover type.

Forest cover type	Even-aged	Two-aged	Uneven-aged
Ponderosa pine	Shelterwood, clearcut, and seed-tree	Irregular shelterwood	Group selection and single-tree selection
Mixed Conifer	Shelterwood, clearcut, and seed-tree	Irregular shelterwood	Group selection and single-tree selection
Engelmann Spruce/SAF	Shelterwood and clearcut	Irregular shelterwood	Group selection and single-tree selection
Lodgepole Pine	Shelterwood, clearcut, and seed-tree	Irregular shelterwood	Group selection
Aspen	Coppice	Coppice with standards	Group selection

Silv-S3	<p>Standard: The size of the uncut forest areas between openings must be based on the Management Objectives for the landscape unit being analyzed. If these Objectives include creating a mix of vegetation types to benefit the kinds of wildlife associated with early-successional stages and edges, the uncut units can be small. If the Objectives include provisions for old-growth- associated species, the uncut units could be large enough to function as an ecological system not overly influenced by edge.</p>
Silv-S4	<p>Standard: When trees are harvested to meet timber production objectives, the cutting shall be done in such a way that there is assurance that the technology and knowledge exist to restock these areas adequately with trees within five years after final harvest. Minimum restocking levels are defined as follows. Spruce-fir trees per acre = 150</p>

	<p>Aspen trees per acre = 300 Douglas fir trees per acre = 150 Lodgepole pine trees per acre = 150 Ponderosa pine trees per acre = 150 Other softwood trees per acre = 150 Other hardwood trees per acre = 150</p>
Silv-S5	<p>Standard: No minimum seedling-height requirements are specified. Seedlings must have survived a minimum of one year and be expected (on the basis of research and experience) to be able to produce the desired stand condition specified for this area in the Forest Plan. The numbers of seedlings in the table above represent the minimum number of seedlings required, considering natural mortality, to produce a merchantable- timber stand at rotation age without intermediate treatments. To assure that adequate restocking of openings created as a result of final harvest is accomplished, as a minimum, stocking surveys are conducted at the end of the first and third growing seasons following reforestation treatment. Adequate stocking cannot be certified until after the third-year growing-season survey.</p>
Silv-S6	<p>Standard: "Five years after final harvest" means five years after clearcutting, five years after the final overstory removal in the shelterwood and seed-tree systems, or five years after selection cutting. The requirement for adequate restocking within five years is initiated by the final harvest. The timing of the first- and third-year restocking surveys is initiated by the reforestation treatment.</p>
Silv-S7	<p>Standard: Where disease can be spread from an uncut stand to a newly regenerated stand, it is desirable to cut the adjacent infected stand before the newly regenerated stand reaches a height of six feet.</p>
Silv-S9	<p>Standard: Trees will not be marked or harvested within approximately 600 feet slope distance from timberline.</p>
Silv-S10	<p>Standard: Use artificial-regeneration methods when it is not possible to rely on the natural sequence of events or environmental conditions to regenerate the stand within five years.</p>
Silv-S11	<p>Standard: When trees are to be harvested on other than suitable lands, exceptions to the stocking guidelines are appropriate (as documented in project decisions) when the harvest meets one of the following criteria: For permanent openings that serve specific management direction; Where provided for in specific management practices and prescriptions; Where it is desirable to delay the onset of regeneration and crown closure to meet specific Desired Conditions and Management Objectives.</p>
Silv-G1	<p><u>Guideline:</u> If the silviculture system being applied to a particular area of the landscape is uneven-aged, harvest trees designated for commercial timber production based on the desired density, as determined by age class or size, and the Objective for the area.</p>
Silv-G2	<p><u>Guideline:</u> Silvicultural Standards and Guidelines should be applied at the watershed and landscape level, as well as to individual stands of trees. The Standards and Guidelines must be applied in such a way as to perpetuate this range of environmental conditions, while supplying goods and services to people. The range of environmental conditions is defined in the Desired Condition statements for the selected alternative. This does not imply the Forest must shoot for the range of natural variability.</p>
Silv-G3	<p><u>Guideline:</u> Fuelwood demand will be reviewed as part of the environmental analyses for proposed timber sales, to determine if timber sale roads should be opened for fuelwood access after the completion of harvest activities. For areas to be opened to fuelwood cutting, decisions will also be made regarding timing and duration of fuels accessibility, in coordination with other resource concerns. Generally, the areas will be open only one to two seasons after completion of harvest activities.</p>
Silv-G4	<p><u>Guideline:</u> Table III-6 gives guidelines for when an opening is no longer considered an opening</p>

Table III-6. Guidelines for when an opening is no longer considered an opening

Ponderosa pine and mixed conifers	Average trees per acre	Average tree height	Distribution
Big game cover	200	6 feet	70%
Retention and partial retention scenic condition objectives	200	25% of the height of the adjacent stand	
Lodgepole pine and spruce/fir/aspen	Average trees per acre	Average tree height	Distribution
Big game cover	250	10 feet	70%
Retention and partial retention scenic condition objectives	250	25% of the height of the adjacent stand	

Silv-G5	<u>Guideline:</u> Except for treatments designed to enhance meadows, altering more than one-third of the edge of a natural opening will be avoided whenever an artificially created opening is adjacent to a natural opening. Additional edge should not be created until previously treated areas are considered closed, according to guideline Table III-6.
Silv-G6	<u>Guideline:</u> The landscape should be the primary unit of analysis for silviculture. A landscape is defined here to mean a distinct landform such as a mesa, or a Level VI watershed. There are a great variety of landscape types within the Rocky Mountain Region. Some may contain more than a single forest species. Some are "fine grained" (characterized by many small areas in various stages of plant succession). Others are "coarse grained" (characteristically forested with large, unbroken expanses of trees and few openings). There are areas in the Region which have become a patchwork of forest and open places as a result of human use prior to establishment of the National Forests, past Forest Service management practices, and natural disturbances (wind, fire, insect activity, and earth movement).
Silv-G7	<u>Guideline:</u> In most circumstances, rely on or make primary use of those silviculture systems which ensure regeneration of forest stands through natural seeding and suckering.
Silv-G8	<u>Guideline:</u> Use artificial-regeneration methods when we cannot rely on the natural sequence of events and/or environmental conditions to regenerate the forest within five years or earlier.
Silv-G9	<u>Guideline:</u> Use thinning practices which consider genetic diversity, as well as competition among the trees for water, nutrients, and light. The frequency of thinning should depend upon the tree species, financial efficiency, and the site growing conditions (as commonly measured by Site Index).
Silv-G10	<u>Guideline</u> Where appropriate, reduce competition between desired trees and other vegetation.
Silv-G11	<u>Guideline</u> The chosen silviculture system should allow emulation of the pattern, timing, and frequency of natural disturbances found in the landscape being treated.
Silv-G12	<u>Guideline</u> Regeneration harvests of even-aged timber stands (sites) should not be undertaken until the stands have generally reached (or surpassed 95 % of the) culmination of the mean annual increment, measured in cubic feet. Exceptions may be made where resource management objectives or special resource considerations require earlier harvest.
Silv-G13	<u>Guideline</u> Manage the firewood program in a manner that reflects overall resource objectives, including snag management.

WILDLIFE

WL-S2	Standard: Provide adequate cover to maintain screening along roads that are kept open for human use and around openings, so as to minimize disturbance and harassment of deer and elk.
WL-S3	Standard: In areas where tall, dense cover is desired for ground-nesting birds, residual cover needs to be carried over from previous growing seasons, since some species begin nesting in April and May before spring growth.
WL-S4	Standard: Some bird species prefer to nest in undisturbed cover. In areas where these species are a primary consideration, manage livestock grazing to avoid adverse impacts on nesting habitat.
WL-S5	Standard: Protect known active and inactive raptor nest areas. The extent of the protection will be based on proposed management activities, human activities existing before nest establishment, species, topography, vegetative cover, and other factors. A no-disturbance buffer around active nest sites will be required from nest-site selection to fledgling (generally March through July). Exceptions may occur when individuals are adapted to human activity.
WL-S6	Standard: Where newly discovered Threatened, Endangered, Proposed, or Sensitive species (TES) habitat is identified, an analysis shall be conducted to determine if any adjustments in the Forest Plan are needed.
WL-S7	Standard: Activities will be managed to avoid disturbance of Sensitive species that might result in federal listing or loss of population viability. The protection will vary depending on the species, potential for disturbance, topography, location of important habitat components, and other pertinent factors. Special attention will be given during breeding, young rearing, and other times which are critical to survival.
WL-S8	Standard: Areas should be closed to activities to avoid disturbing Threatened, Endangered, and Proposed species during breeding, young rearing, or at other times critical to survival. Exceptions may occur when individuals are adapted to human activity, or the activities are not considered a threat.
WL-S9	Standard: If a bald eagle traditional winter roost or nest site is discovered, a management plan will be written to ensure that the necessary habitat components are maintained. In addition, a no-disturbance buffer will be established around the location. The size of the buffer will be determined by the eagle's tolerance of human activity, and local conditions (e.g., topography, vegetative cover).
WL-S11	Standard: Discourage land-use practices and development which adversely alter or eliminate the hunting habitat or prey base within ten miles, and the immediate habitats within one mile, of a peregrine falcon nesting cliff.

WL-S12	Standard: Restrict human activities within one mile of a peregrine falcon nest site between February 1 and August 31.
WL-S13	Standard: No ground-disturbing activity shall be allowed in potential Uncompahgre fritillary butterfly habitat unless a survey is conducted to determine the existence of the species. Ground-disturbing activities include trail building, livestock driveways, or domestic sheep bedding grounds. The usual grazing associated with livestock in the area is not considered ground disturbing. Potential habitat definitions and survey protocols are found in the Uncompahgre Fritillary Butterfly Recovery Plan.
WL-S15	Standard: Do not allow any even-aged timber management within canyons considered to have potential habitat for Mexican spotted owls, or within one-half mile of the canyon's rim.
WL-S16	Standard: Allow uneven-aged timber management only if the resulting timber stand contains the necessary habitat components (for native and desirable nonnative species).
WL-S17	Standard: Develop a fire strategy within potential Mexican spotted owl habitat that will reduce the risk of losing the habitat to a catastrophic fire.
WL-S18	Standard: If any Mexican spotted owl nests are discovered, limit the amount of human disturbance around the nest through such measures as special area closures, seasonal restrictions, or rerouting of trails.
WL-S19	Standard: MIS are Brown creeper (<i>Certhia familiaris</i>), Hermit thrush (<i>Catharus guttatus</i>), Pygmy nuthatch (<i>Sitta pygmaea</i>), Lincoln's sparrow (<i>Melospiza lincolni</i>), Wilson's warbler (<i>Wilsonia pusilla</i>), Vesper sparrow (<i>Pooecetes gramineus</i>), Mule deer (<i>Odocoileus hemionus</i>), Rocky Mountain elk (<i>Cervus elaphus nelsoni</i>), Rio Grande cutthroat trout, (<i>Oncorhynchus clarki virginalis</i>) (brown trout [<i>O. trutta</i>], brook trout [<i>salvelinus fontinalis</i>], or rainbow trout [<i>O. mykiss</i>] to serve as proxies if Rio Grande cutthroat trout is not present).
WL-S20	Standard: Activities will be managed to avoid loss of population viability to MIS. The protection will vary depending on the species, potential for impact, topography, location of important habitat components, and other pertinent factors. Special attention will be given during breeding, young rearing, and other times that are critical to survival. Where appropriate, measures to mitigate adverse effects shall be applied.
WL-S21	Standard: 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 potential adverse effects are minimized.
WL-S22	Standard: When considering management actions within potential and suitable southwestern willow flycatcher habitat, use the Riparian Guidelines 6 through 9 and the Range Clary and Webster residue allowances guidelines (Table III-3) in riparian areas as standards.

SOUTHERN ROCKIES LYNX AMENDMENT (SRLA)

L-VEG-S1	Standard VEG S1: Applies to all vegetation management projects that regenerate forested stands, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: (WUI Fuels Exemption) Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, or VEG S6 shall occur on no more than 3 percent (cumulatively) of lynx habitat on each administrative unit (a National Forest or administratively combined National Forests). In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard. For fuel treatment projects within the WUI see guideline VEG G10. Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages limit disturbance in each LAU as follows: If more than 30 percent 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.
L-VEG-S2	Lynx Standard VEG S2: applies to all timber management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: (WUI Fuels Exemption) Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, or VEG S6 shall occur on no more than 3 percent (cumulatively) of lynx habitat on each administrative unit (a National Forest or administratively combined National Forests). For fuel treatment projects within the WUI see guideline VEG G10. Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period. This 15 percent includes the entire stand within an even-age regeneration area, and only the patch opening areas within group selections. Salvage harvest within stands killed by insect epidemics, wildfire, etc. does not add to the 15 percent, unless the harvest treatment would cause the lynx habitat to change to an unsuitable condition.
L-VEG-S5	Lynx Standard VEG S5: Standard VEG S5 applies to all precommercial thinning projects, except for fuel treatment projects that use precommercial thinning as a tool within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: (WUI Fuels Exemption) Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, or VEG S6 may occur on no more than three percent (cumulatively) of lynx habitat on each administrative unit (a National Forest or administratively combined National Forests) for the life of this amendment.

	<p>For fuel treatment projects within the WUI see guideline VEG G10.</p> <p>Precommercial thinning practices and similar activities intended to reduce seedling/sapling density are subject to the following limitations from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat. Precommercial thinning may occur only: (VEG S5 Exceptions)</p> <ol style="list-style-type: none"> 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3. For conifer removal in aspen, or daylight thinning⁵ around individual aspen trees, where aspen is in decline; or 4. Based on new information that is peer reviewed and accepted by the regional/state levels of the Forest Service and FWS, where a written determination states: <ol style="list-style-type: none"> a) That a project is not likely to adversely affect lynx; or b) That a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat. 5. In addition to the above exceptions (and above and beyond the three percent limitation for fuels projects within the WUI), precommercial thinning may occur provided that: <ol style="list-style-type: none"> a) The additional precommercial thinning does not exceed one percent of the lynx habitat in any LAU for the life of this amendment, and the amount and distribution of winter snowshoe hare habitat within the LAU must be provided through appropriate site-specific analysis and consultation; and b) Precommercial thinning in LAUs with more than 30 percent of the lynx habitat currently in the stand initiation structural stage is limited to areas that do not yet provide winter snowshoe hare habitat; and c) Projects are designed to maintain lynx habitat connectivity and provide snowshoe hare habitat over the long term; and d) Monitoring is used to determine snowshoe hare response. <p>Exceptions 2 and 3 may not occur in any LAU in which VEG S1 is exceeded (i.e., more than 30 percent of LAU in stand initiation structural stage).</p> <p>Note: This standard is intended to provide snowshoe hare habitat while permitting some thinning, to explore methods to sustain snowshoe hare habitat over time, reduce hazardous fuels, improve forest health, and increase timber production. Project design must ensure any precommercial thinning provides an appropriate amount and distribution of snowshoe hare habitat with each LAU over time, and maintains lynx habitat connectivity within and between LAUs. Project design should focus on creating irregular shapes for the thinning units, creating mosaics of thinned and unthinned areas, and using variable density thinning, etc.</p>
<p>L-VEG-S6</p>	<p>Lynx Standard VEG S6: Standard VEG S6 applies to all vegetation management practices within multi-story mature or late successional conifer forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: (WUI Fuels Exemption) Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, or VEG S6 shall occur on no more than 3 percent (cumulatively) of lynx habitat on each administrative unit (a National Forest or administratively combined National Forests).</p> <p>For fuel treatment projects within the WUI see guideline VEG G10.</p> <p>Vegetation management projects that reduce winter snowshoe hare habitat in multi-story mature or late successional conifer forests may occur only (VEG S6 Exceptions):</p> <ol style="list-style-type: none"> 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). <p>Exceptions 2 and 4 may not occur in any LAU in which VEG S1 is exceeded.</p>
<p>L-VEG G1</p>	<p>Lynx Guideline VEG G1: Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat.</p>
<p>L-VEG G4</p>	<p>Lynx Guideline VEG G4: Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.</p>
<p>L-VEG G5</p>	<p>Lynx Guideline VEG G5: Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.</p>
<p>L-VEG G10</p>	<p>Lynx Guideline VEG G10 Fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.</p>
<p>L-VEG G11</p>	<p>Lynx Guideline VEG G11: Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind</p>

	thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
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DISTURBANCE PROCESSES

Undesirable Species (Noxious Weeds)

NW_S1	Standard: Control nonnative and noxious plants throughout the Forest, with priority given to Research Natural Areas and Wilderness. For all proposed projects or activities, determine the risk of noxious-weed introduction or spread, and implement appropriate mitigation measures.
NW_S2	Standard: Only certified "weed-free" hay and straw shall be used on the RGNF
NW_S2-G1	Guideline: Develop a noxious-weed and pest management program that addresses the following components: awareness, prevention, inventory, planning, treatment, monitoring, reporting, and management objectives. Priorities for implementing a program for undesirable plants include: New invaders, new areas, spreading or expanding infestations, and existing infestations.

Fire

F-G1	Guideline: Where feasible and appropriate, use broadcast burning to dispose of slash, return inorganic and organic chemicals in the foliage and small woody material to soils reduce fire hazard, and create seedbeds for natural regeneration.
F-G2	Guideline: Develop and implement a prescribed-fire program, both management- ignited and prescribed natural, which addresses the ecosystem needs and values-at-risk of the entire Forest.
F-G3	Guideline: Initial-attack response will be planned and designated based on the values at risk and the cost of suppression.

Insects and Disease

ID-G1	Guideline: Plan management activities with consideration for potential insect or disease outbreaks. Design management to meet or enhance Management-Area Objectives.
ID-G2	Guideline: Manage vegetation in high-use recreation areas to ensure public safety and to improve forest health, as needed to maintain or improve the desired recreation setting(s).
ID-G3	Guideline: Use integrated pest management techniques, including silvicultural treatments, to meet Management-Area Objectives. Treatment activities will be based on values of, and risks to, adjacent private lands, as well as public land. Priority should be given to areas in which values to be protected exceed the cost of protection. (For example, adjacent to subdivisions, metropolitan areas, recreation sites, or areas of concentrated public use.)
ID-G4	Guideline: Project plans should consider existing infestations of insects or disease within a project area. Activities should be designed to minimize the risks of spreading the infestation, while still providing habitat for those wildlife species dependent on the presence of insects and disease.
ID-G5	Guideline: Control natural insect and disease outbreaks in Wilderness only when justified by predicted loss of resource values outside Wilderness

SOCIAL RESOURCES

Heritage

H-S1	Standard: Conduct all land management activities in such a manner as to comply with all applicable federal, state, and local regulations. Many heritage resources values can be protected effectively through application of the provisions of these regulations: The National Historic Preservation Act of 1966, (P.L. 89- 665, as amended); Native American Grave Protection and Repatriation Act (NAGPRA), (P.L. 101-601); Archeological Resources Protection Act of 1979 P.L. 96- 95.
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Recreation – Developed

DR_S3	Standard: Vegetative-management plans shall be developed and implemented for all developed sites, to enhance the natural setting and maintain or develop the desired vegetation.
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SCENIC RESOURCES

SR-S1	Standard: 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.
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	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.
SR-S2	Standard: Management activities which are inconsistent with the Scenic Integrity Objective will be avoided unless a decision is made to change the Scenic Integrity Level. A decision to change the Scenic Integrity Objective will be documented in a project-level NEPA decision document.
SR-S3	Standard: If field analysis identifies a need to correct the inventory of Scenic Condition Objectives, the correction will be recorded in an environmental analysis document, approved, and the Forest inventory will be updated. Conditions that could warrant a change in Scenic Condition Levels are: <ul style="list-style-type: none"> * Discrepancies in "inherent scenic attractiveness" classification. * Changes in "viewer location" and "sensitivity level." * Discrepancies in "seen area" mapping.

INFRASTRUCTURE – Travelways

T-S1	Standard: Closed or restricted roads may be used for administrative purposes if the use is approved by the District Ranger.
T-S2	Standard: Designated travelways, as displayed on the Rio Grande National Forest Visitor Map, and newly constructed travelways are open to motorized-vehicle use unless a documented decision shows that: motorized use conflicts with FP objectives; motorized use is incompatible with ROS class; travelways are in areas closed to motorized use and are not "designated routes"; motorized use creates user conflicts that result in unsafe conditions unrelated to weather conditions; physical characteristics of travelways are hazardous to motorized use; travelways do not serve an existing or identified future public need; financing is not available for maintenance necessary to protect resources.
T-S3	Standard: On all lands except designated travelways, motorized use with wheeled vehicles is restricted unless the Forest Map or a Forest Order indicates that such use is specifically allowed. Snow machine use on snow is allowed unless specifically restricted.
T-S4	Standard: Perennial stream crossings will be constructed to maintain stream flow sufficient to allow bidirectional movement of adult and juvenile fish and related aquatic organisms.
T-G1	<u>Guideline:</u> Allowable modes of travel shall be clearly signed at each trailhead.
T-G2	<u>Guideline:</u> Travelways no longer needed, or that are contributing to resource damage that cannot be mitigated, shall be obliterated, revegetated, and/or sloped to drain.
T-G3	<u>Guideline:</u> Manage road use by seasonal closure if: <ul style="list-style-type: none"> * Use causes unacceptable damage of soil and water resources due to weather or seasonal conditions. * Use causes unacceptable wildlife conflict or habitat degradation. * Use results in unsafe conditions due to weather conditions. * The road(s) serve a seasonal public or administration need. * The area accessed has seasonal need for protection or non-use.

ECONOMIC STANDARDS

Timber Utilization

TU-S1	Standard: Sawtimber utilization Standards, for live and dead trees are listed in Table III-8. The Standards in Table III-8 apply to the Rio Grande National Forest. (Reference FSH 2409.18, Ch 50.
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Table III-8. Timber utilization standards.

Type of product	Minimum diameter at breast height (in)	Top diameter (in)	Minimum length (ft)	% net of gross (vo).
Live trees				
Sawtimber, coniferous	7-8	5-7	8-10	33.3-50
Sawtimber, aspen	7-8	5-7	8	50
Products other than sawtimber	5	4	6.5	Variable
Dead trees				
Sawtimber	7-12	7-10	8-16	33.3-50
Products other than sawtimber	5	4	Variable	Variable

Appendix D.1A – Lynx conservation measures, vegetation management BLM lands

Canada Lynx Conservation Assessment Strategy (Interagency Lynx Biology Team 2013).

1.	Provide a mosaic that includes dense early-successional coniferous and mixed-coniferous-deciduous stands, along with a component of mature multi-story coniferous stands to produce the desired snowshoe hare density within each LAU.
2.	Use fire and mechanical vegetation treatments as tools to maintain a mosaic of lynx habitat, in varying successional stages, distributed across the LAU in a landscape pattern that is consistent with historical disturbance processes.
3.	Design vegetation management to develop and retain dense horizontal cover. Focus treatments in areas that have the potential to improve snowshoe hare habitat by developing dense horizontal cover in areas where it is presently lacking. In areas of young, dense conifers resulting from fire, timber harvest or other disturbance, do not reduce stem density through thinning until the stand no longer provides low, live limbs within the reach of hares during winter (e.g., self-pruning processes in the stem exclusion structural stage have eliminated snowshoe hare cover and forage availability during winter conditions with average snowpack). If studies are completed that demonstrate that thinning can be used to extend the duration of time that snowshoe hare habitat is available (e.g., by maintaining low limbs), then earlier thinning could be considered.
4.	Retain mature multi-story conifer stands that have the capability to provide dense horizontal cover. If portions of these stands currently lack dense horizontal cover, focus vegetation management practices (such as group selection harvest) in those areas to increase understory density and improve snowshoe hare habitat.
5.	To maintain the amount and distribution of lynx foraging habitat over time, manage so that no more than 30% of the lynx habitat in an LAU is in an early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (i.e., does not provide winter snowshoe hare habitat). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30% of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clearcuts, seed tree harvest, precommercial thinning, or understory removal), no further increase as a result of vegetation management projects should occur on federal lands.
6.	Recognizing that natural disturbances and forest management of private lands also will occur, management-induced change of lynx habitat on federal lands that creates the early stand initiation structural stage or silviculturally treated to remove horizontal cover should not exceed 15% of lynx habitat on federal lands within a LAU over a 10-year period.
7.	Conduct a landscape evaluation to identify needs or opportunities for adaptation to climate change. Consider potential changes in forest vegetation that could occur as a result of climate change (e.g., Gärtner et al. 2008). Identify reference conditions relative to the landscape's ecological setting and the range of future climate scenarios. For example, the historical range of variability could be derived from landscape reconstructions (e.g., Hessburg et al. 1999, Blackwell et al. 2003, Gray and Daniels 2006).
8.	Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape.
9.	In aspen stands, maintain native plant species diversity including conifers.
10.	Recruit a high density of stems, generally greater than 4,600/ha (1,862/ac), of conifers, hardwoods, and shrubs, including species that are preferred by hares.
11.	Provide for continuing availability of lynx foraging habitat in proximity to denning habitat.
12.	When designing fuels reduction projects, where possible retain patches of untreated areas of dense horizontal cover within treated areas.

Appendix D.2 – Project Design Criteria

Project design criteria for all action alternatives
TIMING OF OPERATIONS
Winter logging is encouraged to reduce ground disturbance, disturbance to wildlife and wildlife habitat, and to minimize disturbance to potentially undocumented heritage resources; activities will cease as spring snow melt conditions dictate.
PUBLIC SAFETY
Roads used for vegetation treatment and log hauling would be maintained in accordance with the contract requirements. Temporary traffic control (in accordance with the Manual on Uniform Traffic Control Devices) would be utilized for roads open to public motor vehicle use. Caution signs notifying public of logging or burning activities will be prominently displayed at start of all open roads and all junctions.
If log hauling occurs during dry periods (June to September) adjacent to private residences on the lower portion of County Road 41G, dust abatement may be required. Dust abatement may be applied up to ¼ mile along 41G adjacent to these residences; if needed. Coordinate dust abatement with Saguache County.
Notify the public of logging activities, burning activities, or both through media such as local newspapers, radio, and the Forest website.
Any open system roads utilized for winter logging activities will provide for two-way traffic, either through width of plowing or frequent pull-outs.
PROTECT IMPROVEMENTS
Identify, avoid, and protect overhead and underground utility lines during road improvement, maintenance, and closure work, as well as during material haul and equipment transport.
Any protected improvements such as fences and water developments identified on timber sale area or project area maps would be protected during harvest, burning, or other treatment activities. Damaged improvements will be repaired or replaced, depending upon the amount of damage.
AIR RESOURCES
Prior to any burning operations, a smoke permit will be obtained from the state of Colorado to ensure operations meet air quality standards and smoke impacts are minimized.
WATERSHED PROTECTION – WATER, AQUATIC, FISH, RIPARIAN/WETLANDS, SOILS
Any temporary stream crossing structures (hardened crossings, culverts.) will be designed to provide for passage of flows and sediment, withstand expected flood flows, and allow free movement of resident aquatic life. Upon project completion, remove all temporary crossings, restore the channel morphology, and re-vegetate channel banks.
To the extent feasible, slash piles shall be located at least 50 feet (hand piles) or 200 feet (machine piles) from perennial streams, lakes, ponds, wetlands, or riparian areas.
In commercial timber harvest areas, a no-harvest buffer will be established along all intermittent and perennial stream channels for 100 feet on both sides of the channel. No heavy equipment will operate within this buffer except at designated crossings, unless authorized by the hydrologist or their designee where site-specific conditions would minimize stream and riparian impacts.
In commercial timber harvest areas, a no-harvest buffer of 50 feet on both sides of the channel would be implemented on ephemeral channels to ensure watersheds protection from sediment generated from harvested areas.
All roads (existing, new temporary, or old non-system) used for project will be evaluated to identify and correct erosion or sediment problems. Additional cross drains or other standard measures will be used as appropriate to divert any road drainage into buffer strips and minimize road drainage into stream channels.
Where existing roads will be reconstructed within 100 feet of intermittent or perennial streams, hydrology or soil specialists or their designees will be consulted to ensure sediment sources are disconnected from stream channels. If necessary, hardening, filter fence, straw wattles, timber slash windrows, or other measures will be used, as appropriate, to prevent sediment from entering a stream course.

Project design criteria for all action alternatives
As calculated by the equivalent roaded area (ERA) process, disturbance values will be limited to 15 percent or less of each HUC 6 watershed area, or 10 percent or less in watersheds of concern. Activities which could exceed these limits would require additional investigation by soil or watershed staff to ensure the protection of soil and watershed health.
Considering other resource objectives, re-use existing skid trails and landings whenever practical to minimize new disturbance.
If whole tree yarding is used, limbs and/or tops shall be returned to the unit if 15 percent or more of the unit has exposed mineral soil; this material shall be distributed in areas primarily comprised of bare mineral soils.
Hand felling of hazard trees is permitted in the water influence zone. Trees shall be directionally felled and may be left in place to maintain or improve stream and riparian health. If necessary, felled trees may be stabilized to prevent movement. The Forest timber sale or contract administrator shall consult the hydrologist or wildlife/fish biologist prior to granting approval to remove hazard trees from water influence zone areas. If hazard trees need to be removed from water influence zone areas, they should be felled in such a way as to protect vegetation from damage and one end suspended during removal.
Any hazard tree, and associated slash, cut and lying within 100 feet upstream of a culvert/bridge crossing a perennial or intermittent stream, and within 25 feet from the stream edge that has the potential to obstruct the crossing shall be stabilized, removed, or moved at least 50 feet upslope away from the stream.
Felled hazard trees and slash shall be removed from roadside ditches and culverts, including removing from cross drains and sediment traps.
Felled hazard trees may be removed from stream corridors or riparian areas with agency approval when they create unacceptable fuel loading; fail to meet visual objectives; or create unacceptable limits to human, livestock, or wildlife movement. Minimize skidding across stream channels.
In riparian encroachment treatment areas, avoid cutting conifers that provide substantial shade to a perennial stream unless authorized by the fisheries biologist or designee.
Prescribed broadcast burning operations will avoid the WIZ of streams and wetlands to minimize resource impact, and the only fire that will be allowed is that which may occasionally creep into these areas.
In prescribed broadcast burns, retain ground cover amounts recommended by the soil scientist or their designee to keep erosion of the underburned sites within the limits of the burn plan and objectives for soil cover.
SILVICULTURE, INSECT/DISEASE
If consistent with other resource objectives, in pine dominated stands, avoid creating large amounts of green pine lop and scatter slash from December through June; dispose of any machine constructed slash piles before the center material dries to reduce the probability of damage from pine engraver beetle (<i>Ips</i> , species) population buildup.
Locate machine slash piles at least 30 feet outside the dripline of residual live trees and hand piles at least 10 feet from outside the dripline live trees to avoid damage.
To move toward desired conditions, follow treatment options outlined in Silviculture-Prescribed Fire Guidelines (appendix D), as appropriate.
BIODIVERSITY
In spruce-fir salvage units, retain a minimum average of 6 hard snags/acre in various distributions. Preferably these snags should be spruce and of a larger than average diameter for the cutting unit. For all other forest types, retain the minimum snags per acre as specified in Forest Plan standards or greater, as specified in the site-specific silvicultural prescription
In managed stands, ensure at least the minimum amounts of coarse woody debris is present, in a variety of size classes, are present over time to meet desired conditions for each cover type to retain moisture, provide microsites, and provide habitats for small mammals. Additional amounts may be retained to meet specific resource objectives, as specified in silvicultural prescriptions
Across the watersheds and project landscape, manage or move toward maintaining 30 to 50 percent of forested acres, as appropriate for each forest type, in a mature to old structural stage with sustainable densities, as feasible.

Project design criteria for all action alternatives
Manage to maintain or promote aspen across the landscape; of high priority is to reduce or remove encroaching conifers in lower elevation, drier sites to the extent feasible.
Where chipping/grinding or other mastication method is used to treat understory fuels and prescribed burning is not proposed as a follow-up activity, slash shall not cover more than 50 percent of ground surface and depth shall not exceed four inches to minimize impacts to understory vegetation.
Seeding of disturbed sites will utilize an appropriate native seed mix and application prescription.
Place landings away from desirable regeneration, if possible, to protect understory.
WILDLIFE
If any threatened, endangered, or sensitive species are discovered within the project area during project implementation, they will be protected as directed in land management plans or consultation with the U.S. Fish and Wildlife Service will be initiated as necessary.
A portion of the large slash piles created during timber harvest activities will be left on site for small mammal habitat, especially in the spruce-fir areas most affected by spruce beetle mortality. A team consisting of the District biologist, Forester, and Fuels Specialists will jointly determine which piles would be left.
Closed or gated roads utilized during logging activities and following logging will remain closed to the general public to minimize wildlife disturbance and for public safety. An exception may be temporarily opening roads for firewood collection following thinning or timber harvest.
Trees with known active bird nests or cavities will be designated for retention.
The contract administrator shall make an effort to notify the District Biologist prior to considering or granting approval to cut or remove any hazard tree that actively supports a threatened, endangered, proposed, or sensitive species, including raptor nests.
Based on buffer zones recommended for Colorado Raptors, no project activities will be allowed within the buffer zones during these times if nests are occupied: Golden eagle: within ½ mile radius of active nest; Red-tailed hawk: within ⅓ mile radius of active nest; Swainson's hawk: within ¼ mile radius of active nest; Peregrine falcon: within ½ mile of the nest cliff(s); Northern goshawk: within ½ mile radius of active nest; Sharp-shinned hawk: within ½ mile radius of active nest. As per forest plan direction, the no disturbance buffer around an active nest sites will generally be required from March through July though no disturbance periods may be adjusted depending on species and local site conditions, based on pre-implementation review. For species not listed, the buffer radius will be based on the best available information.
For BLM lands, all applicable conservation measures pertaining to vegetation management identified in the LCAS (2013) will be applied during project planning, analysis and implementation (appendix D.1A).
For BLM lands, retain mature multi-story conifer stands that have the capability to provide dense horizontal cover. If portions of these stands currently lack dense horizontal cover, focus vegetation management practices (such as group selection harvest) in those areas to increase understory density and improve snowshoe hare habitat.
For BLM lands, retain horizontal cover ≥20% as developing or existing dense horizontal cover.
All applicable management Objectives, Standards and Guidelines contained in the Southern Rockies Lynx Amendment will be applied during project planning, analysis and implementation (appendix D.1).
In lynx habitat, areas supporting live advance regeneration will be avoided to the extent possible by adjusting units during layout, by skid trail location and designation, or other means. Areas with ≥ 35% Horizontal Cover (i.e., DHC) in blocks greater than 0.3 acres in size will be protected from damage.
Skid trails and landings will be located to minimize impacts to advanced regeneration. Skid trails will be placed at least 100 feet apart, allowing for topographic variation and skid trail convergence at landings.
In salvage units, retain all live trees except for trees that need to be removed for operational/safety or silvicultural purposes. Operational/safety or silvicultural purposes include the need to remove live trees if necessary to access dead trees for salvage or to address safety concerns.

Project design criteria for all action alternatives
Protect red squirrel primary caches at a density of 1 cache per 2 acres, to the extent feasible. Retain all trees within a 26-foot radius (1/20th acre) from the cache to maintain nest tree (spruce-fir, spruce- mixed conifer and cool-moist Douglas-fir/mixed conifer vegetation zones)
Individual projects generated by this analysis will maintain landscape connectivity for Canada lynx as determined through a review by a wildlife biologist. This review will assess project consistency in maintaining connectivity according to the definition of <i>Habitat Connectivity (lynx)</i> provided in the SRLA ROD, as well as according to guidelines provided in the SRLA Implementation Guide.
Avoid burning any early seral aspen clones or shrub lands over 2 acres in size, except where specific beneficial objectives have been identified.
Conducting prescribed burning activities outside the Southwestern willow flycatcher (SWWF) breeding season (May 1 to August 15) when within ¼ mile of potential suitable SWWF habitat, unless habitat has been confirmed as unoccupied.
If implementing harvest or prescribed fire activities in mule deer or elk winter range (MA 5.41 on NF lands), as part of the pre-implementation checklist process, determine if adjustments are needed in timing or placement of activities during the winter period.
If implementing harvest or prescribed fire activities in mule deer fawning or elk calving areas, as part of the pre-implementation checklist process, determine if adjustments may be needed in timing or placement of activities during the key reproductive period (May 15-July 15).
If any caves or abandoned underground mines are discovered in or near treatment units during lay-out or treatment activity, defer prescribed fire treatments within ¼ mile of a cave/mine entrance or shaft until consultation with a wildlife biologist occurs.
RANGE (LIVESTOCK) MANAGEMENT
As needed in individual timber sale areas, temporary fences would be constructed to restrict livestock access to the project areas during harvest and the early stages of planting and regeneration of the harvested area. Where possible, any new fences would utilize existing barriers and openings or openings created by harvest activities to reduce the need to clear brush or trees. When the temporary fence is no longer needed, it would be removed.
If current natural barriers are made ineffective with the development of skid trails or tree removal, new fence locations would be identified on a sale area and/or allotment boundary basis. Fences would be constructed as necessary to ensure allotment rotations are in compliance with individual allotment management plans and annual operating instructions.
Provide one full growing season rest period prior to scheduling livestock grazing in prescribed burn units, as needed considering timing of grazing, amount of use, and duration.
Unless approved by the Responsible Official, prescribed broadcast burn treatments will not be implemented in multiple pastures under the same grazing permit in the same grazing season.
NOXIOUS WEED MANAGEMENT
All organic material used for rehabilitation (seed, straw, erosion control material, or other) will be certified weed free.
The timber purchaser or other contractors will be required to clean all logging, mechanized thinning, or construction equipment that operates off roads prior to entry to the project area.
Prior to the start of logging or new ground disturbance activities, known weed populations will be identified from the GIS database(s) and select areas will be ground surveyed for other weed populations. Noxious weed populations will be avoided and/or treated prior to additional disturbance, as feasible.
Haul routes and highly disturbed areas, such as landings, will be monitored and treated for noxious weed infestations as needed for 5 years following harvest, as feasible.
Road fill and road base material brought in 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.
If new noxious weed locations are detected in project activity areas, control measures will be implemented.
PRESCRIBED FIRE

Project design criteria for all action alternatives
An approved burn plan will be completed prior to any burn operation. Burn plans will be developed in an interdisciplinary manner to meet specific resource objectives that are consistent with project objectives and land management plans.
For prescribed broadcast burning operations, incorporated roads, trails, meadows, ridgelines, or other landscape features into burn plans to minimize the need for fire line construction.
HERITAGE
A programmatic agreement will be executed with the Colorado State Historic Preservation Office because of the multi-unit scope, the similar and repetitive nature of the project (36 CFR 800.14(b)(1)(i)), and because the effects of the project cannot be fully determined prior to signing an environmental impact statement record of decision (36 CFR 800.14(b) (1)(ii)).
The Rio Grande National Forest and BLM will complete inventories within all areas defined as areas of potential effect, as needed, using the appropriate survey strategy outlined in the programmatic agreement (appendix E).
The heritage pre-implementation checklist will be utilized as each project area is developed to inform the research design and design criteria for each specific area.
Eligible and unevaluated sites will be avoided by all ground-disturbing activities. Locational data will be provided to the timber and fuels programs so they can easily avoid these sites.
Historic properties at high risk of damage by fire will be protected through the use of natural topographic features, previously constructed roads, fuel breaks and/or non-ground-disturbing techniques, such as wet lines and black lines.
Where appropriate, activity units should be designed in cooperation with heritage staff to reduce fuel loading around significant fire sensitive heritage resources.
Allow burning over known sites without fire-sensitive features or materials if slash piles are not within site boundaries, ignition points are selected outside site boundaries, equipment staging occurs outside site boundaries, and equipment does not drive over sites.
Allow thinning within site boundaries provided cutting is accomplished using hand tools only, large diameter trees are felled away from all features and artifact concentrations, thinned material is hand carried outside site boundaries, mechanized equipment is not used within site boundaries and equipment is not staged within site boundaries.
Exempt Undertakings - Some of the vegetation treatment activities, because of their nature and scope, have no potential to adversely affect historic properties and are exempt from further review and/or consultation under the terms of this agreement.
Timber and fuels crews will be trained in the identification of fire sensitive sites and those sensitive to manual and mechanized thinning.
The discovery and education stipulation will be emphasized in areas with old growth or large aspen and ponderosa pine with regard to avoidance and protection of undocumented arborglyphs and culturally modified trees.
Upon the inadvertent discovery of culturally modified trees during prescribed burn implementation, crews will execute the guidance for culturally modified trees described in appendix D.3.
All persons associated with operations under this authorization must be informed that any objects or sites of cultural, paleontological, or scientific value such as historic or prehistoric resources, graves or grave markers, human remains, ruins, cabins, rock art, fossils, or artifacts shall not be damaged, destroyed, removed, moved, or disturbed. If, in connection with operations under this authorization, any of the above resources are encountered, the proponent shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the Rio Grande National Forest authorized officer of the findings. The discovery must be protected until notified in writing to proceed by the authorized officer (36 CFR 800.110 & 112, 43 CFR 10.4).
DEVELOPED RECREATION
Site-specific vegetation management plans will be completed and approved by the district ranger prior to any vegetation treatments being implemented in any developed recreation site.
SCENIC RESOURCES

Project design criteria for all action alternatives
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Use breaks in topography and changes in vegetation to blend treated stands into untreated areas by feathering or scalloping edges, tying into existing openings. Minimize straight lines and abrupt edges unless they are characteristic of the local vegetation patterns.
--

Minimize creating open linear corridors when removing hazard trees along roads, power lines, fences, or other linear infrastructure. Vary corridor width considering natural vegetation patterns and topography to blend treatments into local landscape.

Appendix D.3- Culturally Modified Tree Protection Guidelines

Rio Grande National Forest/San Luis Resource Area BLM

Angie Krall, Heritage Program Manager
Adapted from the Lassen Volcanic National Park and the
Black Hills Fire Use Module Guidelines

This is guidance for protecting culturally modified trees on Forest Service and Bureau of Land Management lands administered by the San Luis Valley Public Lands Center during fuels treatments and suppression events. This is not a one-size-fits-all template for all trees. Each tree will need to be individually assessed to determine the appropriate type of protection necessary. These can be considered minimum specifications for the trees. Fire and fuels crews will be trained in the identification of culturally modified trees prior to treatment in case undocumented culturally modified trees are located.

1. A leaf rake will be used to gently remove the top layer of needles away from the tree bole, but not so deep as to disturb the lower duff layers. A true leaf rake should be used as opposed to a McLeod or a Council rake. This scratch line should be a minimum of 24"-36" wide and the resulting berm should be moved well away from the tree to prevent torching and prolonged heat exposure to the roots of the tree. Minimal raking and berm removal are done to minimize heat exposure to the root crown if fire is to be introduced as a point protection measure.
2. All brush, saplings, dead and down, and ladder fuels will be removed from under the drip line. Brushing will continue away from the drip line to a distance that is prudent and will protect the tree from flame impingement. All cut brush and other cut fuels will be scattered well away from the drip line. Crews will need to be aware there may be other undocumented culturally modified trees in the vicinity, so as not to load fuel from one culturally modified tree to another.
3. Culturally modified trees may themselves have ladder fuels and/or branches which droop to the ground. Leave culturally modified tree branches, live and dead, intact.
4. Culturally modified trees that are dead, both on the ground and standing, also need to be protected. Standing dead culturally modified trees can be treated similarly to the live culturally modified trees (See #1). However, a standard risk assessment and mitigations for working around snags will be applied. For down and dead culturally modified trees, a hand line will be constructed 24"- 36" wide to mineral soil around the down tree and all brush, saplings, dead and down fuels should be removed on a case by case basis to ensure that spotting does not occur within the hand line. Introduction of fire can occur if necessary precautions are taken and with careful monitoring. Care should be taken not to remove fuels from one tree and put it near another potentially undocumented live culturally modified tree, as culturally modified trees are often found in clusters.
5. In situations where the tree has large limbs that reach down to the ground and they are too large or cannot be reached to limb at the bole, construct hand line to mineral soil around the tree drip line.
6. If fire is introduced as a point protection treatment method for culturally modified trees, burn out operations should only occur during cool and moist conditions when live and dead fuel moistures are higher.

7. If introducing fire as a treatment method, fire will be laid at the base of the tree and allowed to work its way slowly out to the drip line. The burnout operation should be done slowly and methodically and will be monitored by crews with hand pumps and hand tools.

8. Double trunked (forked) culturally modified trees appear to be more susceptible to burnout operations (Krall 2011). Therefore, special considerations should be made for these types of culturally modified trees. Needle cast or litter in the crotch of the fork should be removed before treatment with fire. Additionally, the burn out line may need to be adjusted and crews may need to monitor these more closely using hand tools and water pumps.

9. The scars themselves are particularly susceptible to prolonged burning, given the pitch that covers and surrounds the scar face. Deep needle piles must be moved away from the bole of the tree so that heat does not build up near the scar. Raked tree needles should be spread more widely away from the bole of the tree.

Appendix D.4 – Pre-implementation Checklist Process

The environment impact statement describes the purpose and need, alternatives, and discloses the effects of project implementation for each alternative considered in detail. The implementation plan and checklist process is designed to provide consistency, compliance, and integration with the selected alternative(s) and record(s) of decision.

The process outlined is intended to describe the link between the final analysis and record of decision to project-specific implementation without the need for additional National Environmental Policy Act analysis as long as implemented projects remain within the bounds or scope of this analysis and projected effects.

If the acres proposed by type of treatments by watershed are within the maximum acre limits analyzed and is within the footprint areas as approved in the record(s) of decision, then the program of work will be consistent with the effects analyzed.

The resource specialist pre-implementation checklists, summary pre-implementation checklist (see below) and any tracking spreadsheets developed, as needed, based on the selected alternative will provide direction to the project implementation team to ensure individual projects comply with the purpose and need, standard and guidelines, best management practices, and project specific project design criteria, or other requirements.

The forms included are *draft* project summary forms developed to highlight concerns identified during the analysis, specialists may include multiple forms to reflect review of different units of the project, as needed.

It is expected the pre-implementation checklist process may change over the life of the project to incorporate new information, other changes in business rules, or better information as the learning process continues.

Project Pre-Implementation Checklist Summary Sheet and Compliance Review

Project Name: Type(s) of Activity:			Project Lead:		
Legal Description:			Map - attached		
Resource Area	Required Input	Attached?	N/A	Signature	Date
Silviculture	Checklist completed Silviculture Prescriptions				
Biodiversity	Checklist completed				
Wildlife	Field surveys done Checklist completed				
Fisheries	Checklist completed				
Range	Checklist completed				
Invasive species	Surveys completed Checklist completed				
Botany	Surveys completed Checklist completed				
Hydrology	Surveys completed Checklist completed				
Soils	Field surveys done Checklist completed				
Recreation	Checklist completed				
Transportation/ Engineering	Checklist complete				
Scenic	Checklist completed				
Heritage	Surveys completed Checklist complete				
Lands/Special Uses	Checklist completed Landline surveys completed				
Minerals	Checklist completed				
Sale Administration	Checklist reviewed				
Sale Preparation	Checklist reviewed, PDC included marking guides/				

Compliance Evaluation Review	Yes	No	N/A
Project is within the maximum treatment acres identified in the NEPA decision?			
Project design is consistent with desired conditions, design criteria, & mitigation?			
Heritage surveys are complete & action is consistent with CO SHPO letter dated _____?			
Action is consistent with UFSWS biological opinion dated _____?			
Land line locations are in place and protected, as applicable?			
Have additional monitoring or PDC needs been identified?			
For broadcast burn project, burn plan is consistent with objectives and is completed and signed?			
Project is consistent with new NEPA decisions and any management changed conditions?			

I have reviewed the activities proposed for this project. Based on my review, the project is consistent with the La Garita Hills Restoration Project final EIS and Record of Decision for this project.

District Ranger or Field Manager

Date

This documents the **SILVICULTURE** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date:** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is a Silviculture prescription(s) required?

	No , sign and turn in (document why in comment section below).
	Yes , complete sections below.

Comments: (document why silviculture input is not required, other important information)

Is project consistent with NFMA requirements and Forest Plan? (timber suitability, can be restocked to meet objectives, prescription consistent with forest plan, no irreversible damage, etc.)

	No , revise project.
	Yes , complete sections below.

Is project consistent with the Silviculture and Prescribed Fire Guidelines and will move landscape toward desired conditions for short and long-term?

	No , revise project to move toward desired landscape conditions or document concerns below.
	Yes , complete sections below.

Can silviculture prescriptions incorporate all Project Design Criteria (PDC) and any new resource concerns identified?

	No , revise project or document concerns below.
	Yes , complete silviculture prescription including PDC and resource concerns.

Additional Comments/Concerns: (other important information; Include who, what, when, where, as needed)

This documents the **BIODIVERSITY** input into the adaptive NEPA process for the **La Garita Hills Restoration Project**. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Biodiversity input required?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

Comments: (Document why Biodiversity input is not needed, other important information)

Do any forested stands in project meet old growth criteria or potentially have old growth attributes?

	No, document findings in comment section below.
	Yes, complete sections below.

Can management activity retain or promote old growth attributes and sustain old trees?

	No, document findings and any recommendations in comment section below.
	Yes, coordinate with silviculturist and document any mitigation in comment section below.

Does level and sizes of coarse woody debris (CWD) in forested stands meet identified resource objectives (minimums must meet FP standards)?

	No, document needed mitigation in comment section below.
	Yes, complete sections below.

Are snag numbers in forested stands meeting PDC &/or identified resource objectives documented in silvicultural prescription (minimums must meet FP standards)?

	No, document findings and any recommendations for leaving future recruitment snags in comment section below.
	Yes, coordinate with silviculturist and document and/or document mitigation in comment section below.

Does project have opportunities to increase aspen regeneration to maintain aspen on the landscape?

	No, aspen is not present.
	Yes, coordinate with silviculturist and document and/or document mitigation in comment section below.

Additional Comments/Mitigation: (other important information; Include who, what, when, where, as needed)

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This documents the **WILDLIFE** input and compliance review into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Name _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is additional Wildlife input required for this project?

	No , sign and turn in (document why input is not required in comment section below).
	Yes , complete separate INDIVIDUAL TREATMENT UNIT CHECKLISTS, as needed; record results below. *Compile <u>unit</u> checklist results in spreadsheet or other tracking systems for each applicable review item listed below for each unit proposed for treatment, as needed*.

Comments (document why wildlife input is not needed, other important information):

Summary of Individual Treatment Unit Checklist Results and Applicable Design Features

Cover type(s) present	Acres
Spruce-fir	
Spruce- mixed-conifer	
Aspen Mix	
Douglas-fir/mixed conifer: cool moist or cool dry	
Douglas-fir/mixed conifer: warm/dry	
Ponderosa pine	
Piñon-juniper	

Lynx Habitat Review

Mapped Lynx habitat in project area (see current Forest lynx habitat map)

	No , continue to next species section.
	Yes , continue below

Has field verification of all mapped lynx habitat units been completed?

	No , Include rationale for not completing or additional time needed to complete below:
	Yes , complete input sections below

Have necessary dense horizontal cover (DHC) surveys completed?

	No , conduct surveys as needed.
	Yes , continue.

Do any project units contain DHC patches ≥ 0.3 acres?

	No.
	Yes, coordinate with project lead on how to protect or designate for retention.

Photographic documentation obtained for units not requiring DHC surveys?

	No, obtain & file photographs for documentation, as needed.
	Yes. Continue to the next section.

Average horizontal cover percentage evaluated for each treatment unit?

	No, determine average horizontal cover either from DHC surveys or, if obviously less or more than 35%, provide an ocular estimate based on an appropriate number of point locations, based on unit size or other factors.
	Yes

Are any of the proposed treatment units identified as SRLA VEG S6¹²?

	No, continue to the next section.
	Yes, apply appropriate SRLA management direction. Document and track any incidental impacts to VEG S6 DHC.

Are any treatment units in spruce-fir, spruce-mix conifer, or Douglas-fir/mixed conifer cool-moist vegetation zones?

	No
	Yes, work with project lead to ensure timing restriction are applied to avoid disturbance to lynx, as appropriate.

Are any treatment units in spruce-fir, spruce-mix conifer, or Douglas-fir/mixed conifer cool-moist vegetation zones?

	No
	Yes, work with project lead to ensure primary red squirrel cone caches are identified and protected, as described in the PDC.

Is landscape connectivity for Canada lynx maintained by the project?

	No, work with project lead to adjust treatments to maintain connectivity.
	Yes.

Comments/recommendations regarding lynx habitat (Include who, what, when, where, as needed).

--

¹² Stand is multi-storied (≥ 2 layers), mature or late successional ($\geq 40\%$ live canopy closure) and has patches¹² of Dense Horizontal Cover (DHC; i.e., $\geq 35\%$ horizontal cover) providing winter snowshoe hare habitat.

Raptors

Are any treatment units located within the buffer zone of an occupied northern goshawk or other raptor nest?

	No , continue to next section.
	Yes , identify the appropriate buffer zone & timing activity restrictions according to design criteria, record. Add any additional comments or recommendations in the box below.
	If yes , are any planned treatment in the post-fledging area? If so, discuss any changes to prescriptions with silviculturist and project lead.

Comments/recommendations regarding raptors (Include who, what, when, where, as needed).

Bats/Caves/Mines

Are there prescribed broadcast burn treatment areas/units within 1/4 mile of a cave or abandoned underground mines?

	No , continue to next section.
	Yes , consult with wildlife biologist for appropriate mitigations and record below
	Mitigations:

Cavities/Nests

Documented nest sites for MIS or sensitive cavity nesters.

	No , continue to next section.
	Yes , designate tree for retention, as needed; coordinate with project lead. .

Comments/recommendation regarding cavities/nests (Include who, what, when, where, as needed).

Big Game Range

Treatment unit within MA-5.41 or MA-5.42?

	No
	Yes , consult with wildlife biologist for appropriate adjustments in placement/timing of treatment and record below.
	Implementation Adjustments:

Treatment unit within potential mule deer or elk fawning or calving areas?

	No
	Yes , consult with wildlife biologist for appropriate adjustments in placement/timing of treatment as needed and record below.
	Implementation Adjustments:

Prescribed Burning

Is the project a prescribed broadcast burn treatment that includes early seral aspen clones or shrub lands over two acres?

	No
	Yes , Defer treatment unless beneficial objectives are identified (provide below)
	Beneficial Objectives:

Is the project a prescribed broadcast burn treatment within ¼ mile of SW willow flycatcher habitat?

	No
	Yes , is activity proposed during the breeding season? If yes, defer treatment until outside breeding season.

Site Specific Wildlife Needs

Are additional site specific measures needed to conserve habitat for MIS/Sensitive Species?

	No
	Yes , describe the measures and indicate applicable units/roads below. Describe the rationale or reason for the additional measures.

Do any units require the retention or recruitment of big game screening cover adjacent to roads or openings?

	No , continue to the next section.
	Yes , describe recommended treatment modification to silviculture or prescribed burn prescriptions in the section below and indicate applicable units or road sections

Are any units located in ponderosa pine or other potentially suitable habitat for turkey nesting?

	No , done with this section.
	Yes , describe recommended treatment or timing modification to silviculture or prescribed burn prescriptions in the section below.

Comments/additional recommendations and rationale (Include who, what, when, where, as needed).

--

This documents the **FISHERIES** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Fisheries input required?

	No , sign and turn in (document why in comment section below).
	Yes , complete input sections below.

Comments: (document why fisheries input is not needed and other important information)

Does the project include any activities in or adjacent to riparian areas with perennial streams or pools → riparian encroachment or hazard tree cutting?

	No , done with this section.
	Yes , complete sections below; include comments or design features in box below.

Comments/project design features- riparian encroachment/hazard tree cutting

Does the project area include Rio Grande Cutthroat (RGCT) inhabited streams?

	No , done.
	Yes , complete input section below.

Is there a road crossing of a flowing stream that requires in-water construction or road reconstruction activities in or near RGCT inhabited streams?

	No - done with this section
	Yes - -identify any additional design criteria or mitigation needed below.

Site-Specific Road or Stream Crossing Design Requirements: (List specific units and/or roads (if known) where other activities will occur associated with the project. If specific locations are not known at this time, indicate whether the activity will occur with “Yes” or “No”):

Road Number	Project Unit Numbers (if known)	Required Design Criteria, BMPs, and/or Mitigation Measures

PROJECT MONITORING NEEDS/RECOMMENDATIONS (i.e. sediment, shading, design criteria implementation, other; Include who, what, when, where, as needed.)

This documents the **RANGE MANAGEMENT** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
 Type of activity: _____
 Specialist Signature _____ Date _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

What Allotment(s)/Pasture(s) is the project area in (provide specifics as needed)?

Allotment(s)	Acres in Allotment Affected	Livestock #s	Season of Use	# of permits

Is Range input required?

	No, sign and turn in (document why in comment section below).
	Yes, complete sections below.

Comments: (document why range input is not needed or other information)

Does project include prescribed broadcast burning?

	No, continue to the next section.
	If Yes, would proposal affect multiple pastures under one grazing permit in one season? If so, discuss with line officer to determine course of action. Notify permittees, as appropriate.

Are there Range improvements within the project area?

	No. Continue to the next section.
	Yes, provide range improvement/monitoring point locations (ex. shape files, GPS coordinates, maps) as agreed to.
	Unknown, discuss situation with timber or fuel specialists to determine course of action. Can data be collected prior to implementation? If so, GPS improvements and add to database and project map(s).

Will project affect the effectiveness of existing fence lines?

	No, Done with this section.
	Yes, Will temporary fences be needed to control livestock movements? If so, determine location and other needs.

PROJECT MONITORING NEEDS/OTHER RECOMMENDATIONS (include who, what, when, where, as needed)

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This documents the **INVASIVE SPECIES and NOXIOUS WEED** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Invasive Species/Noxious Weed input required?

	No , sign and turn in (document why in comment section below).
	Yes , complete Invasive species/noxious weed input section below.

Comments: (document why invasive species input not required or other important information)

Are there Invasive Species/Noxious Weeds within the project treatment area?

	No .
	Unknown , entire project area has not been surveyed.
	Yes , provide infestation information, avoidance areas, biological treatment sites, etc. (ex. shape files, maps, acreage) as agreed to. Continue to next section.

If Invasive Species/Noxious Weeds are present and may be increased by project activities, can project be adjusted to avoid invasive plants or noxious weeds?

	No , treat weeds prior to implementation.
	Yes , avoid additional disturbance; add to program of work for weeds, as appropriate.

Is spring broadcast burning proposed in an area with cheatgrass?

	No , done.
	Yes , can project be adjusted or other mitigation applied to minimize cheatgrass increase.

PROJECT MONITORING NEEDS/OTHER RECOMMENDATIONS (i.e. need for KV funds for invasive treatment, additions to program of work, etc. Include who, what, when, where, as needed)

This documents the **BOTANY** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
 Type of Activity: _____
 Specialist Signature: _____ Date: _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Botany input required? Does potential habitat for Sensitive or Species of Local Concern occur in activity area?

	No. (ie. no potential habitat is present or other reason), sign and turn in (document why in comment section below).
	Yes. -continue to the next section.

Comments: (document why botany input not required or other important information)

Project area been surveyed for botanical resources and area contains identified potential habitat for or known populations of sensitive plants or species?

	No. Area has NOT been surveyed for botanical resources or survey results no longer valid. Go to the next section.
	Yes. Area has been surveyed for botanical resources and survey results still valid and GIS layer indicates no potential conflicts.

Can an effective botanical survey be conducted prior to project implementation?

	No. Estimate potential risks to best of your knowledge, and present issue to line officer. One of the assumptions used in analysis was that unsurveyed areas are considered occupied. Document discussion and outcome and include in signed review.
	Yes. Conduct survey for botanical resources, documenting survey and findings.

MEADOWS AND GRASSLANDS

Do proposed activities overlap grasslands and meadow(s)?

	No. Continue to next section.
	Yes. Ensure that activities not adversely impact botanical resources and all necessary design criteria needed to protect meadows are implemented.

Proposed activity area contains wetland(s) or fen(s)?

	No, continue to the next section.
	Yes, if wetland is unmapped add the feature to the implementation map. Ensure all mapped wetlands are protected, as required.

ROADS

- Was there a route review?
- Will roads be sprayed with chemical dust abatement?
- Are roads going to be temporary or system? Be prepared to visit road sites with engineers and/or a route review.

PROJECT MONITORING NEEDSS/RECOMMENTATIONS/COMMENTS- Summarize your thoughts and any conflicts, issues, or pertinent discussions you encountered for this project during pre-implementation. If you did not encounter any issues, include that in documentation. Include who, what, when, where, as needed.

This documents the **HYDROLOGY** input into the adaptive NEPA process for **La Garita Hills Restoration Project** implementation. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Hydrology input required?

	No , sign and turn in (document why in comment section below).
	Yes , complete section below.

Comments (document why hydrology input is not required)

EQUIVALENT ROADED AREA (ERA) CHECK

Is project located in California Gulch, South Fork Carnero, North Fork Carnero, Middle Fork Carnero, Johns Cr-Saguache Creek, Squaw Creek, or Houselog Creek watersheds?

	No , done with this section.
	Yes , calculate ERA increase due to activities, document below.

Equivalent roaded area – current and expected following project implementation:

STREAM COURSES

Are there any stream courses in or adjacent to the project area?

	No , done with this section.
	Yes , have appropriate WIZ buffers been applied consistent with approved Project Design Criteria?

Are there any aquatic features of interest that need to be protected (i.e. Instream structures etc.)?

	No , done with this section.
	Yes , complete activity below. Provide location of feature to be protected to project manager.

Are new temporary or old temporary roads needed for project?

	Yes , complete activity below.
	No , go to next section

Are existing old and proposed new temporary roads in or near AMZ/WIZ of streams, lakes, meadows or wetlands?

	Yes , coordinate any road work in areas of concern with sale administration personnel and engineers, as needed, and ensure BMPs and Project Design Criteria are followed.
	No , done with this section.

- Expected new temporary road locations should be shown on the project implementation map for review or field verification; these location may change during implementation. Temporary road cuts exceeding two feet should be avoided; if this is infeasible because of steep slopes, coordinate the extent of stabilization needed with soils and engineering specialists.
- Ensure that temporary roads are physically closed, and seeded, as soon as possible after sale activities. Appropriate closure methods may include: locked gates, dirt berms, boulders, downed trees, fences, or re-contouring. Any recommendations for closing should be included in Comment section below.

Comments/Recommendations: (other important information)

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Any there any new temporary road-stream crossings needed (Connected Disturbed Area)?

	No , done with this section.
	Yes , Design Criteria: Coordinate with timber sale administration personnel to ensure crossings are constructed to minimize streambank disturbance and sediment mobilization, allow for the passage of flood flows, debris and aquatic organisms for the life of the structure and crossing.

Site-Specific Road - Stream Crossing Design Requirements:

Road/Trail Number	Units Accessed	Required Design Criteria, BMPs, and/or mitigation measures

WETLANDS AND SPRINGS

Are there any wetlands or springs within or immediately adjacent to activity units?

	No , done with this section.
	Yes , have appropriate buffers been applied to protect wetland or springs?

Project Unit Numbers	Road Number

PROJECT MONITORING NEEDS/RECOMMENDATIONS (units or roads for BMP monitoring, other; Include who, what, when, where, as needed)

Potential BMP Evaluation Forms to be completed:

- Road A- Active Road and/or Crossing Construction or Reconstruction
- Road B- Completed Road and Crossing Construction or Reconstruction
- Road C- Road and Crossing Operations and Maintenance
- Road D- Road Storage
- Road G- Snow Removal and Snow Storage
- Road H- Parking and Staging Areas
- Road I- Equipment Refueling and Servicing
- Vegetation A- Ground- Based Skidding and Harvesting
- Vegetation C- Mechanical Site Treatments
- Chem A- Chemical Use Near Water
- Chem C- Application of Road Chemicals

This documents the **SOILS** input into the adaptive NEPA process for **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
 Type of activity being proposed: _____
 Specialist Signature _____ Date _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Soils input required?

	No, sign and turn in (document why in comment section below).
	Yes, complete sections below.

Soils - List of all soil map units within this project area and acres and/or percentage:

Map Unit Symbol	Soil Map Unit Name	Unit Acres	Percent of Total
Total			

SOIL CHARACTERISTICS OF CONCERN

Are there any soil map units with soils in potential treatment areas with a higher potential for mass movement or high Erosion Potential with slopes greater than 30 percent?

	No, done with this section
	Yes, answer questions below.

Are there any areas where the soils have low productivity potential?

	No, done with this section
	Yes, answer questions below.

Are soil surveys complete?

	No, give estimate of time to completed needed surveys & PDC in table below; consider access, experience, timing, etc.
	Yes, complete detailed table.

Are there any sites that were unstable for harvest activities and associated road activities?

Answer	Unit	Road/Other	Additional Design Criteria

Are there any soil map units with at least one of the dominant map unit components (soil series) with a horizon clay content >27 percent?

	No , done with this section.
	Yes , complete activity below.

List soil map units that have limited topsoil, limited organic matter, and shallow rooting depth, high clay content, or high erosion or mass movement potential:

Soil Mgt Unit (SMU)	Activity unit	Road/Other	Concern

Comments: (other important information)

MONITORING

Conduct soil detrimental disturbance surveys on units that have multiple soil concerns. Soils with characteristics that may increase their likelihood of potential risk of effects reaching a level to that of being detrimental for each group of activities should be the prioritized pre- and post- soil disturbance assessments for the adaptive management monitoring. Follow the National Soil Assessment process. Include who, what, when, where, as needed.

Recommend Project Unit Numbers for Soils Monitoring	Rationale for monitoring (why unit/road was selected)

Conduct monitoring on units next to waterbodies. Follow National BMP evaluation process. Include who, what, when, where, as needed.

Recommend Project Units and Roads for BMP Monitoring

Potential BMP Evaluation Forms to be completed:

- Road A- Active Road and/or Crossing Construction or Reconstruction
- Road B- Completed Road and Crossing Construction or Reconstruction
- Road C- Road and Crossing Operations and Maintenance
- Road D- Road Storage
- Road G- Snow Removal and Snow Storage
- Road H- Parking and Staging Areas
- Road I- Equipment Refueling and Servicing
- Vegetation A- Ground- Based Skidding and Harvesting
- Vegetation B- Cable and Aerial Yarding Operations
- Vegetation C- Mechanical Site Treatments

- Chem A- Chemical Use Near Water
- Chem C- Application of Road Chemicals

This documents the **DEVELOPED/DISPERSED RECREATION** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature: _____ **Date:** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Recreation input required?

Yes	No	Resource Program
		PUBLIC SAFETY. Consider project specific needs to maintain visitor safety.
		DEVELOPED RECREATION FACILITIES. Research GIS layers, INFRA Database, and files. Possible Developed Recreation Facilities; campgrounds, public use cabins, picnic grounds, interpretive signs, wayside exhibits, bulletin boards, trailheads, kiosks, concentrated use areas, etc.
		TRAILS. Research GIS layers, INFRA Database and files. Forest System Motorized & Non-Motorized Trails and Season(s) of Use ;
		SPECIAL USES. Research GIS layers, INFRA Database and files. Possible uses could include: outfitter/guides, multi-year recreation events, other recreation activities/features under permit, etc.
		DISPERSED RECREATION.
		Coordinate any proposed additional mitigation with the Forest Resource Program lead and District Ranger.

Comments: (other important information)

PUBLIC SAFETY

For all management activities, implement appropriate safety signing or other cautionary signs in conjunction with all management activities to ensure public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).

Other Recommendations:

FOREST DEVELOPED RECREATION FACILITIES -

Are campgrounds present within or adjacent to project or may be impacted by project?

<input type="checkbox"/>	No, continue to next section..
<input type="checkbox"/>	Yes, complete section below.

Campground Name	Project Design Elements
	Protect campground facilities and improvements, some of which may not be located within the campground or recreation site. Ensure recreation related improvements are on sale area or other project maps.
	Work with visitor information personnel to notify public prior to arrival about planned activity and timeframes. Offer alternate camping locations. Place information signs in campground and make personal contacts to notify visitors of planned activities.
	If vegetation management activities are needed in campground or picnic area as determined in site-specific vegetation management plan, if possible, complete the work in conjunction with adjacent treatments to minimize disruption to recreational users.

Rental Cabin present or adjacent to project or may be impacted by project?

<input type="checkbox"/>	No, continue to next section..
<input type="checkbox"/>	Yes, complete section below.

Cabin	Project Design Elements
	Protect facilities and improvements (including fences and water improvements) during all periods of vegetation management. Ensure improvements are on sale or project area map, as appropriate.
	The Carnero Cabin can be rented year round under a reservation system. If project activities are occurring near the cabin or activities may adversely affect cabin use, coordinate with the District Ranger/Forest Recreation Staff to address timing activities or not renting the cabin during that time.
	If possible, avoid creating large slash or landing piles in areas within the immediate viewshed of the cabin unless they can be screened by vegetation or topography.
	If slash piles are approved within the immediate viewshed ensure that the slash pile is burned or disposed of as soon as possible and the area is re-vegetated quickly.

Picnic Grounds, Day Use Areas, Trailheads, Interpretive Sites, Bulletin boards, Kiosks or other concentrated public use sites present?

<input type="checkbox"/>	No, continue to next section..
<input type="checkbox"/>	Yes, complete section below.

Feature Name	Project Design Elements
	Protect facilities and improvements during all periods of vegetation management. Ensure improvements are on sale or project area maps.
	If slash piles are approved within the immediate foreground, ensure that the slash pile is burned or disposed of as soon as possible and the areas is re-vegetated quickly.

DISPERSED RECREATION

Are popular dispersed camping sites, present within or adjacent to project?

	No , continue to next section..
	Yes , complete section below.

Area Name	Project Design Elements for all System Trails
	If located in an acceptable area, maintain site characteristics (shade, fire pit, parking area)

Forest System Trails

System Trails, Motorized or Non-motorized, present within or adjacent to project?

	No , continue to next section..
	Yes , complete section below.

Trail Number/ Name	Project Design Elements for all System Trails
	All developed trails will be shown as protected improvements. Project administrators will ensure protection of trails during project implementation. Ensure improvements are on sale or project area maps, as appropriate.
	Coordinate trail crossings during logging operations with recreation staff.
	If trail needs to be temporarily closed during project activities, coordinate with VIS and use other public notification measures; ensure trail closures are signed on the ground. Identify temporary re-routes, if possible, depending on the length of closure.
	As needed, coordinate vegetation management prescriptions adjacent to trails to enhance trail safety and meet other trail management objectives.
	Timber sale and vegetation treatment contracts include the following provision(s) to protect system trails: Fall trees and skid logs away from the trail and ensure that trails are free of slash. Should a crossing of the trail be required, coordinate crossing location with District Recreation Staff.
	Effectively block skid trails and temporary roads, especially those adjacent to motorized trails, so that treatment activities do not result in any new illegal roads or trails after activities are completed

RECREATION SPECIAL USES

Outfitter/Guides, Recreation Events or other Special Use Permits are present within or may be impacted by project?

	No , continue to next section..
	Yes , complete section below.

Permit Type/ Name	Project Design Elements
	Appropriate safety signing or other cautionary measures would be implemented in conjunction with all management activities to ensure public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).
	All affected or potentially impacted Special Use permittees <u>are to be contacted</u> directly (in person or by phone, followed up with updates by letter, email, or phone) and kept informed of proposed, planned, and contracted activities in the treatment area as they progress.

PROJECT MONITORING NEEDS/RECOMMENDATIONS (i.e. dust levels near campgrounds, smoke effects) Include who, what, when, where, as needed.

This documents the **TRANSPORTATION** input into the adaptive NEPA process for the **La Garita Hills Restoration project** analysis. Document each question, it is important to fill this out, sign and file for future reference **La Garita Hills Vegetation Restoration Project** and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Transportation/roads input required?

	No, sign and turn in (document why in comment section below).
	Yes, complete sections below.

Comments: (document why transportation input is not required, other important information)

This section contains a sequence of activities that should take place prior to implementation of each project. Place an "X" beside each activity after it is completed.

	Identify road needs for each cutting unit.
	List roads and work items for System Roads on the road summary sheet and illustrate on a map.
	Send Road Summary Sheet and Map to team members.
	Work with team members to refine road needs and work through this implementation checklist.
	Have road signs needed for public safety and notification been incorporated?
	Schedule and hold a Route Verification with Team and Line Officer.
	Carry final road work items and any concerns to the final Road Summary Sheet for Line Officer review and signature.

Insert the results of road review into the following table or attach road summary sheet:

Road Number	Additional Information	Proposed Road Work

(This table will contain the same information as the Road Summary Sheet)

Will any closed system roads (ML 1) need to be used?

	Yes , review and implement material below.
	No , go to next section.

- Ensure road remains closed to public travel;
- Ensure road is physically closed and stabilized as soon as possible after sale activities;
- Specify type of closure recommended, if changed from current condition, in the box below. Appropriate methods may include: locked gates, dirt berms, boulders, downed trees, fences, or re-contouring;
- If access is from a State or County road, consult with the appropriate agency for requirements and approval.

Comments/Recommendations: (other important information)

Are new or old temporary roads expected to be needed for project?

	Yes , complete activity below.
	No , go to next section

- Assist sale administration personnel ensure that temporary roads are physically closed, and seeded, as soon as possible after sale activities. Appropriate closure methods may include: locked gates, dirt berms, boulders, downed trees, fences, or re-contouring. Record any recommendations or concerns for effectively closing below.

COMMENTS/RECOMMENDATIONS: (other important information). Include who, what, when, where, as needed.

This documents the **SCENERY** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Scenery/Visuals input required for this project?

	No, sign and turn in (document why input is not required in comment section below).
	Yes, complete sections below.

Comments (document why scenery input is not required, other important information):

Are developed recreation sites such as campgrounds, picnic grounds, the Carnero cabin, or other developed recreation sites visible from the project area?

	No, continue to next section.
	Yes, complete section below.

Facility Name	Design Criteria Description
	Avoid placing log decks, logging slash piles, or machine piles within 200 feet of these facilities (unless blocked by topography). Limit equipment use within this distance zone as much as possible to minimize ground disturbance.
	If decks or logging slash piles must be put within 200 feet of these facilities, remove or dispose of material as soon as possible and rehabilitate the area as soon as feasible.
	Cut stumps in visible areas within 200 feet of recreation facility boundary to 6 inches or less, as feasible
	Minimize cut slopes in areas visible from developed recreation facilities. If visible cut slopes are created, return the slope to a natural appearing condition and rehabilitate the area and place natural levels of down debris across the routes, and re-seed.
	Minimize strong contrasts in vegetation treatments and avoid geometric patterns, straight lines, and sharp corners by placing boundaries along topographic features or “feathering” along treatment boundaries; this is especially important on visible slopes greater than approximately 30 percent. Tie treatments into natural openings and blend treatments into existing vegetation patterns.

Are routes of concern such as roads 41G, 675, 41K or non-motorized trails, present within or adjacent to project and visible in the foreground?

	No, continue to next section..
	Yes, complete section below.

Road/trail #	Project Design Criteria Description
	Avoid placing log decks, logging slash piles, or machine piles within 200 feet of these facilities (unless blocked by topography). Limit equipment use within this distance zone as much as possible to minimize ground disturbance.
	If decks or logging slash piles must be put within 200 feet of these facilities, remove or dispose of material as soon as possible and rehabilitate the area as soon as feasible.
	Fall trees and skid logs away from road and trails.

Is project area adjacent to and/or visible from private land?

	No, continue to next section..
	Yes, complete section below.

Private Land area	Design Criteria Description
	Minimize strong contrasts in vegetation treatments and avoid geometric patterns, straight lines, and sharp corners between private and federal lands by placing boundaries along topographic features or “feathering” along treatment boundaries; this is especially important on visible slopes greater than approximately 30 percent
	Avoid leaving single spaced trees along ridgelines or openings.

Does the project have potential to increase visual diversity in the foreground of major open roads or other high-use areas? Can any of the following design strategies be incorporated into project design? Place a check by PDC if required for this project.

Required/Unit #	Action
	Where appropriate immediately adjacent to high use roads in especially in lower elevation conifer stands, retain trees in a variety of sizes and use variable or irregular spacing to maintain a more natural appearance. This technique has been very effective in maintaining a natural appearance.
	Implement silviculture treatment to increase aspen to improve visual variety.
	As appropriate, when thinning stands in visible areas along high use roads or hiking trails, highlight large diameter mature trees to the extent appropriate, by removing small trees around them that block the view of distinctive trunks or would act as ladder fuels in a fire.
	Plan, design, and locate vegetative manipulation in a scale which retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural features. Describe additional specific recommendations below.
	Apply general design principles for treatment units: 1) proper siting or location, 2) reducing unnecessary disturbance, and 3) repeating the elements of form, line, color, and texture help solve most visual design problems. Describe additional specific recommendations below.

PROJECT MONITORING NEEDS/ OTHER RECOMMENDATIONS (i.e. SI maintenance, PDC effectiveness, photo points, other; Include who, what, when, where, as needed.)

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This documents the **HERITAGE** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Heritage Tiered Undertaking Checklist La Garita Hills Restoration Project

1) Does the project proposal qualify as an exempt undertaking under the PA (Appendix E)

	No , proceed to next question and chronicle in annual report
	Yes , no additional Section 106 compliance is necessary.

2) Define and describe the Tiered Undertaking APE

	Attach map(s) that clearly illustrates the APE
--	--

3) Identify all cultural resources and previously surveyed areas in the APE

4) Have NRHP evaluations been adequately completed for all cultural properties in the APE?

	No , determine NRHP significance for all cultural properties
	Yes , proceed to next question.

5) Determine potential effects on all historic properties within the APE. Have potential adverse effects to historic properties been identified?

	No . Historic properties have not been identified in the APE. Proceed to next step.
	No . Historic properties have been identified in the APE, but no potential adverse effects have been identified. Proceed to next step.
	Yes , but protective measures can be prescribed to eliminate the potential for adverse effects. Follow PA and clearly identify all stipulations in the summary page at the end of this checklist.
	Yes , and protective measures cannot be prescribed to eliminate the potential for adverse effects. An MOA will be developed in concert with the SHPO to resolve the adverse effect.

6) When NRHP evaluations and effects assessments have been completed for all cultural properties within the APE, project reports shall be written and submitted for consultation prior to project implementation. When consulting under the Project, be certain to reference this fact in all project reports and the first paragraph of consultation correspondence.

This documents the **LANDS AND SPECIAL USES** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____

Type of activity: _____

Specialists Signature: _____ Date: _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Yes	No	Resource Program Area
		LAND ADJUSTMENTS. Research GIS layers, INFRA Databases, and files. Possible Acquisitions, Exchanges, Small Tracts Act Cases, etc.
		LANDS SPECIAL USES. Research GIS layers, INFRA Database and files. Possible linear rights of ways such as power lines, telephone lines, water lines, roads under permit/easement, trails, military training, cemetery, research under permit, etc.
		ENCROACHMENTS AND TRESSPASS Research GIS layers, INFRA and Encroachment Databases and files.
		Coordinated all proposed mitigation identified within this checklist with the Line Officer and others as appropriate.

Is Lands or Special Uses input required for this project?

	No, sign and turn in (document why input is not required in comment section below).
	Yes, complete sections below.

Comments (document why lands/special uses input is not required, other important information):

LANDS SPECIAL USE PERMITS

Utility Corridor (Power lines, Telephone lines, Water lines) Special Use Permits are present within or adjacent to project?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

Road Easements (FLPMA, FRTA, Reciprocal), Road Right of Ways, Road Special Use Permits are present within or adjacent to project?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

Special Use Permits (or other) are present within or adjacent to project?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

LANDS

Land Adjustments (Exchanges, STAs, Acquisitions, and Disposals) present?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

Posted Landlines, Landline Errors, Trespass, Encroachment Issues?

	No, sign and turn in (document why in comment section below).
	Yes, complete section below.

Comments: (other important information)

--

PROJECT MONITORING NEEDS/ OTHER RECOMMENDATIONS (Include who, what, when, where, as needed)

--

This documents the **MINERALS** input into the adaptive NEPA process for the **La Garita Hills Restoration Project** analysis. Document each question, it is important to fill this out, sign and file for future reference and documentation of the process.

Project Name: _____
Type of activity: _____
Specialist Signature _____ **Date** _____

Upon receiving project unit maps with proposed treatment activities and associated infrastructure needs, if any (roads, landing locations, etc.), review the area within and adjacent to the proposed project area. Review approved PDC in Final EIS & relevant LMP guidance or BMPs- Complete the checklist & document any findings, concerns, or additional project design criteria for Line Officer Review in areas provided.

Is Minerals input required?

	No, sign and turn in (document why in comment section below).
	Yes, complete section(s) below.

Comments (document why minerals input is not required, other important information):

What Minerals activity is within the treatment area (provide specifics as needed)?

Type of Minerals Activity*	Name	Legal Location

*Abandoned Mines, Active Mining Claims, Notice of Intent, Plan of Operations, etc.

Is there minerals activity within the Treatment Area?

	No.
	If unknown , is survey warranted and needed (document why in comment section)?
	Yes , Provide active mine and/or abandoned mine locations (e.g., shape files, maps, GPS coordinates) as agreed to..

Are there Design Criteria, Mitigation, or Monitoring available or needed - list only those that are pertinent to this project in section below:

Comments: (PDC, mitigation, monitoring; Include who, what, when, where, as needed.)

Appendix D.5 - Silviculture-Prescribed Fire 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 ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
Engelmann spruce – subalpine fir	<p><u>Short- midterm:</u> A healthy mix of mostly young conifers and aspen regeneration including snags and CWD</p> <p>Retain residual live trees¹⁴ in heavily impacted spruce beetle areas</p> <p><u>Long term:</u> More closed canopy; two or more canopy layers with dense understory cover to provide winter snowshoe hare habitat</p> <p>Maintain 5 to 15 percent seral aspen component on the landscape</p> <p>Moderate future fuel loading to reduce future fire severity</p>		<p>Silvicultural Rx: Salvage dead and dying Engelmann spruce or other species 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 since the residual stand will be at an early seral stage with a causal agent of bark beetles. Complete stocking surveys following harvest completion; Allow stands or portions of stands to convert to aspen or plant Engelmann spruce or other suitable conifer seedlings in understocked stands following harvest to speed forest recovery & meet desired stocking levels.</p>		
			Stand Condition Description	Action(s)	Action(s)
		Multi-storied stand with DHC	Stand is multi-storied (≥2 layers), mature or late successional (≥40% live canopy closure) and has patches ¹⁵ of Dense Horizontal Cover (DHC; i.e., ≥ 35% horizontal cover) providing winter snowshoe hare habitat ¹⁶ . (VEG S6)	Only limited salvage harvest related activities or incidental damage to live overstory or DHC could occur in true VEG S6 stands; cap on total incidental damage ¹⁷ to DHC ¹⁸ , will depend on selected alternative (Alt 2 – 250 ac; Alt 3 – 50 ac; Alt 4 – 150 ac); any incidental damage to DHC from salvage activities is counted against Forest VEG S6 caps; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible	Only pile burning would be used to reduce activity slash; No broadcast burning would occur to protect existing understory
		Multi-storied stand lacking DHC	Stand is multi-storied (>2 layers), mature or late successional (>40% live canopy closure); contains an established understory providing <35% horizontal cover.	Salvage harvest; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible.	
		Single-storied stand	Stand is no longer multi-storied (≥2 layers), mature or late successional due to spruce beetle mortality (≥ 75% overstory mortality ¹⁹), but understory trees provide DHC within the stand OR Stand is single-storied &/or not mature or late successional; and understory provides ≥ 20% horizontal cover.	Salvage harvest; minimize or avoid impacts to healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible. BLOCKS (patches) of DHC ≥0.3 acres would be protected during logging activities through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground or other measures; Incidental damage to advance regeneration providing ≥ 20% horizontal cover	

¹³ Refers to stands mapped as lynx habitat, based on the Forest lynx habitat map.

¹⁴ Residual live trees are those expected to live 2-3 years beyond a given mortality event, such as bark beetle outbreak or wildfire.

¹⁵ Patches or blocks are defined as ≥ 0.3 acre in size

¹⁶ 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.

¹⁷ 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. Lynx habitat with VEG S6 characteristics will generally be avoided except for the possibility of access routes to other treatment areas or some other need arising during implementation.

¹⁸ The term “high quality DHC” used in this table refers to DHC within multi-storied, mature or late successional stands containing ≥ 40% live canopy closure.

¹⁹ Ivan, J., pers. comm.

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
				is counted against LAU VEG S1/VEG S2 caps if overstory cover is reduced to 25% or less.	
		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 ²⁰	Salvage harvest: Not subject to SRLA LAU VEG S1/VEG S2 caps; minimize or avoid impacts to healthy advance regeneration to meet silvicultural objectives.	
Spruce-mixed conifer	<p>Short-midterm: Healthy mix of conifers and aspen in a variety of structural stages</p> <p>Retain residual live trees in heavily impacted spruce beetle areas</p> <p>Long term: More closed canopy; two or more canopy layers with dense understory pockets to provide winter snowshoe hare/lynx habitat</p> <p>Maintain 5 to 15 percent seral aspen component on the landscape</p> <p>Moderate future fuel loading to reduce future fire severity</p>		Silvicultural Rx: Salvage dead and dying spruce or other species to recover economic value; sanitize mixed conifer stands to reduce insect and disease levels to improve residual stand health. These harvest treatments are generally expected to be an intermediate harvest. Complete stocking surveys following harvest. For any understocking stands allow stands or portions of stands to convert to aspen or plant Engelmann spruce or other suitable conifer seedlings to speed forest recovery and meet desired stocking levels.		
			Stand Condition Description	Action(s)	Actions(s)
		Multi-storied stand with DHC	Stand is multi-storied (≥2 layers), late successional (≥40% live canopy closure) with patches of DHC (VEG S6)	<u>Only limited salvage harvest related activities or incidental damage to live overstory or DHC could occur in true VEG S6 stands: see spruce-fir section for total caps on incidental damage for each alternative;</u> any incidental damage from salvage activities is counted against Forest VEG S6 caps; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstory canopy cover to the extent feasible.	Only pile burning would be used to reduce activity slash; No broadcast burning would occur to protect existing understory
	Multi-storied stand lacking DHC	Stand is multi-storied (>2 layers), mature or late successional (>40% live canopy closure); contains an established understory providing <35% horizontal cover.	<u>Salvage/sanitation harvest or uneven-aged (UEA) management, as appropriate to meet objectives;</u> Sanitation/salvage focus harvest on major pockets of dead of dead, dying, diseased trees; If regeneration harvest is needed: Single Tree Selection (STS) or Group Selection (GS); minimize or avoid impacts to healthy advance regeneration to the extent feasible; openings created by group selection will not exceed 20% of a stand in a single entry; GS acres count against LAU VEG S1/VEG S2. STS outside group selection openings does not count against any of the caps ²¹ .		

²⁰ 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.

²¹ SRLA Implementation Guide, Page 8

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines															
	Mature/old stands (R2 HSS classification) are 30 to 50 percent of vegetation zone, well distributed across watersheds; Existing old trees are maintained	Single-storied stand	Stand is no longer multi-storied (≥ 2 layers), mature or late successional due to spruce beetle activity ($\geq 75\%$ overstory mortality), but understorey trees provide DHC OR Stand is single-storied &/or not late successional; Understorey provides $\geq 20\%$ horizontal cover.	Salvage/Sanitation harvest; minimize or avoid impacts to quality advanced regeneration to the extent feasible. BLOCKS (patches) of DHC ≥ 0.3 acres would be protected during logging activities through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground or other measures; Incidental damage to advance regeneration providing $\geq 20\%$ horizontal cover is counted against VEG S1/VEG S2 caps if overstorey cover is reduced to 10% or less.																
		Currently unsuitable	75% or more of the overstorey is dead or projected to be dead in two years due to high levels of insect or disease activity, AND understorey trees provide $< 20\%$ horizontal cover above the snow during winter.	Salvage/sanitation harvest; Not subject to SRLA LAU VEG S1/VEG S2 caps; minimized or avoid impacts to healthy advanced regeneration to meet silvicultural objectives.																
Douglas fir/ mixed conifer (cool/moist & cool/dry) and Aspen mix	<p><u>Short & Long Term:</u> Sustainable tree densities; endemic insect and disease activity;</p> <p>A mix of multi (UEA) and single-storied (EA) stands; to the extent feasible, more multi-storied in suitable lynx habitat</p> <p>Higher canopy closure in cool-moist mixed conifer sites and on northerly aspects</p> <p>More open canopy conditions in cool-dry mixed conifer & southerly aspects;</p> <p>Maintain 5 to 15 percent seral aspen component in a range of structural stages on the landscape;</p> <p>Increase VSS 1 & 2</p>		<p>Silvicultural Rx: A variety of commercial harvest or non-commercial treatment activities may be needed depending on stand capability, stand density, level of insect or disease activity, as needed to move toward desired structural conditions and meet other resource objectives across the landscape. Complete stocking surveys for regeneration harvest areas. Monitor and evaluate movement toward desired stand and landscape conditions.</p> <table border="1"> <thead> <tr> <th>Stand Condition Description</th> <th>Action(s)</th> <th>Action(s)</th> </tr> </thead> <tbody> <tr> <td>Multi-storied mature or late-successional stand with DHC</td> <td>Stand is multi-storied (≥ 2 layers), mature or late successional ($\geq 40\%$ live canopy closure) and has DHC (VEG S6)</td> <td>Only limited salvage/sanitation harvest related activities or incidental damage to live overstorey or DHC could occur in true VEG S6 stands: see spruce-fir section for total caps on incidental damage for each alternative; any incidental damage to DHC from salvage activities is counted against Forest VEG S6 caps; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstorey canopy cover to the extent feasible.</td> <td>Only pile burning would be used to reduce activity slash;</td> </tr> <tr> <td>Mature mixed conifer stand lacking DHC, but with $\geq 20\%$ horizontal cover</td> <td>Mixed conifer stand is mature single-storied or immature multi-storied with insect or disease activity present to the extent that stand health & growth is being impacted; healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present.</td> <td>Salvage/sanitation harvest or uneven-aged (UEA) management, as appropriate; Salvage/sanitation focus harvest on major pockets of dead or dead, dying, diseased trees; If regeneration harvest is needed: Single Tree Selection (STS) or Group Selection (GS); minimize or avoid impacts to quality advance regeneration to the extent feasible. Retain $\geq 25\%$ overstorey canopy closure at the stand level; Regeneration acres due to Group Selection acres would count against LAU VEG S1/VEG S2 cap acres.</td> <td>Only pile burning would be used to reduce activity slash;</td> </tr> <tr> <td>Mature mixed conifer stand lacking $\geq 20\%$ horizontal cover; declining aspen may be present</td> <td>Mixed conifer stand is mature; overstorey mortality $< 75\%$, insect or disease activity may or may not be present; evidence of declining aspen may be present; NO healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present, but stand HAS the site capability to develop & sustain</td> <td>A variety of silvicultural actions may be implemented to meet objectives; maintain a minimum of 25 percent canopy cover for intermediate harvest prescriptions; Intermediate harvest prescriptions not subject to SRLA LAU VEG S1/VEG S2 caps; Regeneration opening acres (patch cuts/clearcuts to</td> <td>As verified by field review, if a stand is NOT currently suitable snowshoe hare/lynx habitat: pile burning and/or</td> </tr> </tbody> </table>			Stand Condition Description	Action(s)	Action(s)	Multi-storied mature or late-successional stand with DHC	Stand is multi-storied (≥ 2 layers), mature or late successional ($\geq 40\%$ live canopy closure) and has DHC (VEG S6)	Only limited salvage/sanitation harvest related activities or incidental damage to live overstorey or DHC could occur in true VEG S6 stands: see spruce-fir section for total caps on incidental damage for each alternative; any incidental damage to DHC from salvage activities is counted against Forest VEG S6 caps; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstorey canopy cover to the extent feasible.	Only pile burning would be used to reduce activity slash;	Mature mixed conifer stand lacking DHC, but with $\geq 20\%$ horizontal cover	Mixed conifer stand is mature single-storied or immature multi-storied with insect or disease activity present to the extent that stand health & growth is being impacted; healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present.	Salvage/sanitation harvest or uneven-aged (UEA) management, as appropriate; Salvage/sanitation focus harvest on major pockets of dead or dead, dying, diseased trees; If regeneration harvest is needed: Single Tree Selection (STS) or Group Selection (GS); minimize or avoid impacts to quality advance regeneration to the extent feasible. Retain $\geq 25\%$ overstorey canopy closure at the stand level; Regeneration acres due to Group Selection acres would count against LAU VEG S1/VEG S2 cap acres.	Only pile burning would be used to reduce activity slash;	Mature mixed conifer stand lacking $\geq 20\%$ horizontal cover; declining aspen may be present	Mixed conifer stand is mature; overstorey mortality $< 75\%$, insect or disease activity may or may not be present; evidence of declining aspen may be present; NO healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present, but stand HAS the site capability to develop & sustain	A variety of silvicultural actions may be implemented to meet objectives; maintain a minimum of 25 percent canopy cover for intermediate harvest prescriptions; Intermediate harvest prescriptions not subject to SRLA LAU VEG S1/VEG S2 caps; Regeneration opening acres (patch cuts/clearcuts to	As verified by field review, if a stand is NOT currently suitable snowshoe hare/lynx habitat: pile burning and/or
		Stand Condition Description	Action(s)	Action(s)																
		Multi-storied mature or late-successional stand with DHC	Stand is multi-storied (≥ 2 layers), mature or late successional ($\geq 40\%$ live canopy closure) and has DHC (VEG S6)	Only limited salvage/sanitation harvest related activities or incidental damage to live overstorey or DHC could occur in true VEG S6 stands: see spruce-fir section for total caps on incidental damage for each alternative; any incidental damage to DHC from salvage activities is counted against Forest VEG S6 caps; minimize or avoid impacts to any healthy advance regeneration and green trees contributing to overstorey canopy cover to the extent feasible.	Only pile burning would be used to reduce activity slash;															
		Mature mixed conifer stand lacking DHC, but with $\geq 20\%$ horizontal cover	Mixed conifer stand is mature single-storied or immature multi-storied with insect or disease activity present to the extent that stand health & growth is being impacted; healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present.	Salvage/sanitation harvest or uneven-aged (UEA) management, as appropriate; Salvage/sanitation focus harvest on major pockets of dead or dead, dying, diseased trees; If regeneration harvest is needed: Single Tree Selection (STS) or Group Selection (GS); minimize or avoid impacts to quality advance regeneration to the extent feasible. Retain $\geq 25\%$ overstorey canopy closure at the stand level; Regeneration acres due to Group Selection acres would count against LAU VEG S1/VEG S2 cap acres.	Only pile burning would be used to reduce activity slash;															
Mature mixed conifer stand lacking $\geq 20\%$ horizontal cover; declining aspen may be present	Mixed conifer stand is mature; overstorey mortality $< 75\%$, insect or disease activity may or may not be present; evidence of declining aspen may be present; NO healthy patches of understorey that provide $\geq 20\%$ horizontal cover are present, but stand HAS the site capability to develop & sustain	A variety of silvicultural actions may be implemented to meet objectives; maintain a minimum of 25 percent canopy cover for intermediate harvest prescriptions; Intermediate harvest prescriptions not subject to SRLA LAU VEG S1/VEG S2 caps; Regeneration opening acres (patch cuts/clearcuts to	As verified by field review, if a stand is NOT currently suitable snowshoe hare/lynx habitat: pile burning and/or																	

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
	for aspen and mixed conifer stands to 5 to 15 percent across the landscape		DHC & multi-storied conditions <i>(likely cool, moist mixed conifer or aspen mix on northerly aspects; these sites may also have the largest aspen clones)</i>	convert conifers to aspen, group selection acres to increase DHC, or other final harvest to improve landscape & structural diversity) will not exceed 20 % of a stand in a single entry; Any regeneration opening acres would count against LAU VEG S1/VEG S2 caps.	prescribed broadcast burning may be used to meet project objectives and move toward desired landscape conditions
	Mature/old stands (R2 HSS classification) are 30 to 50 percent of vegetation zone, well distributed across watersheds;	Immature mixed conifer stand with <20% horizontal cover	Mixed conifer stand with potential to improve tree quality, reduce insect or disease activity, or improve individual tree growth by reducing tree density by thinning non-commercial sized trees understory trees have grown BEYOND the stage that provides winter hare cover.	Timber Stand Improvement - Pre-Commercial Thinning (PCT): PCT only if thinning prescription can be modified to only remove advanced regeneration no longer providing winter hare habitat AND retain ≥ 25% crown cover; this activity would NOT count against Forest & LAU VEG S5 caps since it would not affect winter hare habitat.	Pile burning or prescribed burning may be used to meet objectives; avoid impacts to existing understory that has not grown past the stage of providing winter hare habitat.
	Existing old trees are retained	Aspen stand in decline or mixed conifer stand with conifer understory layer	Aspen stand or mixed conifer stand with an understory of established conifers that currently provides DHC.	Limited Pre-Commercial Thinning (PCT): up to 500 total acres may be treated across the analysis area in order to cut conifers out of stands to prolong aspen dominance, improve stand health or growth, or meet other objectives. Acres thinned would count against Forest VEG S5 caps.	Only pile burning may be used to reduce activity slash, as needed to meet objectives
		Non-habitat	Field review or stand exam data indicates mixed conifer stand actually has a high component of pines and is too dry to sustain lynx/snowshoe hare cover. Field verification of non-habitat with documentation is required.	Not subject to SRLA: A variety of silvicultural activities may be implemented, as needed to move toward desired conditions; <i>Document conditions and update vegetation species mix and lynx habitat map, as appropriate to ensure data layers reflect better information.</i>	As verified by field review, if a stand is NOT lynx habitat: pile burning and/or prescribed broadcast burning may be used to meet project objectives and move toward desired landscape conditions
Riparian areas –	Short & Long Term: Maintain or increase aspen and willows to maintain stand diversity and promote beaver habitat in suitable areas. (Stream gradient		Silvicultural Rx: Timber Stand Improvement – Precommercial thinning (PCT) using chainsaws or other equipment to hand thin conifers to increase or maintain vegetation patches dominated by aspen and/or willows within riparian stands.		
Engelmann spruce-subalpine fir, spruce mixed conifer, aspen			Stand Condition Description	Action(s)	Action(s)
		Aspen NOT in decline ²²	Vegetation patch is single or multi-storied, aspen clone(s) or willows present; conifers are providing horizontal cover ≥ 20% in BLOCKS or patches > 0.3 acres in size.	No treatment.	No treatment.
		Aspen in decline	Vegetation patch is single or multi-storied, aspen	Limited Pre-Commercial Thinning (PCT): up to a	Only limited hand

²² Aspen is considered to be in decline where evidence suggests that aspen has been reduced from its historic proportion of the landscape. Evidence of decline includes nearby applicable research or studies; comparison of historical and recent aerial photographs; numerous stands with dead or dying mature aspen with little or no aspen regeneration, etc. (SRLA Implementation Guide).

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
mix	<4%)	with conifer understory	clone(s) or willows present; has green conifer understory providing ≤ 20% horizontal cover in patches >0.3 acres in size, but understory has NOT grown past SISS ²³ stage to the point where lower limbs no longer provide winter snowshoe hare habitat ²⁴ .	total of 500 acres across the analysis area may be treated in order to cut conifers out of stands to prolong aspen dominance or meet other objectives. Acres thinned that reduce winter hare habitat would count against Forest & LAU VEG S5 caps.	piling & burning may be used if necessary to meet objectives.
		Aspen lacking horizontal cover	Vegetation patch is single or multi-storied, aspen clone(s) or willows present; conifer understory has grown BEYOND providing winter snowshoe hare habitat.	Precommercial thinning to decrease conifers; this activity would NOT count against Forest VEG S5 caps since it would NOT affect current or future winter hare habitat.	Only limited hand piling & burning may be used if necessary to meet objectives.
Warm-Dry mixed conifer & Ponderosa Pine	<p>Short & Long Term: Sustainable tree densities; endemic insect & disease activity; mix of multi (UEA) and single-storied (EA) stands;</p> <p>Higher canopy closure on northerly aspects; more open conditions on south or west aspects; Increased open spaces with groups, clumps & single trees; Clumps & tree groups should vary in size; 50 to 60% of type with canopy closure <40%;</p> <p>Retain clumps of mature or old trees to meet wildlife needs for closed canopy;</p> <p>Increased VSS 1 & 2 – 5 to 15 percent on the landscape</p> <p>Existing old trees are retained</p> <p>Maintain a seral aspen component, as feasible</p>	Non-habitat	Silvicultural Rx: A variety of commercial harvest &/or non-commercial activities may be needed depending on forest health or resiliency objectives, as needed to move toward desired structural and species composition conditions and meet other resource needs across the landscape. Monitor and evaluate movement toward desired stand and landscape conditions.		
			Stand Condition Description	Action(s)	Action(s)
			Stands with basal area/SDI values exceeding sustainable levels with potential to diversify canopy & stand structure; sufficient excess larger diameter trees for commercial timber harvest	A variety of silvicultural activities may be implemented, as needed to move toward desired conditions. <u>Options include:</u> Group selection, Single Tree Selection, Commercial thinning, Salvage, Sanitation, Improvement cut, Shelterwood establishment or overstory removal cuts.	Pile burning and/or prescribed broadcast burning may be used to meet objectives. Broadcast burn objectives could include: Reduce seedling/sapling density;
			Stands with excess small diameter trees &/or insufficient volume for commercial harvest	<u>Timber Stand Improvement - Pre-commercial thinning (PCT):</u> reduce ladder fuels; use variable spacing to reduce overall density of smaller trees and maintain a natural appearance & move toward desired conditions for mature stand.	Increase aspen sprouting; Reinvigorate grasses, forbs, shrubs Reduce surface
		Viabale aspen clone(s) present in commercial or non-commercially treated stands	<u>Maintain aspen:</u> Reduce conifer competition by cutting conifers within clone(s) and within a tree height of aspen stems, to the extent feasible.		

²³ SISS = Stand Initiation Structural Stage

²⁴ The point where the branches (“crowns”) at the bottom of the tree have self-pruned to levels above the average snow pack (i.e., 1 to 2 or 3 meters), too high for snowshoe hare use. At this point, the stand no longer provides winter snowshoe hare habitat (SRLA Implementation Guide, Page 20).

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
	Mature/old stands (R2 HSS classification) are 30 to 50 percent of vegetation zone, well distributed across watersheds;				fuels Increase canopy base height Site preparation for natural regeneration
Piñon-juniper	<p>Short & Long Term: Diversified stand structure both within and between stands across the landscape;</p> <p>Increased acres with an open (< 40%) canopy closure to increase grass/forb ground cover;</p> <p>Mature/old stands (R2 HSS classification) are 30 to 50 percent of vegetation zone, well distributed across watersheds;</p>	Non-habitat	<i>Silvicultural Rx:</i> Non-commercial activities including thinning using chainsaws or by mastication and/or prescribed burning may be used to move toward desired structural conditions and meet other resource objectives across the landscape. Monitor and evaluate movement toward desired stand and landscape conditions.		
			Stand Condition Description	Action(s)	Action(s)
			Mature stand with little understory vegetation, closed to moderately closed canopy that is similar adjacent stands on operable slopes (<40 %) with potential to support a grass/forb understory	Timber Stand Improvement - Pre-commercial thinning (PCT) using chainsaws or masticators to thin trees to diversify between and within stand structure, decrease canopy closure and increase openings;	Pile burning and/or prescribed broadcast burning may be used to meet objectives: Reinvigorate grasses, forbs, shrubs Reduce surface fuels Increase canopy base height Increase structural diversity
			Mature stand with open canopy conditions with a healthy understory of grasses/forbs	Prescribe maintenance burning or no activity.	
Stands on slopes >40% or with extensive rock	No activity				
SPECIAL EMPHASIS AREAS (Note: for stands located in both the WUI & CRA, the CRA prescription would be followed)					
Wildland Urban Interface (WUI)					
	Desired Condition	Lynx habitat status	Silvicultural Treatment(s) Options - mechanical		Prescribed fire options & use guidelines
Douglas fir/ mixed conifer (cool/moist & cool/dry) and Aspen mix	Move toward desired conditions for WUI as described below; Protect suitable winter snowshoe hare/lynx habitat where it currently exists in these forest types	Multi-storied mature or late-successional stand with DHC	<i>Silvicultural Rx:</i> Design treatment activities to reduce the potential for crown fires and limit extent of crown fires by decreasing stand density, reducing average canopy closure, increasing landscape diversity, and managing surface fuels and ladder fuels. Opportunities primarily non-commercial treatments except limited areas where sufficient amounts of commercial species are present near a suitable road system.		
			Stand Condition Description	Action(s)	Action(s)
			Stand is multi-storied (≥2 layers), mature or late successional (≥40% live canopy closure) and has DHC (VEG S6).	Only limited salvage/sanitation harvest related activities or incidental damage to live overstory or DHC could occur in true VEG S6 stands: see spruce-fir section for total caps on incidental damage for each alternative; any incidental damage from salvage activities is counted against Forest VEG S6 caps.	Only pile burning would be used to reduce activity slash;

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
		Mature mixed conifer stand with ≥ 20% horizontal cover	Mixed conifer stand does not meet desired conditions for WUI & provides ≥ 20% horizontal cover but <35% DHC (not VEG S6).	<u>Salvage/sanitation harvest or uneven-aged (UEA) management, as appropriate</u> ; minimize or avoid impacts to quality advanced regeneration to the extent feasible. BLOCKS (patches) of DHC >0.3 acres would be protected during logging activities through avoidance during unit layout, designated skid trails & landings, flagging or painting on the ground or other measures; Retain ≥ 25 % overstory canopy closure at the stand level; openings created by Group Selection will not exceed 20 percent of a stand in a single entry; Regeneration acres due to Group Selection would count against LAU VEG S1/VEG S2 cap acres. Incidental damage to advanced regen in salvage/sanitation would count against LAU VEG S1/VEG S2 cap acres if overstory cover is reduced to 10% or less.	Only pile burning would be used to reduce activity slash;
		Mature mixed conifer stand with ≥ 20% horizontal cover	Mixed conifer stand does not meet desired conditions for WUI & provides ≥ 20% horizontal cover but <35% DHC (not VEG S6).	<u>Limited Pre-Commercial Thinning (PCT)</u> : up to 500 total acres may be treated across the analysis area in order to cut conifers out of stands to prolong aspen dominance, improve stand health or growth, or meet other objectives such as reducing ladder fuels. Acres thinned would count against Forest VEG S5 caps.	Pile burning or prescribed broadcast burning may be used to meet objectives. If acres are broadcast burned instead of mechanically thinned, these acres would be counted against LAU and Forest S5 cap for this analysis.
		Mature or immature mixed conifer stand lacking horizontal cover; declining aspen may be present	Mixed conifer stand does not meet desired conditions for WUI & stand does NOT currently provide horizontal cover (including stands where the understory has grown BEYOND the height usable by snowshoe hare).	A variety of silvicultural activities may be implemented, as needed to move toward desired conditions. <u>Options include</u> : Group selection, Single Tree Selection, Commercial thinning, Salvage, Sanitation, Improvement cut, Shelterwood establishment or overstory removal cuts and pre-commercial thinning (PCT) Any regeneration acres would count against LAU VEG S1/VEG S2 caps.	As verified by field review, if a stand does NOT currently provide horizontal cover: pile burning and/or prescribed broadcast burning may be used to meet project objectives and move toward desired landscape conditions

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
Warm-Dry mixed conifer, ponderosa pine or piñon-juniper	Most stands have a reduced potential for crown fire development along with fewer continuous acres to sustain crown fire behavior: Maintain or increase species and seral diversity by retaining or increasing aspen and openings dominated by grasses, forbs, and shrubs; Reduced ladder fuels; Managed for reduced surface fuels, especially those less than 3 inches diameter; Increased between stand variation in structure and canopy density.	Non-habitat	Warm dry mixed conifer or ponderosa pine, single or multi-stored stands with a variety of canopy closures and surface fuels	Move stands toward desired conditions using an appropriate silvicultural treatment options. <u>Options include combinations of:</u> Commercial thinning, salvage, sanitation, improvement cut, pre-commercial thinning (PCT) with or without prescribed burning. PCT may be completed with chainsaws or with use of a masticator.	Pile burning and/or prescribed broadcast burning may be used to meet project objectives and move toward desired landscape conditions Objectives could include: Increase structural diversity; Increase aspen where it occurs; Reinvigorate grasses, forbs, shrubs; Reduce surface fuels; Increase canopy base height;
			Piñon-juniper stands single or multi-stored stands with a variety of canopy closures and surface fuels -	<u>Timber Stand Improvement</u> - pre-commercial thinning (PCT) with or without prescribed burning to move toward desired conditions. PCT may be completed with chainsaws or with use of a masticator.	
Colorado Roadless Areas (CRAs) (RGNF only)					
Spruce-fir or spruce mixed conifer	Natural Recovery following spruce beetle epidemic		Silvicultural Rx: Use prescribed broadcast burning to diversify, restore, and maintain forest stand structural conditions, increase aspen regeneration, and increase patchiness of forested stands. In non-forested sites use prescribed broadcast burning to re-invigorated grasses, forbs, and shrubs.		
		Suitable	Stand Condition Description Stands with Engelmann spruce present in combination with other species (except pines). Mature spruce is likely to have been killed by spruce beetle, but immature trees present in understory layers	Action(s) No mechanical thinning	Action(s) No broadcast burning

Vegetation Zone/ Type	Desired Condition	Lynx habitat status ¹³	Silvicultural Treatment(s) Options – mechanical		Prescribed fire options & use guidelines
Douglas fir/ mixed conifer (cool/moist & cool/dry) & Aspen mix	<p>Short & Long Term: A mosaic of conditions with a mix of open and closed canopies, aspen remains a large component on the landscape;</p> <p>Landscape includes snags and varying amounts of coarse woody debris (CWD)</p>	Suitable	Multi-storied, mature mixed conifer stand with patches of DHC.	No mechanical thinning	<p>Prescribed broadcast burning MAY be used if patches of DHC can be protected, and treatment can move stand toward un-even aged conditions or otherwise improve winter lynx/snowshoe hare habitat in the long-term.</p> <p>Incidental damage to DHC would count against VEG S6 caps.</p>
			Mature mixed conifer stand multi-storied or single storied without DHC.	No mechanical thinning	<p>Implement prescribed broadcast burning to move toward desired conditions.</p> <p>Patches of regeneration impacted by prescribed fire would count against VEG S1/VEG S2 caps.</p>
Warm-Dry mixed conifer & Ponderosa Pine	<p>Short & Long Term: A mosaic of conditions with a mix of open and closed canopies, ponderosa pine is maintained or increased; aspen remains on the landscape, where it occurs; old trees are retained;</p> <p>Landscape includes snags and varying amounts of coarse woody debris (CWD)</p>	Non-habitat	Mixed conifer stand with ponderosa pine present or ponderosa pine dominated stand with moderately closed to closed canopy, increasing density with declining diversity, including loss of aspen and reduced understory	No mechanical thinning	Implement prescribed broadcast burning to move toward desired landscape conditions
			Mixed conifer stand with ponderosa pine present or ponderosa pine dominated stand with open canopy with clumps and single trees with healthy understory vegetation	No mechanical thinning	Implement prescribed broadcast burning to maintain desired landscape conditions

Appendix D.6 - Key Resource Monitoring

Forest Vegetation Treatment Activities

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.

Objective: Monitor and evaluate the effectiveness of silvicultural thinning and prescribed broadcast burn activities to ensure project objectives are met. Use results to inform future projects.

Method: Collect pre-treatment and post-treatment vegetation, snags, coarse woody debris, and fuels data on a portion of treated stands in different vegetation zones. Document and evaluate effectiveness of silviculture and prescribed burn prescriptions.

- **Action:** Document evaluation results. If prescriptions are not meeting project objectives, determine what needs to be adjusted to meet objectives.

Biodiversity

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

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

- **Action:** Document evaluation results; if prescriptions are not meeting project objectives, determine what needs to be adjusted to meet objectives.
 - ◆ Snag numbers, species and size.

- ◆ Amount of large woody debris.
- ◆ Aspen retention and regeneration across watersheds.

Wildlife

Objective: Evaluate whether Forest Plan standards and guidelines and project-specific 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. Examples of items important to monitor include:

- Impacts to understory vegetation; retention/protection of 0.3 acre DHC patches
- Acres of damage to Dense Horizontal Cover by project *
- Percentage of damage to developing understory *
- Skid trail designations and landing placements
- Snags, cavity trees, nest trees are being protected;
- Timing of project activities and roads are remaining closed to public travel;
- Riparian area buffers are being maintained

Fisheries

Objective: Evaluate whether Forest Plan standards and guidelines, best management practices, any project-specific design criteria are being implemented effectively to protect aquatic resources; of particular concern is activities adjacent to Rio Grande Cutthroat inhabited streams.

Method: Perform site inspections during and/or following any road construction, reconstruction or vegetative management activities adjacent to perennial streams to determine compliance with project design criteria. Examples of items important to monitor include:

- Sediment increase in streams;
- Changes that reduce aquatic organism passage;
- Rehabilitation of any road-stream crossings

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.

Travel Management

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.

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 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 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 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

Appendix D 7 - Key adaptive management conditions and actions

	Indicators(s)	Scale – Unit of Measure	Monitoring Frequency	Yellow light condition	Adaptive Action	Red light condition	Adaptive Action
CHANGED CONDITIONS – NEW INFORMATION							
New information or changed conditions relating to environmental effects described	New information or changed condition effecting resource measurement indicators	<u>Analysis area or Resource Cumulative Effects Area</u>	On going	New information or changed condition occur – reviewed by IDT and Responsible Official; within scope and range of effects analyzed	None – document and include in project record	Major new information or changed condition occur – reviewed by IDT and Responsible Official; outside scope and range of effects analyzed	Responsible Official determines the type of additional analysis needed.
WATERSHED and SOILS (Forest Plan Standards, Best Management Practices)							
Maintain watershed and stream health in identified HUC 6 watersheds of concern	Track acres disturbed by: Commercial timber harvest; temporary roads; burning of machine piled slash/other severely burned acres	<u>HUC 6 watershed</u> - Acres of expected disturbance converted to Equivalent Roded Area (ERA)	Prior to each project being approved for implementation	N/A	N/A	ERA Surface disturbance in Watersheds of Concern (California Gulch or 130100040307) is calculated at 10 percent	Additional evaluation of stream health is needed. Identify problem areas that may need additional PDC or restoration prior to approving additional disturbance. Discontinue treatments if no additional PDC or restoration is feasible.
Maintain watershed and stream health in identified HUC 7 sub-watersheds of concern	Track acres disturbed by: Commercial timber harvest; temporary roads; burning of machine piled slash/other severely burned acres	<u>HUC 7 sub-watershed</u> - Acres of expected disturbance converted to Equivalent Roded Area (ERA)	Prior to each project being approved for implementation	N/A	N/A	ERA Surface disturbance in Watersheds of Concern (Cave Creek, Miners Creek, or Hat Springs) is calculated at 10 percent	Additional evaluation of stream health is needed. Identify problem areas that may need additional PDC or restoration prior to approving additional disturbance. Discontinue treatments if no additional PDC or restoration is feasible.

	Indicators(s)	<u>Scale – Unit of Measure</u>	Monitoring Frequency	Yellow light condition	Adaptive Action	Red light condition	Adaptive Action
Maintain surface disturbance at less than 15% in remaining HUC 6 watersheds	Track acres disturbed by: Commercial timber harvest; temporary roads; burning of machine piled slash/other severely burned acres	<u>HUC 7 sub-watershed</u> - Acres of expected disturbance converted to Equivalent Roded Area (ERA)/	Prior to each project being approved for implementation	Indicator activities are located: California Gulch, North, Middle, South Forks of Carnero Cr., or John-Saguache Cr watersheds & ERA calculations are at 12% ²⁵	Closely track activities and prioritize future projects to ensure thresholds are not exceeded	Wildfire or other unforeseeable severe disturbance activity occurs that results in 15% of a watershed being disturbed	Discontinue any major surface disturbance activities in watershed pending additional evaluation or until recovery has occurred.
Maintain soil productivity	Acres of detrimental soil disturbance (DSD) following activity completion	<u>Activity unit</u> - - Percent detrimental disturbance	Prior to each project being approved for implementation & post treatment monitoring	Pre-implementation review indicates past timber harvest has occurred in activity unit & soil characteristics are not sensitive	Monitor level of DSD following activity completion; complete any needed rehabilitation within 5 years following harvest completion	Pre-implementation review indicates past timber harvest has occurred in activity unit & soil resource inventory units (SRIs) has sensitive characteristics	Work with IDT to modify unit by adjusting boundaries, identifying additional PDC or mitigation needed to maintain soil productivity. Drop unit from project if soil productivity cannot be maintained.
LYNX HABITAT (Southern Rockies Lynx Amendment to Forest Plan, 2008)							
In lynx habitat - Limit incidental damage from management activities in multi-storied, mature, late successional stands with Dense Horizontal Cover (DHC) (VEG S6)	Acres of salvage harvest & related activities in VEG S6 stands	<u>Analysis area</u> - Acres of incidental damage to DHC	Annually reporting to USFWS	Acres of incidental damage to DHC is at 85 percent of maximum incidental damage acres as approved in Selected Alternative (alternative 2 = 250 acres; alternative 3= 50 acres; alternative 4 = 150 acres)	Closely track activities; prioritize future projects to ensure maximum approved incidental damage acres are not exceeded	Acres of incidental damage to DHC is at 100 percent of maximum incidental damage acres as approved in Selected Alternative	Work with IDT to modify units by adjusting boundaries, identifying additional PDC as needed to avoid any additional impacts to DHC. Drop activity units if impacts cannot be avoided.

²⁵The watersheds listed will depend on the selected alternative, but will include those HUC 6 watershed that have the highest potential to exceed the 15 percent disturbance level of concern.

	Indicators(s)	<u>Scale</u> – Unit of Measure	Monitoring Frequency	Yellow light condition	Adaptive Action	Red light condition	Adaptive Action
Less than 30 percent of lynx habitat in an LAU is in stand initiation structural stage (VEG S1)	Acres of mapped lynx habitat in stand initiation structural stage (SISS) that currently does not provide winter snowshoe hare habitat	<u>LAU</u> - Cumulative acres in SISS due either to natural disturbances &/or management activities	Annually & prior to each project being approved for implementation & post treatment monitoring	Acres of lynx habitat in SISS is at 26 percent in an LAU	Closely track activities; prioritize future projects to ensure SISS does not exceed 30 percent.	Acres of mapped lynx habitat in SISS is at 30 percent in an LAU	Work with silviculturist & IDT to modify units or treatments as needed to avoid any additional regeneration activities in mapped lynx habitat.
Less than 15 percent of mapped lynx habitat in an LAU is regenerated by management activities over a 10 year period (VEG S2)	Vegetation management activities recorded as a stand regeneration treatment	<u>LAU</u> - Acres regenerated within ten years	Annually & prior to each project being approved for implementation	Vegetation management activities have regenerated 12 percent of lynx habitat in an LAU	Closely track activities; prioritize future projects to ensure regeneration does not exceed 15 percent.	Acres of mapped lynx habitat regenerated is at 15 percent in an LAU	Work with silviculturist & IDT to modify units or treatments as needed to avoid any additional regeneration activities in mapped lynx habitat
In lynx habitat – Limit thinning or prescribed burning activities that would reduce densities of seedling or saplings that provide winter snowshoe hare habitat	Acres of pre-commercial thinning (PCT), riparian conifer encroachment, or prescribed burning in stands that provide horizontal cover	<u>Analysis area</u> – Acres treated in lynx habitat that provides horizontal cover	Annually & prior to each project being approved for implementation	Pre-commercial thinning or prescribed burning has reduced seedling or saplings that provide horizontal cover on 425 acres	Closely track activities; prioritize future projects to ensure effects to stands providing horizontal cover does not exceed 500 acres total	Pre-commercial thinning or prescribed burning have reduced seedling or saplings that provide horizontal cover on 500 acres	Avoid additional pre-commercial thinning or prescribed burning that would reduce horizontal cover in lynx habitat
LANDSCAPE RESILIENCY, SUSTAINABILITY, DIVERSITY (Land Resource Management Plans, other agency direction and strategies)							

	Indicators(s)	<u>Scale</u> – Unit of Measure	Monitoring Frequency	Yellow light condition	Adaptive Action	Red light condition	Adaptive Action
Maintain or restore landscape resiliency, sustainability, & diversity; see desired conditions - <i>Silviculture-Prescribed Fire Guidelines–Appendix D.5</i>	Track forested acres treated by activity type & silvicultural objectives by vegetation zone & watershed (focused on drier vegetation zones)	<u>Analyzed HUC 6 watersheds within analysis area</u> – acres commercial thinning; acres pre-commercial thinning; acres regeneration harvest; acres prescribed broadcast burning	Annually & prior to each project being approved for implementation	Less than 40 percent of acres approved for treatment have been implemented or scheduled for implementation within 8 years following the Decision	Closely track activities; prioritize future projects to ensure that projects implemented would maximize restoration benefits	Less than 60 percent of acres approved for treatment have been scheduled for implementation within 10 years following the Decision	Evaluate progress and movement toward desired conditions; prioritize activities that can be completed within 5 years & that could accelerate movement toward desired conditions.

Appendix E – SHPO Programmatic Agreement

PROGRAMMATIC AGREEMENT
AMONG THE RIO GRANDE NATIONAL FOREST,
THE SAN LUIS VALLEY FIELD OFFICE BUREAU OF LAND MANAGEMENT,
AND THE COLORADO STATE HISTORIC PRESERVATION OFFICE
REGARDING
IMPLEMENTATION OF THE LA GARITA HILLS RESTORATION PROJECT

WHEREAS, the focus of the La Garita Hills Restoration Project (hereafter Project) is to restore forest health, wildlife habitats, watershed health, and scenic quality along with providing wood products, safe developed recreations sites, and promoting rural development on lands managed by the 1996 Revised Land and Resource Management Plan, Rio Grande National Forest (Forest) and Bureau of Land Management's (BLM) 1991 San Luis Resource Area Plan; and

WHEREAS, the Area of Potential Effect (APE) of the Project includes 121,115 acres and is located in the northwestern portions of Forest and BLM lands entirely within Saguache County in the San Luis Valley of Colorado(Appendix A); and

WHEREAS, the Forest and BLM propose to carry out a landscape-scale restoration and vegetation management to be implemented over several years using an adaptive management approach to conduct a range of management activities as authorized by the Organic Administration Act (16 U.S.C. 551), the National Forest Management Act of 1976 (P.L. 94-588, 90 Statute 2949) the Healthy Forests Restoration Act of 2003 (P.L. 108-148) and other statutes; and

WHEREAS, Section 106 of the National Historic Preservation Act (Section 106) and its implementing regulations 36 CFR Part 800 as amended titled "Protection of Historic Properties" requires that federal agencies take into account the effect of an undertaking on historic properties as defined by 36 CFR 800.16(l); and

WHEREAS, the Forest and BLM have determined that vegetation restoration and management activities including but not limited to, timber salvage, commercial harvest, thinning, hydro axe and prescribed burning are undertakings, as defined by 36 CFR 800.16(y), and these activities have the potential to affect historic properties; and

WHEREAS, the Forest and BLM intend to satisfy their Section 106 responsibilities through the execution of a programmatic agreement (PA) because the effects on historic properties cannot be fully determined prior to approval of the Project (36 CFR 800.14(b)(1)); and

WHEREAS, a phased approach to the Section 106 process, as outlined by 36 CFR 800.4(b)(2), shall be used because the Project is to be implemented in phases spanning more than one fiscal year, and it is not reasonably possible to complete Section 106 compliance for all aspects of the undertaking prior to reaching a National Environmental Policy Act (NEPA) decision. In this phased approach, a final NEPA decision on the Project will be made prior to completion of the

identification and evaluation of properties in the entire project area. According to 36 CFR 800.5(a)(3), the agency officials will use a phased process in applying the criteria of adverse effect consistent with phased identification and evaluation efforts; and

WHEREAS, the Forest is the lead in the environmental review and the BLM is a cooperating agency with both agencies signing separate Records of Decisions for the Environmental Impact Statement; and

WHEREAS, in order to comply with Section 106 for the Project, both the Forest and BLM are Signatories to this PA; and

WHEREAS, the Forest and BLM will conduct individual Section 106 consultation on project implementation undertakings (hereafter tiered undertakings). The BLM will complete Section 106 consultation on tiered undertakings by following the process as set forth by the *State Protocol Agreement between the Colorado State Director of the Bureau of Land Management and the Colorado State Historic Preservation Officer Regarding the Manner in which the BLM will meet its Responsibilities under the National Historic Preservation Act and the 2012 National Programmatic Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers* (hereafter State Protocol). The Forest will comply with tiered undertakings by following the stipulations of this PA and the Tiered Undertakings Checklist (Appendix B); and

WHEREAS, pursuant to Section 101(d)(6)(B) of the National Historic Preservation Act (NHPA) and 36 CFR 800.2(c)(2)(ii), the Forest and BLM consulted with the Southern Ute Tribe, the Ute Mountain Ute Tribe, The Uintah and Ouray Ute Tribe, the Jicarilla Apache Nation, the Navajo Nation, the Pueblo of Taos, the Pueblo of Picuris, the Hopi Tribe, the Pueblo of Santa Ana, the Pueblo of Santa Clara, the Pueblo of Ohkay Owingeh, the Cochiti Pueblo, the San Ildefonso Pueblo and the Pueblo of Nambe on this PA and have invited those Tribes expressing an interest in the Project to concur in this PA, with the further understanding that, notwithstanding any decision by these Tribes to decline concurrence, the Forest and BLM shall continue to consult with these Tribes throughout the implementation of this PA; and

WHEREAS, Saguache County and the Town of Saguache have been consulted by the Forest and BLM and invited to concur in this PA with no response; and

WHEREAS, the Forest and BLM have consulted with Colorado State Preservation Office (SHPO) pursuant to 36 CFR 800.14 (b); and

WHEREAS, the Forest and BLM notified the Advisory Council on Historic Preservation (ACHP) according 36 CFR 800.6(a)(1) and the ACHP has elected to not participate; and

NOW, THEREFORE, the Forest, BLM and SHPO agree that tiered undertakings associated with the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the Project on historic properties.

The Forest and BLM shall ensure that the following Stipulations are met.

I. SCOPE

This agreement can be applied to tiered undertakings associated with the Project, including but not limited to:

- A. Mechanical and Manual Vegetation Treatments. Mechanical treatments that have the potential to affect historic properties through ground disturbance include those that utilize heavy mechanized equipment to fell and remove trees. Equipment used will vary from project to project but can include feller bunchers, other large wheeled or track vehicles, skidders to push felled trees into larger piles, backhoes, or hydro axes.
- B. Prescribed Burning. Burn units, any locations identified for hand or mechanical fire line construction, and any locations designated for loading, camping, equipment parking, or other fire support activities.
- C. Exempt Undertaking Activities. Vegetation treatment activities that have no potential to adversely affect historic properties are exempt from further review and consultation (Appendix C).
 - i. Only Forest Heritage Professionals and BLM Cultural Resource Specialists will review proposed tiered undertakings to determine whether a specific activity qualifies as an exemption.
 - ii. In consultation with SHPO, Tribes and other consulting parties, the Forest and BLM may propose other classes of exempted undertakings and Appendix C may be revised following agreement by these parties. Such revision will not require formal amendment to the PA.

II. PROFESSIONAL STANDARDS AND QUALIFICATIONS

For work performed on Forest lands, a heritage professional (Appendix D) at the Rio Grande National Forest shall oversee compliance conducted under this PA and shall make recommendations to the agency official. BLM Cultural Resource Specialists shall meet qualifications outlined in their State Protocol for work conducted on its lands (Appendix D).

III. INTERNAL COORDINATION

Forest heritage professionals and BLM cultural resource specialists will be engaged in the project planning process, including scoping, as early as possible to ensure cultural resources are considered in planning and design. Agencies shall ensure coordination between staff throughout the implementation of tiered undertakings carried out under this PA. Pursuant to

36 CFR 800.2(a)(2), the Forest and BLM remain individually responsible for Section 106 compliance for tiered undertakings.

IV. COMPLIANCE PROCEDURES FOR FOREST AND BLM TIERED UNDERTAKINGS

A. Master Class I. A cultural landscape scale analysis, or Master Class I, was completed for the Master Project APE of 121,115 acres to establish the likely presence of historic properties. This overview will be applied for each tiered undertaking, and may be reviewed and modified as needed. This overview will be used to identify and evaluate historic properties that will inform determination of effect for each tiered undertaking. Tiered undertakings will be completed using the following tools:

- Use of the Forest Service and BLM GIS cultural resource survey and site layers
- A predictive model built on slope, aspect, proximity to water and vegetation type
- Previous cultural resource survey and existing sites
- Previous overviews and planning assessments
- Information obtained through tribal consultation and public input
- Information provided by other resource specialists familiar with the APE
- Topographic maps, GLOs, aerial photographs, Google Earth, LiDar, and ortho quads
- Other available GIS layers and maps including soils and slope
- Vegetation layers that may contain culturally modified trees (CMTs)
- Determination of known/expected fire sensitive sites

i. The Master Class I deliverables to SHPO before first tiered undertaking include:

- Summary of existing sites and surveys and maps depicting the location of known sites and previous survey coverage
- Map of landscape analysis using predictive model showing high site probability areas
- La Garita Hills NEPA Heritage Specialist Report

B. The BLM will complete Section 106 consultation on tiered undertakings by following the process as set forth by the State Protocol.

C. The Forest will complete Section 106 on tiered undertakings by following the process as set forth below, using the Tiered Undertaking Checklist in Appendix B and the Survey Strategy outlined in Appendix E.

D. The FS and the BLM shall provide all parties to this PA a combined annual summary report detailing work undertaken pursuant to its terms. Such reporting shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the efforts to carry out the terms of this PA.

V. COMPLIANCE PROCEDURES FOR FOREST TIERED UNDERTAKINGS

- A. Defining the Area of Potential Effect (APE). The APE is defined based upon direct, indirect, and cumulative effects and is documented as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effect is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16(d)). The APE for direct effects is the area within which historic properties may sustain physical alteration or destruction as a result of the Undertaking. The APE for indirect effects on historic properties considers visual, audible, and atmospheric elements that could diminish the integrity of historic properties for which setting, feeling, and/or association are aspects of such integrity.
- B. Initial Cultural Resource Report. The Forest will submit an initial cultural resource inventory report and will consult only on the eligibility of individual cultural resources as they are recorded during future tiered undertakings. The initial cultural resource report shall consist of the following:
- A Cultural Resource Survey Management Form
 - A title page, abstract, table of contents, and introduction
 - An environment section
 - A Culture History and Context section
 - A Statement of Objectives and Research Design
 - Filed methods
 - References Cited
- C. Identification and Evaluation. As specific aspects or locations of an alternative (tiered undertaking) are refined or access is gained, the agency official shall proceed with the identification and evaluation of historic properties in accordance with 36 CFR 800.4(b)(1) and (c). Identification will follow Forest Service Manual 2360 using the identification guidelines as outlined by Appendix E.
- D. Determination of Effect. An inventory report shall be completed at the end of each tiered undertaking and will be submitted to SHPO prior to implementation. Recommendations of National Register of Historic Places (NRHP) eligibility, effect, and treatment will be made at this time. SHPO will review and provide comment in the timeframes explicated below.
- i. No Historic Properties Affected: If no historic properties are present in the APE, or if they are present but will not be affected by activities associated with the undertaking, the Forest will make a determination of “No Historic Properties

Affected”. If SHPO does not respond within 10 business days, the Forest may assume the SHPO has no comment and proceed with the undertaking.

- ii. No Adverse Effect: If a proposed undertaking will affect a historic property, but the effects will not diminish the aspects of integrity or the characteristics that make the property eligible for the NRHP, the Forest will make a determination of “No Adverse Effect”, as defined in 36 CFR 800.5(b). If SHPO does not respond within 10 business days, the Forest may assume the SHPO has no comment and proceed with the undertaking.
 - iii. Adverse Effect: If a proposed undertaking alters, directly or indirectly, any of the aspects of integrity or characteristics of a historic property that qualify it for inclusion in the NRHP, the Forest will make a determination of “Adverse Effect”. The SHPO will respond within 15 business days and, upon concurrence, the Forest shall initiate consultation to resolve adverse effects as set forth by 36 CFR 800.6.
 - iv. If the Forest and SHPO fail to reach agreement on NRHP eligibility, effect and effect resolution, consultation will follow 36 CFR 800.4 through 800.7 as appropriate.
- E. Timing of Project Implementation. Project implementation of tiered undertakings may proceed once all identification efforts, reporting and mitigation measures (if any) have been completed.
- F. Final Cultural Resource Report. A final report will include an evaluation of the survey strategy, evaluation of avoidance and minimization methods, a list of all sites recorded during the Project, summary and conclusions from the entire project. All phases of the cultural resource inventory reports shall be consistent with SHPO guidelines including documentation of all previously recorded and newly recorded cultural resources, and a determination of National Register eligibility for each resource.
- G. Post-Review Discoveries. The Forest shall follow procedures under 36 CFR 800.13 for post review discoveries if historic properties are discovered or if unanticipated effects on historic properties are found after the Section 106 consultation on the effects of the undertaking are completed. The Forest will fully comply with NAGPRA regulations at 43 CFR 10.4 in the event of the discovery human remains, funerary objects, and other NAGPRA items. In addition, the Forest and BLM are signatories to the San Luis Valley Intra-tribal and Intra-agency Memorandum of Understanding that provides procedures for compliance with the Native American Graves Protection and Repatriation Act on federal lands within the San Luis Valley of southern Colorado.
- H. Emergencies. In the event of an emergency, the Forest will follow procedures defined at 36 CFR 800.12.

- I. Limited Finds. All limited finds surveys on the Forest will be reported using the same process outlined in the Limited Finds PA. The Limited Finds PA process will be used throughout the duration of this PA, regardless of whether the Limited Finds PA has expired.

VI. CONFIDENTIALITY

To the extent consistent with the NHPA, Section 304, and the Archaeological Resources Protection Act, Section 9(a), cultural resources data from Forest and BLM lands will be treated as confidential by all signatories and are not to be released to any party not a signatory to this agreement. Duplication or distribution of cultural resource data from Forest or BLM lands by any signatory requires written authorization from the Forest.

VII. DISPUTE RESOLUTION

Should any signatory or concurring party to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented, the Forest and/or BLM shall consult with such party to resolve the objection. If the Forest and/or BLM determine that such objection cannot be resolved, the agencies will:

- A. Forward all documentation relevant to the dispute, including the agency proposed resolution, to the ACHP. The ACHP shall provide the agency with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, agency shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories and concurring parties, and provide them with a copy of this written response. The Forest and BLM will then proceed according to its final decision.
- B. If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, the Forest and/or BLM may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the Forest and/or BLM shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories and concurring parties to the PA, and provide them and the ACHP with a copy of such written response.
- C. The Forest and BLM's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

VIII. AMENDMENTS

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP.

IX. TERMINATION

Any signatory to this PA may initiate termination by providing written notice to the other Signatories of their intent. After notification by the initiating signatory, the remaining Signatories shall have 90 business days to consult to seek agreement on amendments or any other actions that would address the issues and avoid termination. Termination of this PA or failure to abide by its terms shall require the Forest and BLM to comply with 36 CFR 800 with respect to undertakings that would otherwise be reviewed under the terms of this PA.

X. DURATION

This PA shall remain in effect for up to 15 years after the date of execution. The Forest, BLM and SHPO shall re-evaluate the PA every 5 years if necessary. Signatories shall ensure the PA will be re-evaluated and amended to accommodate any changes to the terms. All signatories will be consulted during the amendment process (See Section VIII).

Execution of this PA and implementation of its terms evidences that the Forest and BLM have taken into account the effects of the Project and its tiered undertakings on historic properties.

In witness thereof, the parties to this PA through their duly authorized representatives have executed this PA on the dates cited below, and certify that they have read, understood, and agreed to the terms and conditions of this PA as set forth therein. The effective date of this PA is the date of the last signatory signature affixed to these pages.

Signatories:

Rio Grande National Forest

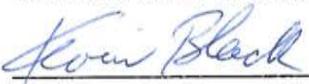

Dan Dallas, Forest Supervisor, Rio Grande National Forest Service

06/07/2016
Date

San Luis Valley Field Office


Andrew Archuleta, Field Office Manager, Bureau of Land Management

6/08/2016
Date

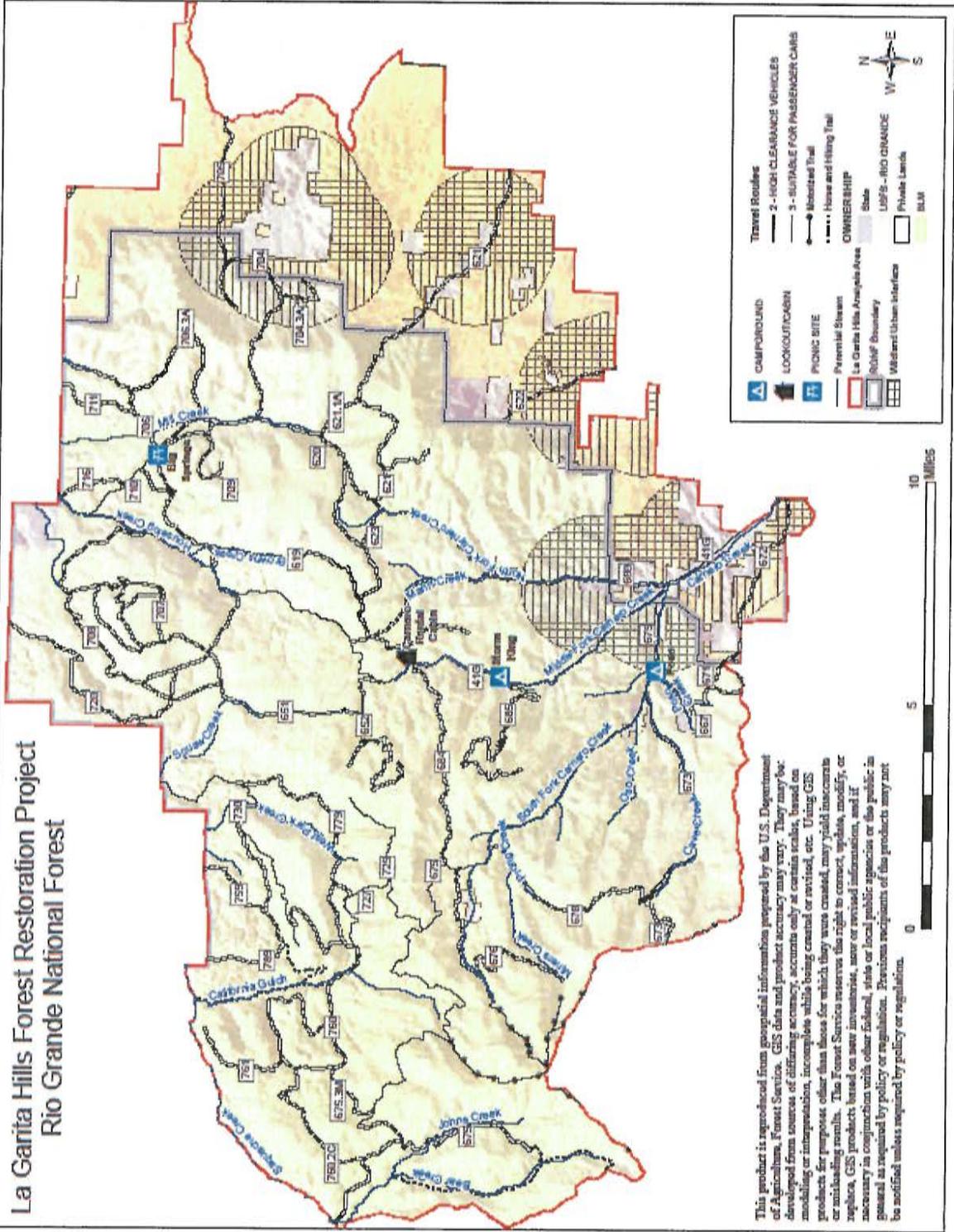
Colorado State Historic Preservation Office


for Steve Turner, Colorado State Historic Preservation Officer

5/27/16
Date

Appendix A. Project APE

La Garita Hills Forest Restoration Project
Rio Grande National Forest



Appendix B: Tiered Undertaking Checklist for the Rio Grande NF

1) Does the project proposal qualify as an exempt undertaking under the PA (Appendix C)

<input type="checkbox"/>	No, proceed to next question and chronicle in annual report
<input type="checkbox"/>	Yes, no additional Section 106 compliance is necessary.

2) Define and describe the Tiered Undertaking APE

<input type="checkbox"/>	Attach map(s) that clearly illustrates the APE
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3) Identify all cultural resources and previously surveyed areas in the APE

4) Have NRHP evaluations been adequately completed for all cultural properties in the APE?

<input type="checkbox"/>	No, determine NRHP significance for all cultural properties
<input type="checkbox"/>	Yes, proceed to next question.

5) Determine potential effects on all historic properties within the APE. Have potential adverse effects to historic properties been identified?

<input type="checkbox"/>	No. Historic properties have not been identified in the APE. Proceed to next step.
<input type="checkbox"/>	No. Historic properties have been identified in the APE, but no potential adverse effects have been identified. Proceed to next step.
<input type="checkbox"/>	Yes, but protective measures can be prescribed to eliminate the potential for adverse effects. Follow PA and clearly identify all stipulations in the summary page at the end of this checklist.
<input type="checkbox"/>	Yes, and protective measures cannot be prescribed to eliminate the potential for adverse effects. An MOA will be developed in concert with the SHPO to resolve the adverse effect.

6) When NRHP evaluations and effects assessments have been completed for all cultural properties within the APE, project reports shall be written and submitted for consultation *prior to project implementation*. When consulting under the Project, be certain to reference this fact in all project reports and the first paragraph of consultation correspondence.

Summary:

Master Class I Updates:

Analysis of Indirect and Cumulative Effects Tiered to Prior LGH Undertakings:

The recommendation of effect for this project is:

<input type="checkbox"/>	<i>No Historic Properties Affected</i>
<input type="checkbox"/>	<i>No Adverse Effect</i>
<input type="checkbox"/>	<i>Adverse Effect</i>

Appendix C: Exempted Undertaking Activities

Some vegetation treatment activities that have no potential to effect historic properties are exempt from further review and consultation. These exempted activities require no additional consultation under Section 106.

1. Activities where the APE is entirely located on slopes greater than 25% on Forest land and slopes greater than 30% on BLM land where no known historic properties are present, with no potential for cultural resources such as rock art, rock shelters, significant mining features and appropriate historical documentation has been consulted. Possibly up to 40% with hydro-axe equipment.
2. Activities where the APE is entirely within previous natural ground disturbance that has modified the surface so extensively that the likelihood of finding cultural resources is negligible.
3. Beetle Management and Fuels Reduction
 - Insecticide spraying on single trees and small stands of trees.
 - Tree sanitation where trees are felled, peeled, piled and removed by hand. No heavy machinery is used and activities occur outside of known historic properties boundaries and/or buffer zones as appropriate.
 - Trap tree activities; felled, debarked, hand-piled and burned in previously disturbed burn areas. No heavy machinery is used.
 - Lethal trap tree activities; felled, pesticide applied. No trees removed and no heavy machinery is used.
 - Aggregate (trap-out) beetle activities; funnel traps hand-placed in trees.
 - Semiochemical treatments.
 - Application of pesticides that do not have the potential to affect access to or use of resources by Tribes.
 - Mowing with a brush hog or similar rubber-tired equipment that occur outside of known historic properties boundaries and/or buffer zones as appropriate.
 - Slash disposal in previously disturbed areas where the slash is piled by hand and burned. Understory removal of non-commercial timber using chainsaws to reduce ladder fuels, break up the continuity of fuel and to improve stand health and resiliency. Slash is either hand piled for chipping or bucked by hand, loaded on to rubber-tired vehicles and hauled away. This excludes the use of large tracked vehicles.
 - Aspen enhancement projects where non-commercial ponderosa pine will be cut from the understories of existing aspen stands using chainsaws to reduce ladder fuels, break up the continuity of fuel and to improve stand health and resiliency of existing aspen.

Draft 04/22/2016

- Branch pruning activities where selected trees are pruned to improve tree health and resiliency, reduce ladder fuels, and to create defensible space around structures. Slash is either hand piled for chipping or bucked by hand, loaded into rubber-tired vehicles and hauled away. This excludes the use of large tracked vehicles.
- Boundary treatments where dead standing trees, down trees, and slash within 100 ft. of the national Forest/private-land boundary are cleared with chainsaws, understory ladder fuels are removed, and lower branches on retained trees are pruned to create a fuel break. Slash is either hand piled for chipping or bucked by hand, loaded into rubber-tired vehicles and hauled away. This excludes the use of large tracked vehicles.
- Creation of defensible space around homes and structures through removal of trees, brush, and other vegetation using chainsaws and hand tools, where such activities do not affect the integrity of the setting of historic properties. Slash is either hand piled for chipping, or bucked by hand, loaded into rubber-tired vehicles and hauled away. This excludes the use of large tracked vehicles.
- Logging activities may be implemented over snow cover on or around historic properties under the following conditions:
 - A minimum of 18 inches of compacted snow or ice exists throughout the duration of undertaking activities to prevent surface and subsurface impacts.
 - All concentrated work areas (e.g. landings, skid trails, turnarounds, and processing equipment areas) shall be identified prior to snow accumulation and located outside the boundaries of historic properties.

Appendix D: Definitions

BLM Cultural Resource Specialist – A GS-9 or a higher-grade that can 1) recommend determinations of NRHP eligibility and effect, along with effects resolution, if necessary, to the field manager; 2) conduct all other Section 106 consultation activities on behalf of the field manager; and 3) determine whether an undertaking may be exempt from identification and evaluation of cultural resources.

Forest Heritage Professional –The Heritage Professional is an individual who meets, at a minimum, the standards set forth in Forest Service Manual 2360 and the provisions of the Office of Personnel Management Operating Manual for Qualifications X-118, and/or the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation, Professional Qualifications for Archeologists and/or Historians (48 FR 190:44716-44742)

Appendix E: Survey Strategy (Rio Grande NF Only)

1. Areas of High Potential for Historic Properties within Treatment Units:

- Prehistoric Cultural Resources:
 - Areas of known high site density and/or known site locations
 - Ecotonal boundary areas (e.g., areas between canopied and non-canopied areas)
 - Areas located within ¼ mile of permanent water sources
 - Natural travel routes associated with mountain passes
 - Geographic features within loosely canopied areas including high points and open views, saddles, terraces, benches and ridges (e.g., hunting corridors)
 - South, east and west facing slopes less than 15%
 - Areas known to contain geological outcrops of tool stone source material
- Historic Cultural Resources:
 - Areas within or in close proximity to bedrock deposits containing precious or marketable metal ores
 - Natural travel corridors for pack trails, wagon trails, stock driveways, auto roads, and/or railroads.
 - Areas located within ¼ mile of permanent water sources
 - Areas in proximity to railroad grades
 - Any potential historic cultural resource identified as a result of literature search

2. Treatment Units that include the following shall be intensively field surveyed:

- Any area where machine piling or any other activity using mechanized equipment, including machine piling, wind rowing, mechanical crushing, skid trails where identified, and cutting units where skid trails are not identified
- Hand and mechanical fire line construction
- Staging areas, including constructed safety zones
- Water bars and other constructed erosional features
- Other ground disturbing activities not previously surveyed for cultural resources
- Areas that include old growth Ponderosa pine and or Douglas fir that might contain fire sensitive features such as CMTs and wickiups.