Crossons-Longview Forest Restoration Project

Environmental Assessment

South Platte Ranger District
Pike National Forest
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Crossons-Longview Forest Restoration Project Environmental Assessment

South Platte Ranger District
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Jefferson County
Colorado

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Chapter 1.
Purpose of and Need for Action

The South Platte Ranger District of the Pike and San Isabel National Forest has prepared this Environmental Assessment (EA) on the potential environmental effects of proposed activities in the Crossons-Longview Forest Restoration Project area, in compliance with the National Environmental Policy Act (NEPA) and the Healthy Forests Restoration Act (HFRA) and other relevant federal and state laws and regulations.

1.1 Purpose of and Need for Action

The purpose of the proposed project is to restore sustainable forest conditions that are resilient to fire, insects, and diseases, while providing for diverse wildlife habitats, recreational opportunities, and sustainable watershed conditions. Past forest management has created forests that are susceptible to large-scale disturbance such as high intensity fire and insect outbreaks. The proposed project would respond to a need to reduce the potential of these events by using targeted vegetative treatments to reduce the likelihood of large-scale, high intensity wildfires and improve resiliency of the forest to insects and disease. Tree thinning, prescribed burning, and/or other fuel reduction methods can substantially reduce the occurrence of high intensity fires, improve the health of the remaining trees and increase vegetative diversity. These measures would create healthier forest conditions that are closer to the more open and diverse historical forest structure. The actions proposed would additionally protect watersheds, enhance wildlife habitat and provide for enhanced recreation opportunities.

The current forest conditions are the result of a combination of intense, landscape-scale historical logging, large stand replacing fires during the late 19th and early 20th centuries, and aggressive fire suppression efforts. These past actions have created overly dense stands of nearly uniform age and species. The forest structure today is one of more even-aged, mature trees that carry fire both vertically and horizontally with higher intensity and severity than would have occurred in the more open and diverse historical condition. This has led to an increase in the risk of high intensity wildfires in, and around, the Project Area.

The juxtaposition of the current forest conditions with local water, recreation, and other natural and developed resources is of great concern. There are hundreds of homes, critical watersheds and significant associated infrastructure adjacent to and near the project area that are at risk of damage should a high intensity wildfire occur in the area. The steadily increasing population and associated development will proportionately increase this risk in the future. Meanwhile, wildfires have increased by number of incidents, intensity, and acres burned within and nearby the project area.

The need to reduce forest fuels has been clearly demonstrated by the recent large-scale, high intensity fires occurring across the western United States and in the Front Range of Colorado. The Hayman Fire, as well as several other recent fires on the Pike and San Isabel National Forests, destroyed homes, infrastructure and other property on private and public lands; damaged critical watersheds; imperiled fish and wildlife habitat; and reduced recreational opportunities. Subsequent run-off from severe thunderstorms during the monsoon season over the fire-denuded areas eroded soils, leading to flooding and sediment and debris flows which destroyed homes, damaged highways and various other facilities as well as degraded fisheries.

The watersheds in the project area are critical community resources as they are a source of the domestic water supply for metropolitan Denver. The North Fork South Platte River, a critical water supply for the Denver Water Department, runs through the project area, transporting runoff and water diverted from the western slope to Strontia Springs Reservoir. Strontia Springs Reservoir, which is just downstream of the project area, has already been substantially impacted by sediment and debris flows from several recent wildfires.

The Crossons-Longview Forest Restoration Project responds to the identified purpose and need by proposing vegetative treatments that would improve forest conditions by increasing resiliency to large-scale, high intensity fire and damage from insects and diseases while providing for improved diversity of wildlife habitat, enhanced recreational opportunities, and reduced risk of damage to watersheds. The specific purposes of this project are:

1. To reduce the potential of large-scale, high intensity wildfire with uncontrollable fire behavior, such as active crown fire.
2. To reduce the potential that a wildfire would negatively affect public water supplies from subsequent severe flooding and sedimentation.
3. To improve forest health, vigor, and resilience to large-scale fire, insects and disease.
4. To enhance wildlife habitat through the reduction of the potential for large-scale, high intensity wildfires, enhancement of shrublands and aspen habitat, and Pawnee montane skipper habitat.

1.2 Proposed Action

The South Platte Ranger District of the Pike and San Isabel National Forest proposes to treat approximately 9,574 acres within the 22,729 acre Crossons-Longview Project Area to move the montane forest ecosystem towards historic conditions. The treatments would result in reducing wildfire hazards and improving the health of the forest. The 9,574 acres of treatment contain Ponderosa pine, Douglas-fir, Mixed conifer, Lodgepole pine, Aspen and shrublands (Figure 1). Specific actions would be dependent on site-specific conditions and the vegetation type, however, actions would include thinning, created openings and prescribed burning. A combination of mechanical harvesting equipment and hand treatment would be used. No new systems roads would be constructed, however some temporary roads would be used.

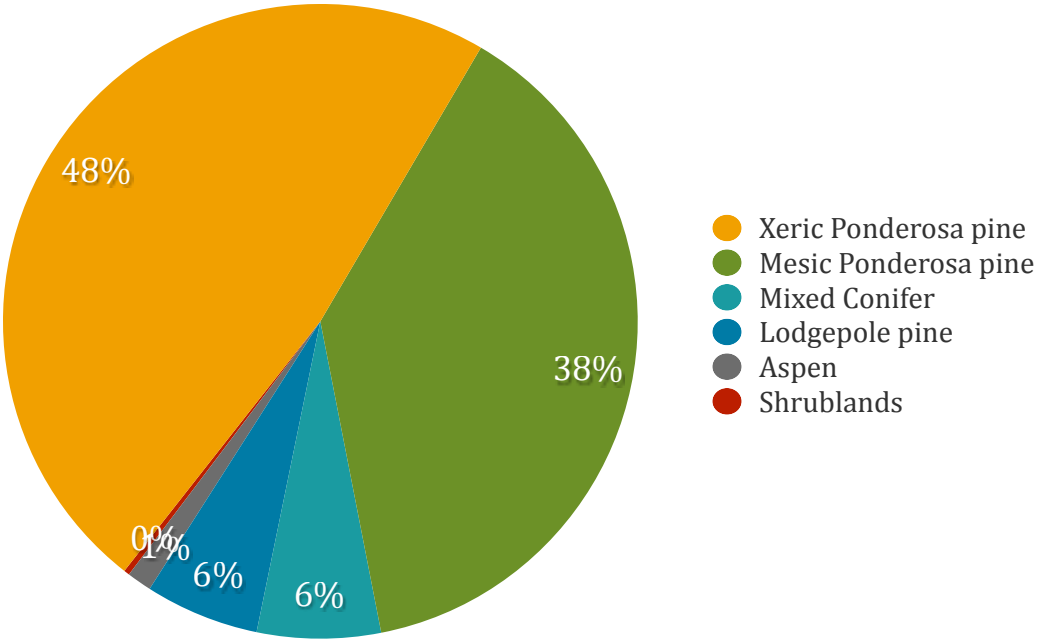

Figure 1. Estimated Distribution of Vegetation Types in Proposed Action

The Crossons-Longview Project Area is located within the South Platte Ranger District of the Pike and San Isabel National Forest. The Project Area includes approximately 22,729 acres of land, of which 15,196 acres are NFS lands. An estimated 7,533 acres of mostly private land are excluded from consideration. Most of the private land is owned by individual (residential) landowners along Park County routes 68 and 70, and Jefferson County route 126, and some scattered in-holdings within national forest boundaries. Ferndale, Buffalo Creek, Estabrook, Insmont, and Longview are all private residential areas surrounded by National Forest System lands. Colorado State Land Board, Jefferson County Open Space, Denver Water Board, private land, and National Forest surround the Project Area and are adjacent to the project boundary. The Project Area is located in Jefferson and Park Counties approximately 20 miles southwest of Denver.

1.3 Decision Framework

The District Ranger, who is the Responsible Official, will decide which actions, if any, to implement. This decision will be based on:

- Whether the proposed activities and alternative address the issues, are responsive to national policy/ guidance and direction in the Forest Plan, as amended, and meet the purpose of and need for action in the Crossons-Longview Project Area.
- Whether the information in this analysis is sufficient to implement proposed activities.
- Whether the proposed activities would have significant effects and therefore required the preparation of an Environmental Impact Statement.

If an action alternative is selected, project implementation could begin in the first quarter of 2016. Implementation of the proposed actions would be accomplished within approximately 10 years, although some proposed actions could take longer to implement.

1.4 PUBLIC INVOLVEMENT

The NEPA process and the associated USDA Forest Service implementing regulations provide for an open public involvement process. The NEPA phase of a proposal begins with public and agency scoping. Scoping is the process used to identify major issues and to determine the extent of environmental analysis necessary for an informed decision to be made concerning a proposed action. Issues are identified, alternatives are developed, and the environmental analysis is conducted and documented. The Crossons-Longview Forest Restoration Project is being prepared as an authorized hazardous fuels reduction project utilizing the appropriate tools under Title I of the Healthy Forest Restoration Act (HFRA) of 2003 (USDA Forest Service, 2003). The purpose of this Act is to expedite hazardous fuels reduction and forest restoration projects on federal lands at risk of wildland fire or insect and disease epidemics.

The public scoping process began March 20, 2014 when the scoping letter was mailed. Two public meetings were held to gather public comments. The first meeting was held on April 2nd, 2014 in Conifer, Colorado. Maps of the project area and information on the approach of the project were presented in an open house format along with a presentation. Eight people signed in at that meeting. A second meeting was held on April 9, 2014 in Bailey, Colorado. Fifteen people signed in at the Bailey meeting. In addition, 6 people called the Ranger District for more information on the project.

Public outreach, meeting notices and advertisement included:

1. The posting of legal notice in the Douglas County News Press
2. Emailing of the scoping notice to 25 people, groups and agencies
3. Mailing letters to 550 individuals, groups and agencies
4. A news release that was sent to the local media
5. Posting a notice on the US Forest Service website
6. Posting the scoping notice on pinecam.com
7. Posting the scoping notice on the Buffalo Creek Bulletin Board.

A scoping report (JW Associates, 2014) was created that presents the scoping process and analysis of the comments received.

1.5 Issues

Issues are points of discussion, debate, or dispute about environmental effects that may occur as a result of the proposed action or an alternative. It is these potential environmental effects, particularly potential negative effects, which provide focus for analysis, influence alternative development, and lead to development of mitigation measures. Issues are used to display differing effects between the proposed action and the alternatives regarding specific resource elements.

A list of potential issues was developed by the project interdisciplinary (ID) team on the basis of their knowledge of the Proposed Action and the area affected, and the public comments submitted during scoping. These "potential issues" are reviewed to determine: a) the significant issues to be analyzed in depth, and b) issues which are not significant or which have been covered by prior environmental review and, therefore should be eliminated from detailed analysis. The issues were further refined based on an analysis of the scoping comments. Eight significant issues were identified.

1.5.1 Vegetation

Forested stands in the analysis area tend to be dense and lack a diversity of age classes of trees. They are therefore more susceptible to crown fire, insects, and disease. One purpose of the proposed action is to create forest conditions that are resilient to fire, insects, and diseases. The proposed action may substantially alter the existing vegetation from its present condition in order to meet this purpose. Ground-disturbing activities may also increase the susceptibility of the analysis area to invasion and spread of noxious weeds.

1.5.2 Fire and Fuels

One of the primary purposes of the proposed action is to reduce fuel loads so that, in the event of a wildfire, suppression opportunities are improved, public and firefighter safety are improved, the risk to public and private property is reduced, and the extent of stands susceptible to crown fire is reduced. Proposed treatments may alter fuel loads, alter potential fire behavior, and alter existing fire regime condition class.

1.5.3 Watersheds

Activities associated with the proposed action may cause increased water production because of the decrease in trees. There may also be a short-term decrease in surface water quality due to soil erosion from project activities.. At the same time, the proposed action is designed to reduce the long-term risk of watershed damage from wildfires, including soil erosion, flooding, reduced water quality, and damage to municipal water facilities.

1.5.4 Wildlife

Management Indicator Species (MIS) are species whose response to management activities may help to predict the likely response of a wide range of species with similar habitat requirements. Forest Plan Amendment #30 identified four potential MIS for the PSICC, several of which may be affected by the proposed action. A Wildlife Specialist Report (JW Associates, 2015g) has been prepared in conjunction with this draft Environmental Analysis.

1.5.5 Special Status Species

The Endangered Species Act (ESA) and USFS policy require the assessment of potential effects of proposed agency actions on species that are listed as threatened, endangered, or proposed under the ESA, or as sensitive by the Regional Forester. A draft Biological Assessment (BA) and draft Biological Evaluation (BE) were has been prepared in conjunction with this draft Environmental Assessment. Consultation with the US Fish and Wildlife Service will be pursued as appropriate.

1.5.6 Cultural Resources

Several federal laws require consideration of potential effects to cultural resources. The proposed action has the potential to cause adverse effects to eligible properties.

1.5.7 Economics

Implementing the proposed action may not produce a net benefit to the government in terms of cost/benefit ratio. However, intangible benefits to natural resources (for example, lowered risk of large-scale, high intensity wildfire, increased resistance to insects and disease, reduced risk of adverse watershed damage, and reduced costs for future firefighting) may be more important than the direct monetary cost. The cost may also be justified because the wildfire hazard to public and private property would be reduced. Timber production would not be emphasized; however, commercial timber products may be sold to help offset costs. The proposed project may also benefit the local community by providing work in the form of service contracts and as a source of fuel wood.

1.5.8 Road Access

Road access was identified as an issue during the scoping period. Several people identified specific routes that they would like to have opened. Others suggested that any new roads (system or temporary) be minimized because there are so many people that use the area for recreation and they might turn any new routes, even if temporary, into access into areas that previously did not have access.

Chapter 2. Alternatives

This chapter describes and compares the No Action, the HFRA Proposed Action, and one action alternative to be considered in this analysis. It includes a description of each alternative considered. The HFRA Proposed Action was developed to respond to the purpose and need, and is fully compliant with the Forest Plan.

The Land and Resource Management Plan (USDA Forest Service 1984) for the Pike and San Isabel National Forests and the Comanche and Cimarron National Grasslands provides management direction for the lands within the Crossons-Longview Project Area. The LRMP establishes Management Areas (MA) and associated management direction for these areas. The Project Area includes three Management Areas where treatments could occur including:

- MA 2B - Rural and Roaded Natural Recreation Opportunities
- MA 5B - Big Game Winter Range
- MA 7A - Wood Fiber Production and Utilization (sawlogs)

Management Area 2B

Management Area 2B is found on the east and southwest and central west portions of the Project Area. This management area covers approximately 44 percent of the Project Area. The emphasis for Management Area 2B is rural and roaded-natural recreation opportunities, including both motorized and non-motorized recreation such as driving for pleasure, viewing scenery, hiking, fishing and other outdoor recreation. Motorized travel may be prohibited or restricted to designated routes, to protect physical and biological resources (USDA Forest Service 1984).

Management Area 5B

Management Area 5B is found in the northwest portion of the Project Area and covers approximately 11 percent of the Area. None of the identified trails travel through this MA. The emphasis for Management Area 5B is primarily big game winter range, specifically for forage and cover on winter range. Winter habitat for deer, elk, bighorn sheep and mountain goats is to be emphasized. Treatments to increase forage production or to create and maintain thermal and hiding cover for big game are applied.

Recreation management would be considered subordinate to the needs of big game winter range and primarily for summer use. Winter recreation is to be managed for very low or low densities. Some areas may be closed to winter use if necessary to prevent disturbance of wildlife (USDA 1984).

Existing local roads are close and new motorized recreation use is managed to prevent unacceptable stress on big game animals during the primary big game use season. Additional direction stipulates that visual activities remain visually subordinate and harmonize and blend with the natural setting.

Management Area 7A

Management Area 7A is to be managed primarily for wood-fiber production and utilization. This MA is found in the central portion, and covers approximately 44 percent, of the Project Area. Most of the trails in the Project Area are located in this Management Area. Management activities are to remain visually subordinate along Forest roads and trails. Roaded-natural recreation opportunities are provided along Forest roads. Semi-primitive motorized recreation opportunities are provided on those local roads and trails that remain open and semi-primitive non-motorized opportunities are provided on those that are closed.

2.1 Alternative A - No Action

Under Alternative A (No Action), none of the proposed thinning, creating openings, prescribed burning, and removing trees and creation of fuel breaks would be implemented in the Crossons-Longview Project Area. Vegetation on the forest would follow natural succession, disturbance and recovery processes. These processes include the continued natural accumulation of forest fuels over time. The watersheds that supply water for the cities of Denver and Aurora would remain susceptible to high intensity wildfires that could negatively affect the ability of those watersheds to provide high-quality drinking water. The WUI would continue to have a high risk of extreme fire behavior in many locations. Forest health and vigor, and associated resistance to insects and disease would continue to decline.

2.2 Alternative B - Proposed Action

The South Platte Ranger District of the Pike and San Isabel National Forest proposes to treat 9,574 acres within the 22,729 acre Crossons-Longview Project Area to move the montane forest ecosystem towards historic conditions. The proposed actions would alter forest stand and understory conditions and would be accomplished by a combination of mechanical harvesting and hand treatment. Specific actions would be dependent on site-specific conditions and the vegetation type; however, actions would include thinning, created openings, and prescribed burning. Professional judgment would be used, within guidelines and taking into consideration the terrain and vegetative type, to determine which one or combination of treatments are most appropriate for individual treatment sites.

Treatment areas would occur in Management Areas 2B, 5B and 7A. Approximately 41 percent of the treatments would be in MA 2B, approximately 14 percent would be in MA 5B, and approximately 45 percent of the treatments would occur in MA 7A. Approximately 55 percent of the treatment areas are located within 0.5 miles of existing roads, with 33 percent of those areas treated by hand due to slopes between 35-60 percent. Approximately 61 percent of the treatment areas lie on slopes of 0-35

percent and would be considered appropriate for treatment with traditional harvesting equipment and commercial product removal. The treatments on slopes between 35-60 percent would likely be hand treatments. Where possible, vegetation treatments would take into consideration previously treated areas and/or past burned areas in order to increase the overall landscape benefit.

The Proposed Action does not include the establishment of any new system roads, however, approximately 10 miles of temporary roads would be used to access the proposed action treatment areas. The target vegetation areas are identified on Table 1 and Figure 2. It is expected that project activities would take approximately 10 years to treat the proposed treatment area.

Table 1. Crossons-Longview Vegetation Types of Proposed Treatments

Vegetation Type	Area (acres)	Percentage
Xeric Ponderosa pine	4,581	49%
Mesic Ponderosa pine	3,684	38%
Mixed Conifer	603	6%
Lodgepole pine	557	6%
Aspen	121	1%
Shrubs	28	<1%
Total	9,574	

Areas considered available for treatment were determined by first identifying target vegetation types for treatments on all National Forest System (NFS) lands (15,196 acres) within the Project Area. The Project Area includes 7,533 acres of private land that are excluded from consideration. The target vegetation types are identified on Table 1 and described below in detail. Areas within 0.5 miles of existing and proposed temporary roads (see Section 2.2.3 below) and on slopes less than 60 percent would be the focus of the proposed treatments.

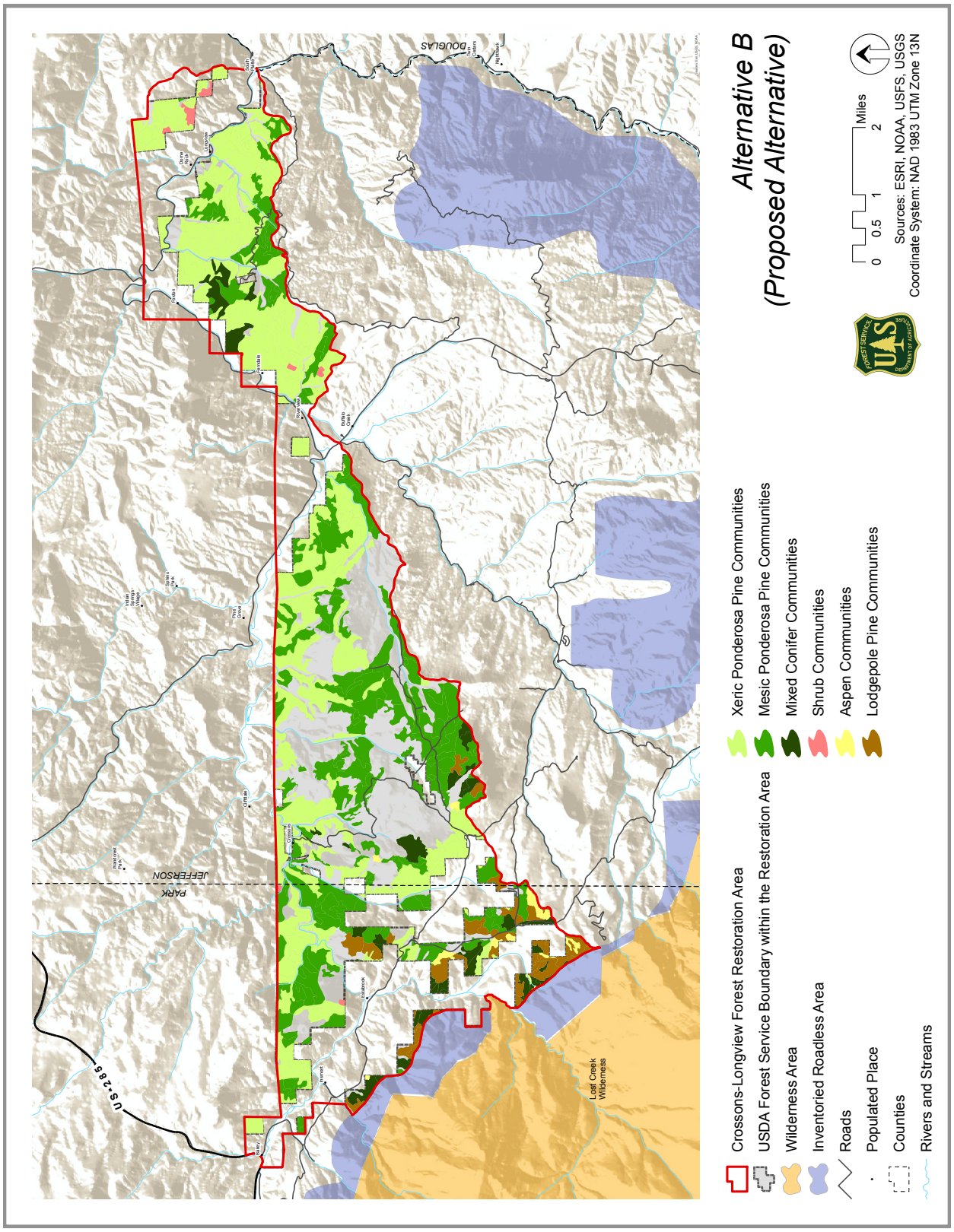

Figure 2. Alternative B - Proposed Action Treatments Map

2.2.1 General Operations

Treatments in all vegetation types would be required to follow a consistent set of operational guidelines. These guidelines include the following:

1. Adaptive management would be used to ensure protection of resources and restoration of the ecosystem. Operations and treatment areas would be monitored during the life of the project to ensure management and resource protection objectives are achieved. If this monitoring reveals that the objectives are not being met, the treatment approach would be modified to achieve the desired results.
2. Harvesting equipment would not be allowed on slopes greater than 35 percent, unless the contractor can demonstrate ability to remove material without environmental damage, such as excessive soil disturbance.
3. Conventional logging systems would be used to remove material from areas that are accessible from existing National Forest System Roads, unclassified roads, or constructed temporary roads. Typically, skidders move trees to decks where a loader or processor loads them onto logging trucks to transport them off site.
4. Slash left on-site may be hand or machine piled, lopped and scattered, removed from the site mechanically, crushed with yarding and harvesting equipment, or a combination of these methods. Residual activity fuels may also be minimized through piling and burning or broadcast burning.
5. Opportunities for holiday tree cutting and firewood gathering by the public would be provided where practical.

2.2.2 Forest Treatments by Vegetation Type

Kaufmann et al. (2006) identified five major vegetation zones in the Colorado Front Range. These zones are roughly determined by elevation and range from the low elevation Plains Grassland up to the high elevation Alpine. The proposed vegetation treatments for the Crossons-Longview project are primarily within the Lower and Upper Montane vegetation zones. Ponderosa pine is a dominant tree species of the Lower Montane zone although Douglas-fir is also present in many locations. The upper Montane Zone is a transition from the Montane to the Sub-alpine zone and vegetation patterns are more complex. Ponderosa pine is still a substantial part of this zone, however other tree species are also common including Douglas-fir, lodgepole pine, limber pine, aspen and spruce. Within each of the major vegetation zones, topographic position, aspect and soils also influence the mix of vegetation and the response to disturbance.

A review of the data on historic fire regimes of the area (Kaufmann et al., 2006) indicates that at any given elevation, xeric (dry) sites were more likely to support low density stands and low severity fires than were mesic (moist) sites. Because of this variability, rather than a uniform historical landscape structure or fire behavior pattern across any specific vegetation zone, there was a mix of fire regimes and vegetative structure within each zone. However, across all vegetation zones, the proportion of the landscape that supported low density stands and low severity fires most likely decreased with elevation as the proportion of more mesic conditions increased. The more mesic conditions would have been characterized by a mixed severity fire regime, which would have created a heterogeneous vegetation structure.

Some areas in the Project Area would not receive any vegetation treatments. No-Treatment Areas include sites where fuels reduction or forest health treatments are not needed, e.g. current forest stands and areas that are essentially similar to their historic conditions. For all areas, if stand conditions dictate an alternative treatment to the target treatment type, this variation would be accommodated.

Ponderosa Pine

Background

The historical montane forest was likely quite open with fewer trees, greater age diversity between stands, and larger openings than the area displays today. Openings are defined as areas capable of producing forest, but that have no trees, or only a very small number of trees per acre arranged as singles or small groups. Studies have indicated that fire typically served to maintain open mature stands, as well as to maintain some areas as openings. Brown et al., 1999 and Kaufmann et al., 2000a provide evidence that frequent, mixed-severity fires were most common in ponderosa pine stands from 1000 to 1870 AD. The area of severe fires were relatively small in extent, but they were critical in creating openings of 20 to 40 acres that were maintained by the dry site conditions until regeneration occurred. The open forest was protected from extensive fires because of the distance between tree crowns and the openings (USDA Forest Service, 2002a).

Smaller surface fires that did not move into the crowns would have encouraged the maintenance of ponderosa pine on these sites and limited the spread of Douglas-fir, which does not tolerate fire well, to sites where fires were infrequent, particularly wetter, north-facing slopes. The smaller fires would also have kept the forest more open by limiting the growth of understory trees.

Variation in frequency and severity of fires created a varied vegetative pattern across the landscape. This mosaic pattern would be maintained as the patch-like variations of age classes, densities, and openings caused fires to skip around rather than kill the majority of trees over large areas in a single fire event. Some stands would have had many age classes from seedlings to trees more than 400 years old. There were probably few snags (standing dead trees) and cavities in live trees. A few stands would have been nearly even-aged due to stand-replacing fires followed by even-aged regeneration.

One key to the sustainability of the historical forest was the open condition, which played a role in preventing the development of large crown fires. The open forest would have had larger distances between tree crowns combined with larger openings, compared to current conditions, that would have reduced the likelihood of large crown fires. Openings may have covered 20 to 25 percent of the area, and some of these openings may have persisted for decades due to climatic and seed source limitations. Regeneration would have begun immediately on other burned sites. Therefore, post-fire patterns of regrowth would have resulted in variations both in space and time, contributing to the complexity of the landscape.

Ponderosa pine in the Project Area can be divided into two classifications; xeric and mesic (Kaufmann et al., 2006).

Xeric Ponderosa Pine

Xeric ponderosa pine consists of mostly ponderosa pine as the dominant vegetation, with smaller areas having no dominant tree type but having Gambel oak/mountain mahogany. These systems would have a history of frequent, low intensity fires, creating more open forested conditions.

Xeric Ponderosa pine is classified as:

1. Ponderosa pine stands below an elevation of 6500 feet
2. Ponderosa and Douglas-fir stands between 6500 and 7500 feet in elevation except on north slopes
3. Ponderosa and Douglas-fir stands between 7500 and 8500 feet in elevation on south and west aspects, and exposed ridges.

The treatment objective on the xeric ponderosa pine sites would be to create more open forested conditions. The treatments would reduce the basal area to a range of 20 to 80 square feet per acre by creating clumps of trees (defined here as five or more trees with their crowns touching), and openings of 1 to 40 acres where at most individual trees are present with a canopy cover ranging from 15 to 20 percent.

Mesic Ponderosa Pine

Mesic Ponderosa pine likely developed under a mixed severity fire regime (Crane, 1982 and Kaufmann et al., 2006) that would have resulted in a greater variety of stand structures and ages than would have developed on the drier (more xeric) Ponderosa pine sites.

Mesic Ponderosa pine is classified as:

1. Ponderosa pine stands between 6500 and 7500 feet in elevation on north aspects
2. Ponderosa pine stands between 7500 and 8500 feet in elevation on north and east aspects
3. Ponderosa pine stands between 8500 and 9500 feet in elevation on all aspects

As with the Xeric Ponderosa pine, the treatment objectives would be to create more open forested conditions. However, there would be a greater range of residual stand densities and fewer fire-maintained openings in these more mesic areas. Larger clumps (both in overall size and number of trees present per clump) would be present compared to the xeric systems. There would also be a greater amount of Douglas-fir left within the residual stands. Treatments would result in residual stand densities between 40 to 120 basal area (square feet per acre) and openings would be between 1 to 20 acres, depending on terrain. Canopy cover in these stands would average 20 to 35 percent.

Ponderosa Pine Guidance and Constraints

The following guidance and constraints would be used in treating in both mesic and xeric Ponderosa pine:

a. In ponderosa pine stands, thin trees to a canopy closure that would average about 15 to 35 percent. Overall, canopy cover may differ substantially from one point to another, but across a given area it would average 15 to 35 percent.

b. Preference would be given to retaining ponderosa pine over Douglas-fir and retaining larger trees with few low branches. Larger trees would generally be retained; trees identified as older than 200 years would be retained. The spacing would be variable retaining natural clumpy characteristics. Existing snags that are not a hazard would be retained for cavity-dependent wildlife.

c. Trees would be thinned in a manner to create clumps or cohorts of trees intermingled with irregular openings or areas of lower tree density. Existing stand structure and site conditions would determine where "clumps" and openings would be created. In general, pockets of older, platy-barked trees would be targeted as leave clumps, and areas of younger trees or pockets of dwarf-mistletoe-infected trees would be targeted for removal to create openings.

d. Thinning would have the objective of a residual stand density of 20 to 80 square feet per acre on the more xeric sites and 40 to 120 square feet on the more mesic sites.

e. Ladder fuels and lower limbs and branches may be removed from the residual stand to minimize torching and crowning.

Openings would be created over 20 to 25 percent of the treatment areas to mimic historic conditions using the following guidance and constraints:

a. Openings would be between 1 and 40 acres in size on xeric sites and between 1 to 20 acres on mesic sites.

b. The lowest tree densities and majority of openings would occur on the xeric Ponderosa pine sites. The mesic Ponderosa pine sites would have fewer openings and slightly higher tree densities (see guideline d, above).

c. Some of the openings would have no trees and the rest would have canopy closures of 15 to 20 percent.

Mixed Conifer

Background

Mixed conifer areas are generally composed of limber pine, Douglas-fir, spruce, lodgepole pine and some ponderosa pine. The historical disturbance regime was mixed-severity fires with a fire recurrence interval of 30-100 years (Crane, 1982), which created a mosaic of conditions composed of structural stages ranging from young to old trees. Stands were variable but generally uneven-aged and open, with occasional patches of even-aged structure. Denser tree conditions existed in some locations such as north facing slopes and valley bottoms. The historical pattern would be small clumps and groups of trees interspersed within variable-sized openings of grasses and shrubs and a greater variety of stand structures and ages (Crane, 1982).

The density of the Project Area's mixed conifer stands has increased due to the lack of natural disturbances. In particular, understory trees, that provide ladder fuels, are present across a larger proportion of the mixed conifer forest than would have existed historically. Therefore, these stands are at a high risk of large crown fires.

Mixed conifer is classified as;

1. Bristlecone/limber pine, and xeric and mesic Mixed Conifer cover types
2. Douglas-fir cover type between 6500 and 7500 feet in elevation on north aspects
3. Douglas-fir cover types between 7500 and 8500 feet in elevation on north and east aspects

Mixed Conifer Guidance and Constraints

Residual stand basal areas should range from 40 to 120 square feet per acre. This is a higher density basal area requirement than for other vegetation types because mixed conifers have smaller root systems and therefore a greater dependency on other trees for support. In other areas, patchy openings would be created to encourage regeneration and provide an increase in age class diversity. Areas with evidence of disease or insect infestation (i.e., dwarf mistletoe, spruce budworm or bark beetles) would be priority areas for creating these openings. Openings would range in size from 1 to 40 acres with most being less than 10 acres in size. Small clumps of trees may be left scattered across the larger (greater than 1 acre) openings to create structural diversity and provide seed for natural regeneration. The less shade tolerant species would generally be favored for these leave tree clumps.

Some areas would be thinned from below leaving a relatively even-aged stand of the larger cohorts. The thinning would retain the more mature trees and remove the more flammable understory vegetation.

Standing dead trees that are not a safety hazard would be retained for cavity-dependent wildlife. Following treatment, prescribed fires would be used to reintroduce fire to the landscape. The current vegetative conditions may preclude the use of prescribed fires because of the density of the vegetation.

Lodgepole Pine

Background

Lodgepole pine grows on a wide range of sites, typically between 7,500 and 10,000 feet and can occur in pure or mixed stands (Shepperd and Alexander, 1983). Lodgepole is mostly shade intolerant and can exist as a climax species in some stands or a seral species where eventually they are replaced by spruce and fir. Stand replacing fires are natural in lodgepole pine and, because the majority of the cone production from the lodgepole species is serotinous (cones being covered in sap), the cones generally open up after a fire has swept through, creating a new cohort of even aged saplings crops up soon after a fire. Fire therefore effectively sets the seedbed for a new generation of trees, which often reproduce prolifically following wildfire (Agee, 1993). Studies of lodgepole pine in the Central Rockies indicate that the return interval of stand replacing fires is 50 to 200 years while mixed severity fires occur every 40 to 500 years. Stand replacing fires are the most common, occurring 73 percent of the time (USDA Forest Service: Fire Effects Information System,

1996; accessed January 7, 2014). Lodgepole pine is susceptible to bark beetles, mistletoe, blow down and fire (Lotan, 1964).

Lodgepole Pine Guidance and Constraints

Lodgepole pine would be treated based on the conditions of the stands. The treatments listed below would be applied based upon what is needed to achieve greater age-class diversity and increase the health in lodgepole pine stands.

1. Sanitation thinning would be implemented in areas of dwarf mistletoe, mountain pine beetle and gall rust, including the following treatments;
    a. Remove trees containing dwarf mistletoe, create patch cuts in large infestations
    b. Remove and treat trees infested with mountain pine beetle or other insects
    c. Remove unhealthy and suppressed trees
2. Thin from below, remove most small diameter regeneration that is less than 12 inches DBH where mature trees would be wind firm.
3. Use strip cuts where regeneration harvest is prescribed. This treatment would be the first entry of several that would be required to complete the regeneration harvest.
4. Create forest openings of irregular size and shape ranging in size from 1 to 30 acres. Openings should be established in diseased or insect damaged areas; enlarge existing openings.

Aspen

Background

Fire has also been important in maintaining the vigor and extent of aspen. Aspen in this area have been maintained by suckering from long-lived clones that prosper following fire. Aspen provides many benefits to the landscape, including natural fire breaks, species diversity and important wildlife habitat. Bartos (2001) argues that aspen has declined by 49 percent in Colorado due to encroachment by conifers. Other researchers (Kulakowski and Veblen, 2006) do not agree that the magnitude of aspen reduction has been as great as that suggested by Bartos. In general, the occurrence of large and severe fires would increase the extent of aspen and the lack of fires would allow the successional replacement of aspen by conifers (Veblen and Donnegan 2005). Disturbance regimes in aspen are generally similar to the conifer stands that are next to them (Veblen and Donnegan, 2005). In the Project Area, aspen are present next to ponderosa pine, lodgepole pine, and mixed conifer forests that have mixed severity fire regimes with fire return intervals of between 30 and 100 years. Therefore, aspen stands have likely experienced fewer disturbances in the past 100 years due to fire suppression than would be expected.

Aspen areas are defined as;

1. Aspen cover type
2. Lodgepole pine, ponderosa pine, and mixed conifer cover types that are adjacent to aspen stands, or have an aspen component in the understory.

Aspen Guidance and Constraints

The objective of treatments in aspen would be to restore the health and vigor of the existing aspen clones and expand their current extent. Treatment would include the removal of competing conifer trees and some cutting of aspen to encourage new growth. Where aspen is a dominant species (=> 70 basal area) treatment for these areas would remove encroaching conifer species, while taking care to limit damage to remaining aspen.

In lodgepole pine, ponderosa pine, and mixed conifer areas where there is an aspen component, openings would be used to convert those areas to aspen. To accomplish this, an area would be cleared around the aspen clone of 1.5 times the average tree height of the surrounding non-aspen species. By reducing competition and propagating younger trees, the health and vigor of the aspen component would be improved, and the remaining and new aspen would have increased resistance to insects and disease.

The treatment area for aspen is higher than the current extent of pure aspen stands in the project area. This is because one of the restoration objectives is to increase the extent of aspen in the Project Area. Therefore, some areas that are not pure aspen but which have an aspen component will be treated to encourage further propagation and spread of aspen.

Shrublands

Background

Gambel oak and mountain mahogany are the two shrubs that occur in the project area and can dominate a stand or occur with ponderosa pine, Douglas-fir, and Rocky Mountain juniper.

Gambel Oak

In Colorado, Gambel oak only occurs in clones of small to large shrub form, and does not grow as large trees. As a broadleaf deciduous shrub Gambel oak contributes to the biodiversity of a stand and increases diversity of invertebrates, birds, and other wildlife. Acorn production from mature trees is valuable to wildlife (e.g., bears and turkeys). Its new leaves are good browse for deer and elk. However, extensive, dense stands of Gambel oak can outcompete grasses and herbaceous understory. These types of stands can also be a major factor in fire behavior because they have a substantial aerial biomass. Following fire, Gambel oak clones resprout quickly and vigorously in response.

Mountain Mahogany

Mountain mahogany is a common shrub that grows between 4,500 and 9,000 feet in elevation. In the project area, it does not attain the stature of Gambel oak. Mountain mahogany leaves and sprouts are a highly valuable browse resource for elk, mule deer, and bighorn sheep. Stands dominated by Mountain mahogany can become dense and decadent without fire, or other disturbances, and outcompete grasses and herbaceous understory plants. However, due to their smaller stature and smaller leaf biomass, Mountain mahogany does not influence fire behavior as much as Gambel oak. It does resprout following fire but does not come back as quickly or as dense as Gambel oak.

Shrubland Guidance and Constraints

The objectives of treatments in shrublands are to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and hand thinning would be used to thin or remove shrubs and stimulate grass and other ground cover. Treatments in Gambel oak and mountain mahogany areas would create large gaps in the canopy (minimum distance between these gaps of 1.5 times the average height of the canopy) and leaving patches of mature shrubs. Gambel oak would also be removed from under the dripline of residual trees. Gambel oak fuel treatment areas would need periodic maintenance to control sprouting. Mountain mahogany treatment areas would need to be monitored to ensure there is a desired forage response.

2.2.3 Road Access

Access to treatment areas would comply with the following guidance and constraints:

1. Existing National Forest System Roads (NFSRs) would provide the primary access to the project area. No new NFSRs would be constructed. NFSRs used for the project would be maintained or reconstructed as needed to accommodate safety, management operations, or environmental considerations.
2. Unclassified roads/trails considered suitable for operations would also be maintained or reconstructed for use during this project, but would be rehabilitated once operations were completed. These unclassified roads are not part of the Forest Service system and are candidates for restoration based upon roads analysis.
3. Temporary roads would be constructed to the minimum standard needed for safe and efficient use by project equipment, which may include vegetation clearing and earth movement. Temporary roads would extend a maximum of 0.5 miles from existing roads. It is estimated that a maximum of 10 miles of temporary roads would be used.
4. Obliteration of Temporary Roads, Jump-up spurs, Skid Trails and Landing - Return the ground to the original shape and contour found prior to the construction of the temporary road, jump-up spur, skid trail, and landing following treatment. Ripping and seeding may be required. Minimum ripping depth shall be 4 inches in depth across width of construction. Retain sufficient slash to cover obliterated temporary road, jump-up spur, skid trail, and landing to aid in erosion control and block unauthorized access when needed.
5. Some private roads may be needed to access portions of the project area. If private road access is required, access agreements with private land owners would need to be negotiated. It is possible that some land owners may not agree to allow use of private roads. This could reduce the total number of acres treated or change the methods used for treatment if product removal is not possible.

2.2.4 Fuel Breaks

Fuel breaks are areas of land in which fuel density is reduced to improve fire control opportunities. The goal of a fuel break is to break the continuity of forest fuels at strategic locations to slow the progress of a wildfire or modify its behavior so that fire suppression efforts are more effective. The creation and maintenance of fuel breaks throughout the project area would support the purposes of the project by protecting watersheds, local communities and other resources, and to provide for effective fire suppression efforts in the event of a wildfire.

The Proposed Action would create up to 1,000 acres of fuel breaks within the vegetation target areas shown on Figure 1. The fuel breaks would be a portion of the 9,574 acre overall treatment area. The specific locations for the fuel breaks would be determined during project implementation, however, they would likely be located where natural features, such as ridgetops, or manmade features, such as roads, would increase their effectiveness. An area of approximately 150 feet to each side of the center line of selected road systems would be treated, favoring the downslope side. On ridgelines, the minimum recommended fuel break width is approximately 300 feet roughly centered on the ridgeline. Because the rate of fire spread increases as the slope increases, fuel breaks may not be centered on the ridge but constructed with wider areas on the steeper side of the ridge. The activities required to construct a fuel break would vary depending on the existing conditions, but would likely include thinning and prescribed fire to create and maintain open conditions. Crown separation is a critical factor for fuel breaks. A minimum of 20-30 foot spacing between the edges of tree crowns is desirable. Fuel break thinning is classified as a heavy "sanitation and improvement" cut from below. Trees that are suppressed, diseased, deformed, damaged, and of low vigor would be removed along with all ladder fuels. All limbs and tree tops would be lopped and scattered, piled, burned or removed when possible. Stem wood would be removed whenever possible.

2.2.5 Prescribed Burn Treatments

Prescribed burns can improve forest conditions by reducing ground and ladder fuels, reducing litter and duff layers, removing low hanging branches, and even removing some larger trees. Post –treatment, prescribed burns may be used to remove slash and control regeneration. Prescribed fire could be used in most forest types that have been treated mechanically or by hand, or it could be used as a treatment by itself. Prescribed burn treatments may include broadcast burning, pile burning, or a combination of both. By removing these fuel layers, ladder fuels that can carry fire from the forest floor into the canopy are reduced which consequently reduces the potential severity and intensity of future fires. Prescribed fire would also be used to maintain open forest conditions and to create small openings. Areas that are intended to be maintained as openings would potentially need to have periodic burns or re-burned every few years to maintain the open conditions.

Prescribed burn treatments would reduce litter and duff layers, slash produced by treatments, surface fuels, regeneration, ladder fuels, and maintain open forest conditions. Prescribed fires would also be used to create small openings. These treatments would be implemented with the following guidance and constraints:

1. Prescribe burn slash after material has sufficiently dried after completing treatments, where appropriate.
2. Prescribe burn the treatment areas as necessary to maintain the openings or minimize tree regeneration.
3. Before any prescribed burning would take place, appropriate burn and smoke management plans that address site-specific details would be completed and approved.
4. Prescribed fire could be used in most areas that have been treated mechanically or by hand, or it could be used as a treatment by itself. The exact treatments to be used and their locations would be determined after treatments are completed, depending on the level of natural and activity fuels in each stand.

2.2.6 Wildlife Habitat Improvements

Wildlife habitat for many species would be improved over the current conditions by reducing the potential for large, high severity wildfires. The aspen enhancement treatments would improve wildlife habitat for those species that utilize aspen. In addition, some specific wildlife habitat improvement opportunities have been identified and are discussed below.

Pawnee Montane Skipper

Vegetation treatments within Pawnee montane skipper (*Hesperia leonardus montana*) habitat would be designed, where appropriate, to improve conditions for this species. Skippers occur in dry, open (average 30 percent canopy cover), ponderosa pine woodlands at elevations up to 7,500 feet. The species requires small openings in a forest matrix with uneven tree distribution for reproduction. Treatments of xeric ponderosa pine habitat may be considered to improve the long-term habitat conditions for the skipper in areas that historically had suitable habitat that are now “degraded” (i.e. south slopes and ridge tops with dense tree growth). Habitat improvement for the species would generally involve treatments with openings limited to 0.5 acres or less.

Bighorn Sheep

Vegetation treatments for bighorn sheep habitat improvements would be part of the proposed action where they can fit within the purpose and need for this project. The US Forest Service would work cooperatively with Colorado Parks and Wildlife to identify appropriate areas for vegetation treatments in Gambel oak and mountain mahogany during project planning. Vegetation treatments in these areas may be able to achieve the goals of the Crossons-Longview Restoration Project and provide habitat improvements for bighorn sheep.

2.2.7 Watershed Protection

The watersheds in the Crossons-Longview Project Area are critical community resources as they are the source of their domestic water supply for metropolitan Denver. The North Fork South Platte River runs through the project area, transporting runoff and water diverted from the western slope. This water supply is critical to the Denver Metropolitan Area and Strontia Springs Reservoir, located just downstream of the project area, has been substantially impacted by sediment and debris flows from several recent wildfires. The proposed action will focus on protecting critical watersheds from large, high severity wildfires that could lead to catastrophic debris flows in the North Fork South Platte River that could further impact water supplies locally and in Denver, including Strontia Springs Reservoir.

2.3 Alternative C

Alternative C was developed in response to a concern that increasing access through the use of temporary roads would cause some negative effects. Alternative C proposes that minimal temporary roads will be built to accomplish the project's purpose and need. Temporary roads would be limited to short segments needed to accomplish the treatments, such as jump-up spurs. Relying on the existing road network will lessen the ability for product removal and will shift treatment methods toward more mastication and hand thinning. This alternative seeks to balance forest restoration with concerns about expanding the existing road network.

Because minimal temporary roads will be constructed, all mechanical treatment must occur off of existing roads, limiting the area that can be accessed by traditional logging equipment. It is assumed that the majority of treatment will occur within 0.5 miles of existing roads, which reduces the available treatment area to 6,325 acres. This alternative does not limit treatments to within 0.5 miles of existing roads. However, it is assumed that treatments completed outside of 0.5 miles of existing roads would likely be hand thinning, mastication or prescribed fire. Table 2 presents the proposed treatment area by vegetation type for Alternative C and Figure 3 displays those areas on a map.

Table 2. Crossons-Longview Vegetation Types for Alternative C Treatments

Vegetation Type	Area (acres)	Percentage
Xeric Ponderosa pine	2,919	45%
Mesic Ponderosa pine	2,500	40%
Mixed Conifer	422	7%
Lodgepole pine	354	6%
Aspen	115	2%
Shrubs	16	< 1%
Total	6,326	100%

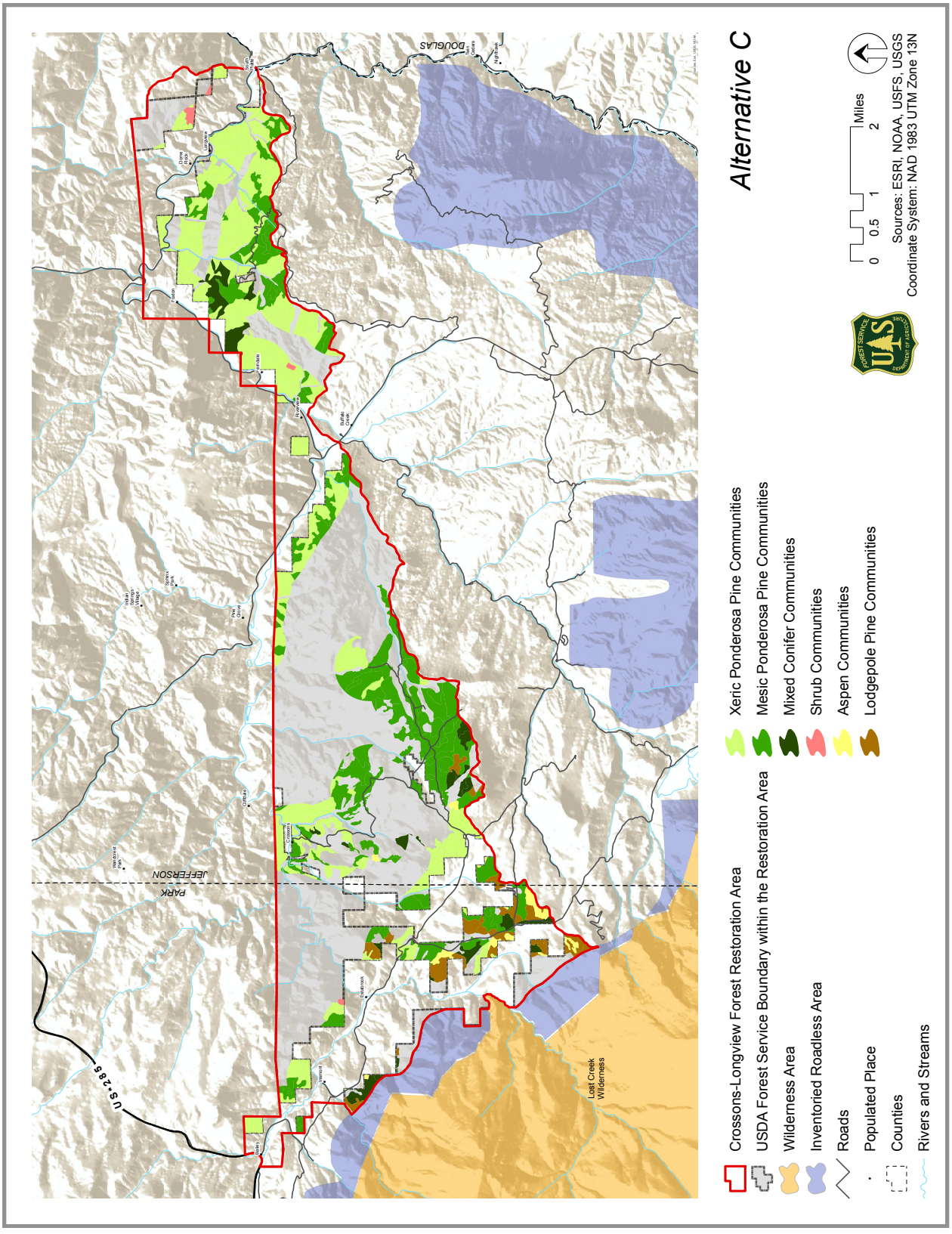

Figure 3. Alternative C Proposed Treatments Map

Like Alternative B, the treatments would be accomplished by a combination of hand and mechanical work along with prescribed fire. Professional judgment will be used, within the guidelines, taking into consideration the terrain and vegetative type, to determine which one or combination of treatments are most appropriate for individual treatment sites. All the treatment areas are located within 0.5 miles of existing roads. Approximately, 67 percent of the treatment areas lie on slopes of 0-35 percent and would be considered appropriate for treatment with traditional harvesting equipment. The treatments on slopes between 35-60 percent would likely be hand treatments. Alternative C does not include the construction of any new system and only minimal temporary roads. It is expected that it will take approximately 5-7 years to treat the entire targeted area.

Sections 2.2.1 through 2.2.8 would also apply to Alternative C, however there would be minimal temporary roads used in this alternative those portions of Sections 2.2.3 that reference temporary roads would not apply to this alternative.

2.4 Design Features

Specific design features are listed, as appropriate, for each technical area. The following is a listing of the documents that provide guidance and required design features that the proposed action and alternatives will incorporate. Additionally, all project activities will meet the requirements determined in consultation with the USFWS and the associated biological opinion.

1. USDA Forest Service. 1984. Pike and San Isabel National Forests, Land and Resource Management Plan, Rocky Mountain Region, USDA Forest Service. USDA Forest Service, Pike and San Isabel National Forests, Pueblo, CO.
2. Forest Service Handbook (FSH) 2509.25, Watershed Conservation Practices Handbook.
3. Prescribed burning would follow all state and local laws and air quality permit restrictions
4. Visual Quality Objectives in the Forest Plan (see reference above)
5. Perform heritage resource surveys and protect known sites. Comply with Section 106 of the National Historic Preservation Act, as amended.
6. All project activities will meet the requirements determined in consultation with the USFWS and the associated biological opinion.
7. Perform sensitive species surveys within 2 years prior to treatment in each unit, and enact protection measures to enhance species viability in the project area.

2.5 MONITORING

Two types of monitoring activities are identified: implementation and effectiveness. The intent of monitoring and adaptation is to allow land managers to respond to changed conditions and new information during the project implementation period. Options for how to best implement the project exist and would continue to evolve. The following are the outlines of monitoring for project area resources to ensure resource management objectives are achieved.

1. In addition to pre and post implementation monitoring for Threatened and Endangered species, monitor Management Indicator Species (MIS) and Regional Forester's Sensitive Species that may be directly affected by the project. Species can be monitored directly, in cooperation with partners, or via vegetation monitoring of constituent habitat requirements.
2. If the Forest Plan general directions, standards, and guidelines for wildlife and fish resources and habitat improvement and maintenance are not achieved, then:
    a. Reduce or modify vegetation treatment operations and/or,
    b. Increase species monitoring to determine the source of impact and apply appropriate mitigation.
3. Monitor vegetation and noxious weeds. If the Forest Plan general directions, standards, and guidelines for habitat improvement and maintenance are not achieved, then:
    a. Reduce or modify vegetation treatment operations and/or,
    b. Increase use of noxious weed control measures
    c. Increase noxious weed monitoring to determine the source of impact and apply appropriate mitigation.
4. Monitor soil erosion and water quality, including implementation and effectiveness of water conservation practices and other mitigation. If the Forest Plan general directions, standards, and guidelines for soil and water resources are not achieved, then:
    a. Reduce or modify vegetation treatment operations and/or
    b. Increase soil and water quality monitoring to determine the source of impact and apply appropriate mitigation.
5. Monitor off-highway vehicle (OHV) use within the treatment area. If the Forest Plan general directions, standards, and guidelines for dispersed recreation, including OHV use, are not achieved, then:
    a. Scarify, seed and block the creation of unclassified roads, unauthorized OHV trails and/or
    b. Gate and/or sign with "closed to motor vehicles" to discourage the creation of unclassified roads or unauthorized OHV trails, and increase law enforcement.

2.6 Alternatives Considered but Eliminated From Detailed Consideration

2.6.1 No Prescribed Fire

An alternative that would have excluded prescribed fire from the proposed actions was considered. Public opposition to the use of prescribed fire was identified during the scoping process. An alternative excluding prescribed fire was considered, but eliminated from detailed consideration because it does not meet the purpose and need. Without using some type of prescribed fire to remove activity fuels and/or restore fire to the ecosystem, the results to the proposed treatments would be rearranging fuels rather than reducing them. These actions would not meet the purpose and need. Prescribed fire is an essential tool in reducing high fuel loadings in the Project Area.

Chapter 3.
Affected Environment and Environmental Consequences

This chapter describes the affected environment and discloses the potential effects of the proposed action and each alternative. This section forms the scientific and analytical basis to compare the potential environmental effects of each alternative. The interdisciplinary team considered the following factors in their analysis of the potential environmental consequences:

1. The probable consequences of each alternative on environmental resources,
2. Achievement of project objectives,
3. Adherence to Forest Plan standards, guidelines and objectives,
4. Compliance with federal and state laws and regulations.

The Crossons-Longview Project Area is located within the South Platte Ranger District of the Pike and San Isabel National Forest. The Project Area includes approximately 22,729 acres of land, of which 15,196 acres are NFS lands. An estimated 7,533 acres of mostly private land are excluded from consideration.

3.1 Forest Vegetation

3.1.1 Forest Vegetation Affected Environment

General Characterization and Vegetation Cover Types

The lands within in the boundaries of the Project Area include both National Forest System lands and a significant portion of private lands that are excluded from consideration for treatments. For the vegetation analysis the term “Project Area” refers only to the National Forest System lands.

The Region 2 Vegetation (R2Veg) database was used to characterize the current structure of the forested landscape. The data on vegetation contained in this database were obtained from a combination of aerial photo interpretation and field surveys conducted prior to September 2007. Information used to characterize the forest vegetation of the Crossons-Longview area includes cover types, structural stages, crown cover, and elevation.

Cover types are a way of classifying areas by the vegetation that occupy a site. Cover type data from the R2Veg database were used to assess the existing species composition of the vegetation across the Project Area. Cover

types are named for the plant species that presently dominate on the site. Section 2.2.2 Forest Treatments by Vegetation Type contains a detailed description of how cover types are classified for the Project Area.

Vegetation is also characterized by structure. Structure is described by habitat structural stages, which are defined by size class, tree diameter, and canopy closure (measured as crown cover percent). Table 3 displays habitat structural stage definitions.

Table 3 Habitat Structural Stage Definitions.[1]

Habitat Structural Stage	Size Class	Diameter (inches)	Crown Cover (%)
1T[2]/1M[3]	Grass-Forb	Not applicable	0 – 10
2T[2] /2S[4]	Shrub-Seedling	< 1	0 - 10
3A	Sapling-Pole	1 – 9	11 – 40
3B	Sapling-Pole	1 – 9	41 - 70
3C	Sapling-Pole	1 – 9	71 - 100
4A	Mid-aged	9+	11 – 40
4B	Mid-aged	9+	41 - 70
4C	Mid-aged	9+	71 - 100%
5[5]	Mature	Not applicable[5]	Not applicable[5]

Crown cover is a measure of density and is the percentage of a fixed area covered by the vertical projection of the outermost perimeter of the tree crowns. The total crown cover of an area cannot exceed 100 percent. Crown cover is used to describe stand density or how open or closed the tree crowns are within a stand. Research of historical conditions of ponderosa pine forests of the region has estimated that the typical crown cover was 25 to 30 percent, although higher crown cover may have characterized some ponderosa pine stands in the upper montane.

Vegetative communities result from complex interactions of climate, soils, topography, disturbance and time. The most important natural disturbances affecting forest succession in the montane zone of the Colorado Rockies are fire, insect outbreaks and windstorms (Veblen and Donnegan, 2005). Humans have affected the forest vegetation of the region through logging, livestock grazing and fire suppression. In their discussion of historical fire regimes of the ponderosa pine forest of the area Kaufmann, Veblen, and Romme (Kaufmann et al., 2006) divide the montane zone into the lower montane and upper montane zones.

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[1] Hoover and Wills, 1987

2 Opening in forest cover type created by some type of disturbance – previously tree covered.

3 Natural meadow – not previously tree covered.

4 Shrub cover type

5 Old Growth, Forest Criteria and Documentation usually determined by a scoring system. Class does not distinguish between canopy cover classes, existing conditions in this class is assumed to be >40 percent crown cover.

Xeric Ponderosa Pine

Xeric Ponderosa pine is the most abundant cover type within the Project Area occupying 5,845 acres. These stands are predominately mid-aged (Structural Stage 4) but there are also some sapling-pole (Structural Stage 3) and mature trees (Structural Stage 5). Small areas with seedling cover (Structural Stage 2) are also present (Figure 4). Within the mid-aged class (Structural Stage 4), stands with more than 40 percent canopy cover are slightly more abundant. Only three percent of the xeric ponderosa pine exists as openings (grass/forbs). While there is some variety of structural stages within the existing ponderosa pine cover type, the historic landscape most likely would have had a greater proportion of area with less than 40 percent crown cover and more openings (Structural Stage 1T&1M).

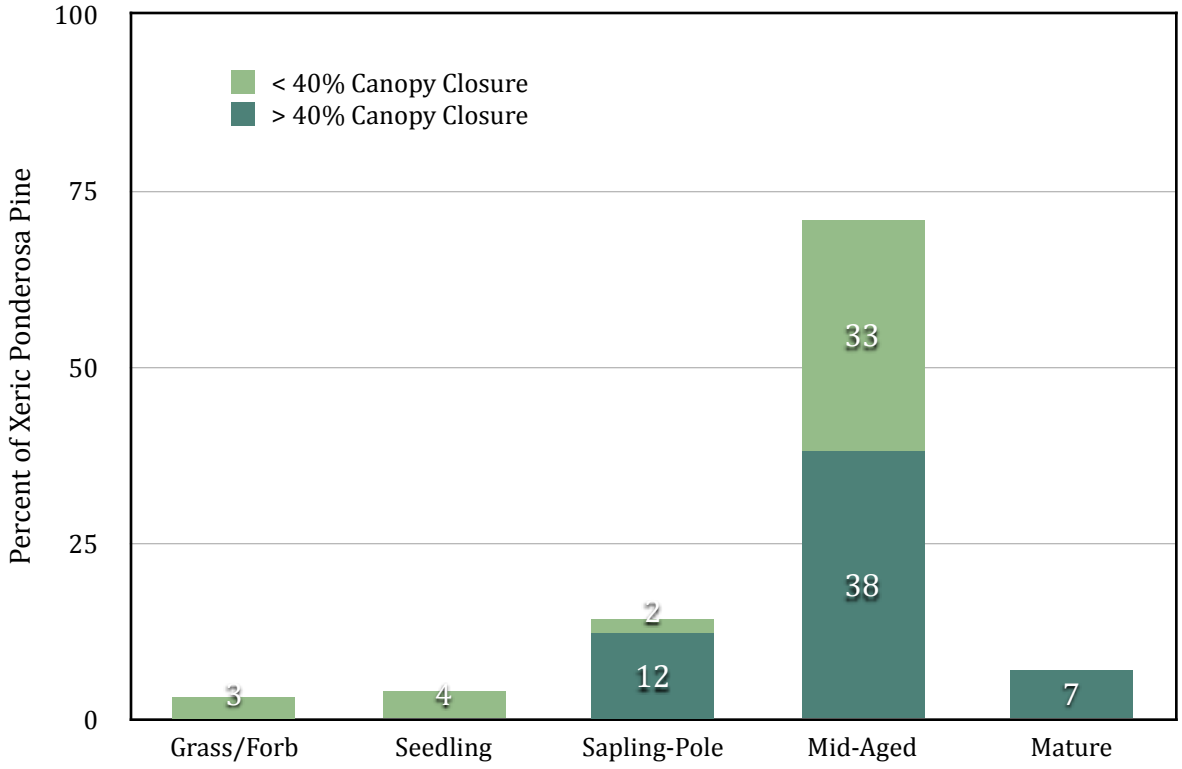

Figure 4. Existing Structural Stages for Xeric Ponderosa Pine.

Mesic Ponderosa Pine

Mesic ponderosa pine is the second most abundant cover type in the Project Area comprising 4,240 acres. Size and canopy distribution of mesic ponderosa pine stands resemble xeric ponderosa pine stands. Mid-aged stands (Structural Stage 4) are the most abundant and 42 percent of these stands have more than 40 percent canopy cover. Sapling-pole sized (Structural Stage 3) and mature trees (Structural Stage 5) are also present as are small areas with seedlings (Figure 5). Like the xeric ponderosa, only three percent of the mesic ponderosa pine cover type area exists as openings (grass/forbs).

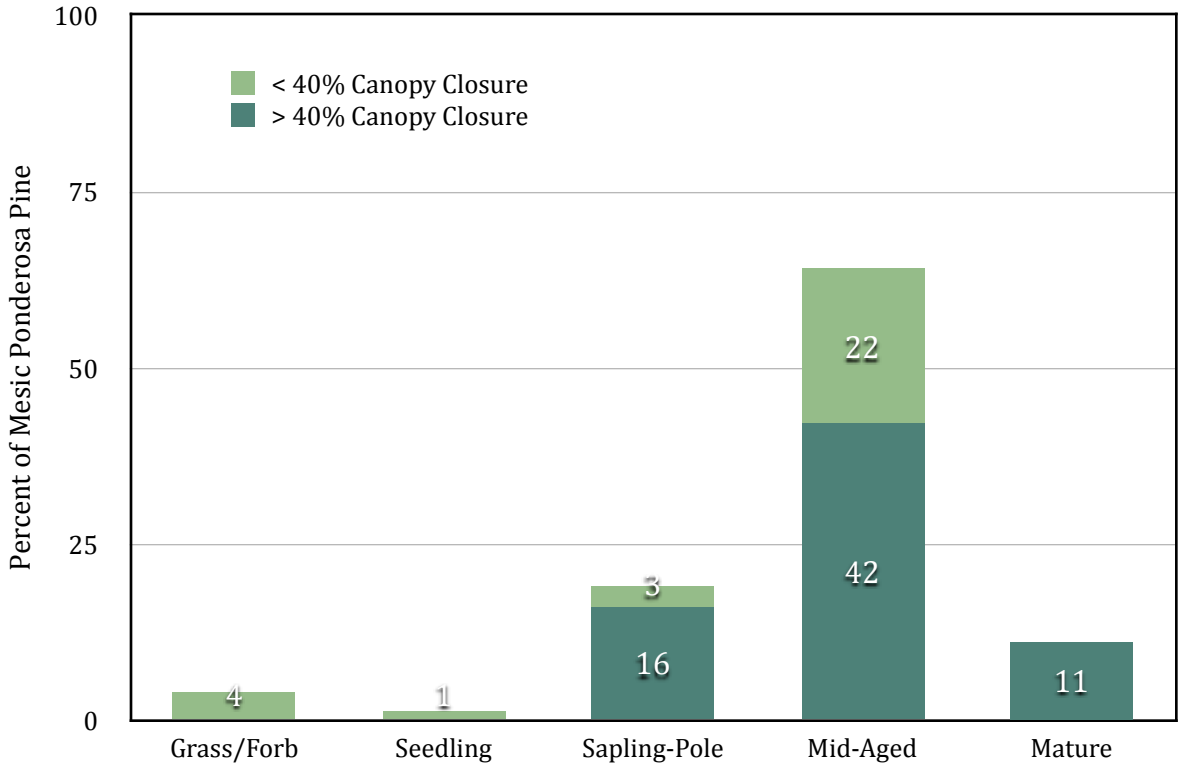

Figure 5. Existing Structural Stages for Mesic Ponderosa Pine.

The denser ponderosa pine stands found within the Project Area create conditions suitable for large stand-replacing fires to occur. Denser canopies with small understory trees help fires reach the crown level. Because of this shift in stand conditions, large stand-replacement fires within this cover type in the region have become more common in recent years (USDA Forest Service, 2002a).

Mixed Conifer

The mixed conifer cover type occupies 694 acres, or approximately 6 percent of the National Forest System lands in the Project Area. Mixed conifer areas are generally composed of Douglas-fir, white fir, ponderosa pine, bristlecone pine and limber pine. Most trees are in the sapling-pole (Structural Stage 3) or mid-aged class (Structural Stage 4) with 80 percent of this community having more than 40 percent canopy cover. Openings comprise 13 percent of the mixed conifer cover type treatment area. Figure 6 illustrates habitat structural stages and crown cover for the mixed conifer zone.

Historically, the disturbance regime for mixed conifer stands of the area was mixed-severity fires with a fire recurrence interval of 30-100 years (Crane, 1982). Therefore, a mosaic of conditions composed of structural stages ranging from young to old trees was typical of the mixed conifer areas of the montane zone. Stands were variable but generally uneven-aged and open, with occasional patches of even-aged structure. Denser tree conditions existed in some locations such as north facing slopes and valley bottoms. It is likely that a greater proportion of the mixed conifer forest within the Crossons-Longview Project Area today have higher densities (crown cover) than would have existed under the historic disturbance regimes.

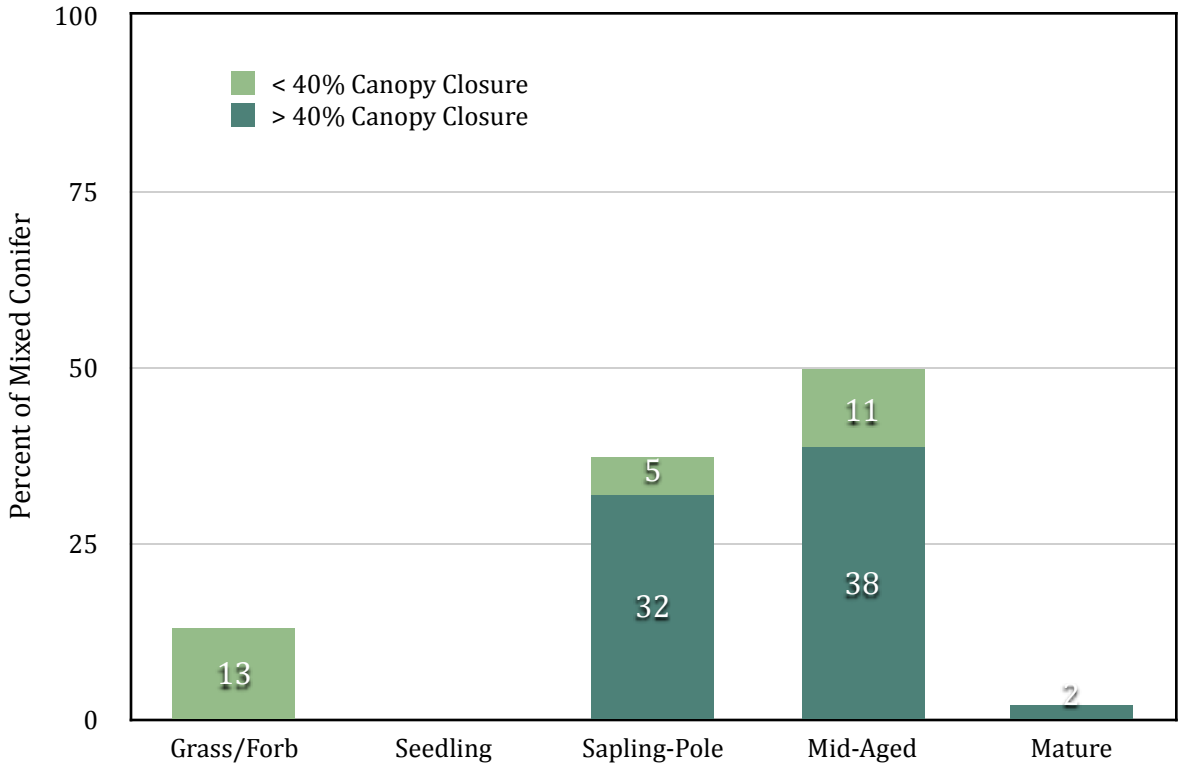

Figure 6. Existing Structural Stages for Mixed Conifer.

Lodgepole Pine

There are 596 acres of the lodgepole pine cover type in the treatment area, or five percent of the National Forest System lands in the Project Area. All of these lodgepole pine stands have greater than 40 percent canopy closure. Lodgepole pine stands are either sapling-pole (Structural Stage 3) or mid-aged trees (Structural Stage 4) as shown in Figure 7. There are no mature or seedling lodgepole stands in the Project Area. There are also no openings in the lodgepole cover type.

Lodgepole pine grows on a wide range of sites, typically between 7,500 and 10,000 feet and can occur in pure or mixed stands (Shepperd and Alexander, 1983). In mixed stands at lower elevations, it can occur with Douglas-fir and ponderosa pine. At higher altitudes, mixed stands consist of Engelmann spruce, subalpine fir and limber pine. Lodgepole is mostly shade intolerant and exists as a seral species where environmental change such as fire has occurred.

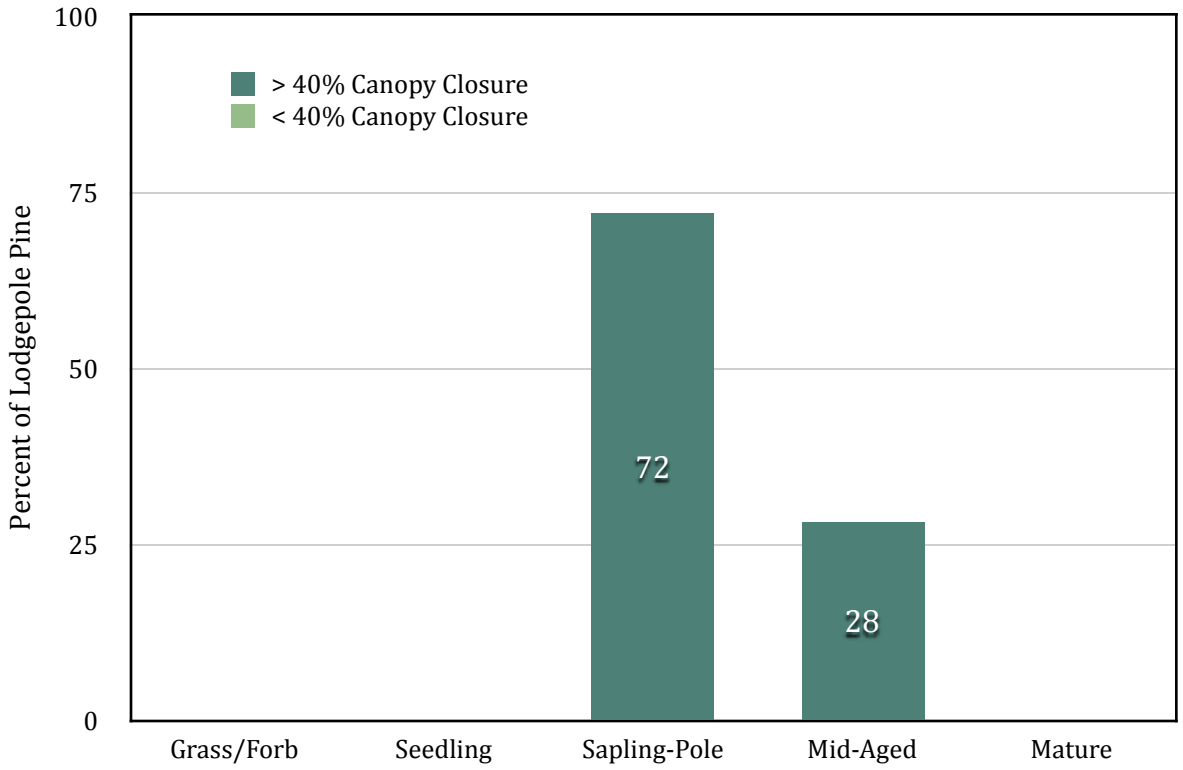

Figure 7. Existing Structural Stages for Lodgepole Pine.

Aspen

There are 125 acres of aspen in the Project Area. Aspen stands are found either as sapling-pole of mid-aged stands, most of which have canopy closure that is 40 percent or greater. There are no stands of mature or seedling aspen in the Project Area.

Quaking aspen is the most widely distributed tree in North America. Quaking aspen grows on a variety of sites including moist upland woods, dry mountainsides, high plateaus, and along riparian corridors. Climatic conditions vary widely throughout their range, but aspen generally occur where annual precipitation exceeds evapotranspiration. In the Rocky Mountains, altitude plays an important role in its distribution. At higher elevations, quaking aspen is stunted and grows bent or prostrate. This species is not shade tolerant and typically has open canopies with high light levels in the understory. This high light level allows for the establishment of conifers on many sites. On these sites aspen is seral to conifers and in the absence of disturbance may be replaced by conifers over time. On other sites aspen is self-replicating. Aspen reproduces from seed, but rationing, or suckering, is the most common mode of regeneration. Aspen form clones that are connected by a common parental root system; this characteristic allows it to sprout vigorously after burning or cutting.

Aspen provides many benefits to the landscape, including natural fuel breaks, species diversity and important wildlife habitat. Aspens are unique in their ability to stabilize soils and provide habitat for many bird and mammal species. Aspen stands are important nesting and hiding grounds for grouse, doves, warblers, and juncos. Deer and elk browse on aspen year-round, but are especially dependent upon it during fall and winter when aspen protein levels are high relative to other browse species. Aspen communities are described as the major “deer-producing forest type”.

Fire suppression impacts aspen regeneration. In the absence of periodic burning, aspen would succeed to conifers or other vegetative types (Jones et al., 1985). Recent data has shown a 50 to 96 percent decline in aspen in the western United States, with a 49 percent decline in Colorado (Bartos, 2000). For these reasons, aspen restoration should be given top priority throughout the west (Bartos, 2000). Aspen is susceptible to numerous pathogens, many of which are positively correlated with stem injury caused by ungulate browsing (Romme et al., 1995). Disturbance regimes in aspen, where they are seral to conifers, are similar to the conifer stands that are next to them (Veblen and Donnegan, 2005).

Aspen is principally found on the southwest portion of the Project Area and is adjacent to grass / forb / shrub dominated areas, ponderosa pine, lodgepole pine and riparian communities. In the montane zone aspen is adjacent to ponderosa pine and mixed conifer forests that have mixed severity fire regimes with fire return intervals of between 30 and 100 years. Therefore, aspen stands in this zone have likely experienced fewer disturbances in the past 100 years due to fire suppression. Where aspen occurs near lodgepole pine the stand replacing fires occur every 50 to 200 years while mixed severity fires occur every 40 to 500 years.

Shrublands

There are two types of shrublands within the Crossons-Longview Project Area including Gambel oak (Quercus gambelii) dominated and true mountain mahogany (Cercocarpus montanus) dominated. There are 67 acres of shrubland within the Project Area that are classified as habitat structural stage 2.

Gambel oak is a tall shrub or short tree where it occurs on the Pike and San Isabel National Forest. This species is limited at lower elevations by moisture stress and at higher elevation by competition with other species. It is probable that this cover type experienced infrequent stand replacing fires under the historic conditions (Veblen and Donnegan, 2005). This shrub re-sprouts after fire from rhizomes and can recover rapidly following fire. The Gambel oak communities in the Crossons-Longview Project Area have become decadent over time in the absence of fire. Gambel oak becomes denser as it ages and shades out grasses and other ground cover. In southern and southwestern Colorado, Gambel oak occupies a secondary successional stage in ponderosa pine and Douglas-fir (Pseudotsuga menziesii) stands removed by fire or logging (Brown, 1958; Harrington, 1964). It is a persistent subclimax to conifers or a climax species of foothill ranges (Dixon, 1935; Engle et al. 1983; Hayward, 1948; Lull and Lincoln, 1950). Gambel oak generally increases with disturbance or thinning of ponderosa woodlands. Gambel oak is a fire-adapted species (McKell, 1950). It responds to fire by vegetative sprouting from the lignotuber and rhizomes, often vigorously in the first season following fire (Brown, 1958; McKell, 1950).

True mountain-mahogany is a deciduous shrub. In Colorado it occurs on dry slopes, hills, ridges, mesas, desert foothills, and rocky outcrops between 4,000 and 8,500 feet of elevation (Harrington, 1964). It grows best in full sun (Kitchen, 2004), tolerates early-seral site conditions, and is dominant in several late-seral or climax communities (Zacek et al., 1977). Often true mountain-mahogany is top-killed by fire; however, it quickly recolonizes burned sites through root crown or rhizome sprouts (Cronquist et al., 1997). The fir return interval for mountain mahogany when in a Gambel oak scrub community ranges between less than 35 to less than 100 years and 2–30 years when in interior ponderosa pine (Arno, 2000). The fire return interval varies widely. Numerous authors report that true mountain-mahogany seedlings are rare in the early postfire years (Keeley and Keeley, 1988) and that seedling establishment is most typical in mature stands (Halsey, 2005). Mountain mahogany provides forage and habitat for diverse wildlife species and most types of livestock (Reynolds and Johnson, 1964).

3.1.2 Forest Vegetation Environmental Consequences

This section describes the effects of Alternative A (No Action), Alternative B (Proposed Action) and Alternative C on the vegetation of the Crossons-Longview Project Area. As discussed above in Analysis Methods, the term Project Area refers only to National Forest System lands within the Project Area boundaries.

Effects Common to All Alternatives

Under all alternatives, there would be forest stands that would not be treated. These untreated stands would include much of the subalpine zone as well as forests on steep slopes, areas set aside to meet fish and wildlife

management objectives, and to protect riparian areas and water quality. In the absence of disturbance, these untreated stands would continue to mature and succeed to more shade tolerant species over time. A number of wildfires have burned within or near the Project Area including the Lower North Fork (2012), Snaking (2002), High Meadow (2000) and Buffalo Creek (1996). These fires burned with varying intensity altering habitat structural stages and fuel loads. In many places, forests of varying densities and canopy closures have been converted to grassy meadows which alter the behavior of future fires.

Alternative A (No Action)

Direct and Indirect Effects

Alternative A (No Action) would have no direct short-term effects on the forest structure of the Crossons-Longview Project Area. Since no new vegetation treatments would be implemented under this alternative, the forest structure would not be directly altered. However, Alternative A could have significant indirect effects on forest structure over time. In the absence of disturbance, open early successional habitats would continue to decline as seral habitats progress toward later seral stages. This trend toward a more homogenous landscape would have the greatest impact on the vegetation of the montane zone.

Xeric and Mesic Ponderosa Pine

The dry ponderosa pine treatment area includes those areas that would have historically been characterized by very open stand conditions with frequent low severity fires. Under Alternative A (No Action) the trend toward more closed stand conditions would continue on some of these sites. In the absence of disturbance more of these areas would progress to the mature stage and develop a crown cover of greater than forty percent. Openings which are transient features of the landscape would eventually be colonized by trees, further diminishing landscape heterogeneity. Wooded areas would likely become increasingly dense in the absence of fire or vegetation treatment. Without periodic fires, seedlings that develop in the more open areas would grow and develop into saplings and pole size trees. These denser, multi-storied stands may be more susceptible to hot fast moving crown fires due to the ladder fuels provided by the smaller under story trees. Trees within these denser stands would be under additional stress due to increased competition for site resources. This additional stress can make these stands more susceptible to injury from insects, disease, and drought.

The potential changes over time within the more mesic ponderosa pine stands would be similar to the drier (xeric) sites of ponderosa pine. However, the mesic stands would have had more variation under the historic disturbance regimes than was present on the dryer sites. Under Alternative A (No Action), younger sapling-pole stands would progress into the mature stage. Without disturbance most of these stands would develop a crown cover over 40 percent. Over-time, these mesic stands would become more homogenous with less variation in density and structural stage.

The risk of loss due to mountain pine beetles would likely increase in both xeric and mesic ponderosa pine stands over-time as they increase in density and average stand diameter. If populations of mountain pine beetles were to increase in the area, high rates of mortality would be expected within the higher risk stands.

Mixed Conifer

Under Alternative A (No Action), the mixed conifer stands within the montane zone would continue to mature. The amount of Douglas-fir would be expected to increase on these sites as the less shade tolerant limber pine and ponderosa pine die out and are replaced by the more shade tolerant firs. In the absence of disturbance, younger stands would not be initiated and the forest stands would become more homogenous.

Although Alternative A (No Action) would have no direct short-term effect on the forest structure of mixed conifer stands,, it could have a profound indirect effect on the long-term disturbance regimes of the montane zone in the Project Area. Under Alternative A (No Action), forest stands of the montane zone would continue to become more homogenous with fewer and fewer openings and higher stand densities. This type of forest structure is at greater risk to large-scale disturbances either by large wildfires or extensive insect and disease outbreaks. This type of disturbance regime, where large areas of forest are disturbed by high intensity and large-scale events, is not typical of the historical pattern in the montane zone (Kaufmann et al. 2006, Veblen and Donnegan, 2005). This type of disturbance regime creates large, contiguous blocks of homogeneous habitat structural stage, rather than a mosaic of stand ages and structures. Although historically, insects played a role in these forests, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildfire, insects and disease may become the major disturbance agent. A long-term effect of Alternative A would be to perpetuate a trend towards a "boom and bust" cycle of disturbance between insects and disease and fire in the forests of the montane zone. This type of disturbance regime and the resulting landscape pattern is much different from the historical landscape. Landscape heterogeneity and wildlife habitat would diminish.

Lodgepole Pine

Barring any disruptive event such as fire, lodgepole is typically succeeded by more shade tolerant species such as Douglas-fir, subalpine fir and Engelmann spruce (Schmidt, 1989). This process would also occur in the absence to treatment under Alternative A. It is also possible that a large, stand-replacing fire could occur reverting the system to an early seral lodgepole pine stand.

Aspen

Under Alternative A (No Action) the amount of aspen within the Crossons-Longview Project Area would likely decline over time. Some of the aspen stands have an established conifer component. In the absence of fire or conifer removal, these sites would eventually convert to conifers as aspen is shaded out. On sites where aspen is self-replicating, sudden aspen decline may result in more open grass or shrub dominated communities developing. As the older aspen die out and new aspen sprouts are not produced; shrubs and grasses may become the dominant vegetation in these areas. All aspen stands are susceptible to persistent disease infestations in the absence of fire or mechanical thinning would contribute to decline across the Project Area.

Shrublands

Without treatment or fire, Gambel oak communities in the priority treatment area would become decadent over time. Oak stands are likely to persist in the absence of fire or thinning but would become denser with age and shade out grasses and other ground cover. Under the Alternative A (No Action) these communities would

continue to fill in and the oak shrubs would dominate these sites. These shrub dominated areas do not provide the variety of vegetation that more seral communities do and they may be more prone to hotter wildfires due to greater volumes of woody fuels.

Mountain mahogany communities would persist in the absence of fire or be colonized by trees in the long term. Habitat value would not be adversely impacted in Alternative A but shrub communities form a less effective fuel break than herbaceous communities.

Cumulative Effects

The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and extending 10 years into the future. The cumulative effects analysis area includes the Crossons-Longview Project Area as well as adjacent private and National Forest lands where on-going or foreseeable future vegetation management projects could affect the forest vegetation of the Crossons-Longview Project Area.

The existing condition of the vegetation within the Crossons-Longview Project Area is largely the result of past and present human activities. The Euro-American settlement of the Pikes Peak area began in the mid-1800s and brought with it mining, logging, road construction, grazing, non-native plant and animal species, human-caused fires, suppression of natural fires, and many other activities that affected the vegetation of the area. All these activities have altered the natural disturbance regimes of the forest. Several large fires are reported to have burned in the area between 1850 and 1890. Some of these where thought to have been human caused. In addition, intensive logging during this time had removed much of the commercial forests in the Woodland Park area. By the turn of the century much of the original forest vegetation had been altered through mining, timber harvesting, large wildfires, and livestock grazing. This period of extraction was followed by the establishment of the Pike and San Isabel National Forest and an emphasis on watershed protection and reestablishing the forested landscape. Tourism also increased in the area as visitors came to drive the road or ride the cog train to the top of Pikes Peak. In the twentieth century active fire suppression became another emphasis of the USDA Forest Service. The policy of suppressing wildfires over the last 100 years has resulted in many forests developing denser vegetation that would have historically been reduced by more frequent, low-intensity and mixed severity fires.

Historically fires regulated tree density, species composition, reduced the amount of dead biomass, maintained clearings, and promoted nutrient cycling (Covington and Moore, 1992; Covington and Moore, 1994; Covington and Sackett, 1984; Covington and Sackett, 1988; Fulé et al., 1997; Mast, 1993; Swetnam and Betancourt, 1990). Fire suppression and cattle grazing, introduced by Euro-American settlement in the late 1800s, have caused major changes in the spatial pattern and ecological processes of ponderosa pine ecosystems. These changes have increased tree density and reduced the frequency of natural fires (Covington, 1994; Weaver, 1961). As a result, trees are colonizing clearings normally maintained by fire and new clearings are not being created. Open savannas of high herbaceous content have changed into dense forests with closed canopies and reduced nutrient cycling rates (Covington and Moore, 1992; Covington and Sackett, 1988; Fulé et al. 1997; Swetnam and Betancourt, 1990). Fire suppression and grazing facilitated a significant increase in the amount of Douglas-fir trees (Kaufmann et al., 2000). Grazing contributed to increased tree densities by reducing herbaceous cover and breaking fuel continuity on the forest floor. Tree seedlings proliferated in the

absence of fire and competition from grasses (Harrington and Sackett, 1992). Thick organic layers on the forest floor and dense pine canopies have suppressed herbaceous vegetation in the rangeland (Sackett et al., 1993). Increased pine density decreased individual tree vigor resulting in greater mortality from insects, disease and drought. In the absence of fires, surface fuel loads and vertical fuel continuity increased to unprecedented levels creating ideal conditions for crown fires (Covington and Moore,1992; Covington and Sackett, 1988; Fulé et al., 1997; Swetnam and Betancourt, 1990). Prolific dead and down materials (fuel loading) increase fire line intensity and make forest fires difficult to extinguish. These changes have caused deterioration in forest ecosystem integrity (Dahams and Geils, 1997).

Current ponderosa pine forests (including those present in the Project Area) have large fuel loads, are prone to insect outbreaks, and are more susceptible to large, high intensity wildfires (Covington, 1994; Covington and Moore, 1992; Kaufmann et al., 1998; Rapport et al., 1998). Nearly all ponderosa pine forests have been altered significantly by human activities, and current forest structures often bear little resemblance to historical forests (Fulé et al., 1997). Current fire behavior is beyond historical norms in terms of frequency, severity and size. The Hayman Fire, for example, burned with complete tree mortality on about 95% of the landscape. Tree age data from this area indicate that the size of area burned with complete mortality was unprecedented over the last five centuries (Huckaby et al., 2001). Large scale, stand-replacing fires can result in erosion, sedimentation, and flooding that impact watersheds and threaten human health (Bruggink et al., 1998).

Following the period of intensive logging and wildfires in the late 1800s, there was increased erosion and a reduction in water quality as sediment from the recently logged and burned areas reached the streams and rivers. With the establishment of the municipal watersheds, the management emphasis for the lands within the Crossons-Longview Project Area was one of maintaining forest vegetation and minimal disturbance. Because of this emphasis on maintaining water quality very few vegetation treatments or logging was conducted on the National Forest or the adjacent lands managed by the utilities. However in more recent years, some vegetation treatments been initiated to reduce the wildfire hazard in the area.

Under Alternative A, there would be no additional vegetation treatments on National Forest lands in the Crossons-Longview Project Area. While the recent and on-going vegetation treatments on private lands within the Crossons-Longview Project Area would help to reduce stand densities and create a more diverse landscape. Without any treatments on National Forest System lands, a large portion of the Crossons-Longview Project Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer. Lodgepole pine stands would be replaced by mixed conifer stands until stand replacing fire resets the system.

Contemporary projects within the South Platte Ranger District include the Big Turkey Trailhead recreational management, Devils Head Communication Site Lease, Douglas County Public Works weather stations, IREA Spring Creek Ranch Powerline Rebuild, Kenosha Pass Communications Site Lease and the Platte Canyon Powerline Rebuild and Reauthorization. The cumulative effect of the past, present and reasonably foreseeable future actions on the condition of the forest vegetation in the Crossons-Longview Project Area under Alternative A (No Action), is an area dominated by forest stands that are generally healthy but relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

In the absence of forest management, these trends would continue. The long-term result would be a greater departure from the historical norms which sustained the ecosystem and the values societies depend upon including water supply.

Alternative B (Proposed Action)

Direct and Indirect Effects

The Proposed Action includes the treatment of 9,564 acres and construction of temporary roads.

Xeric Ponderosa Pine Treatment Areas

Alternative B would break up the homogeneity of the xeric ponderosa pine stands in the Project Area. The proposed action would treat 4,581 acres, or approximately 78 percent, of the xeric ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, 84 percent of the treated area would have a canopy closure less than 40 percent. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 8 illustrates how Alternative B would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

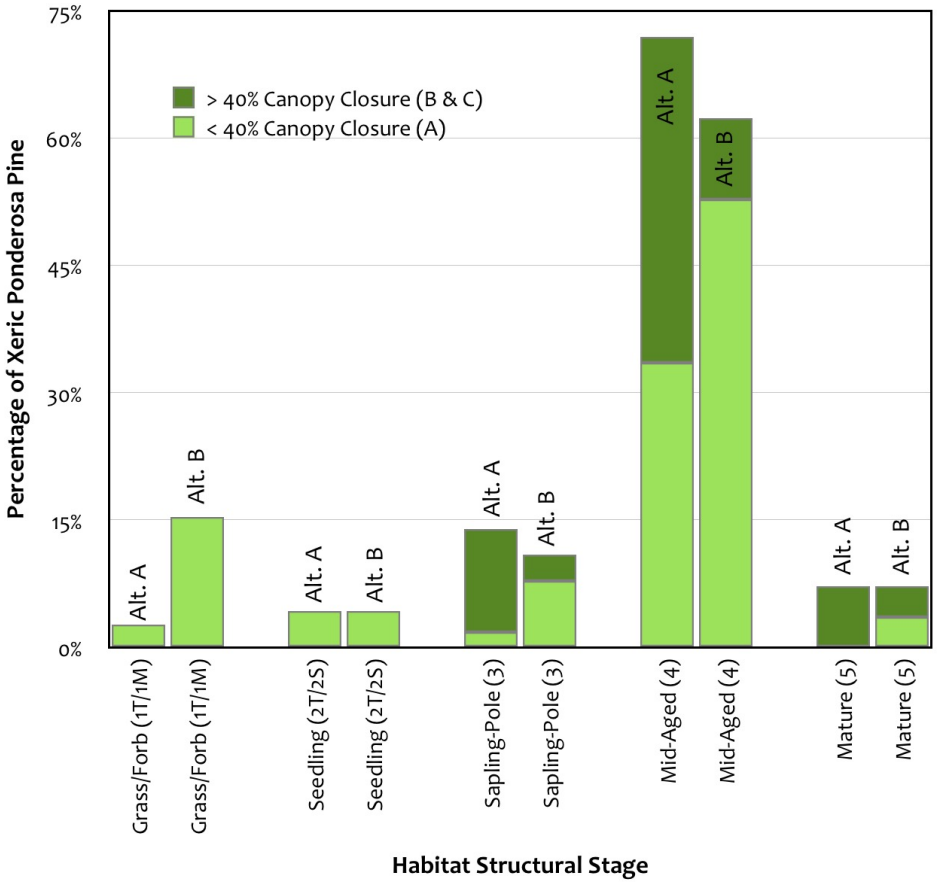

Figure 8. Alternatives A and B Structural Stages for Xeric Ponderosa Pine.

Proposed treatments would include a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Stands would be thinned to between 10 to 35 percent canopy closure. Most treated areas would have post-treatment canopy closure of 25 to 30 percent. Areas with canopy closure greater than 40 percent would still exist but would be reduced from approximately 57 percent of the xeric ponderosa pine in the Project Area to only 17 percent (Figure 8). In thinned stands, the spacing of thinning would be variable, retaining natural clumpiness. Pockets of dwarf mistletoe would be targeted for removal and pockets of older, platy barked trees would be leave clumps. The targeted basal area in thinned stands would be 20 to 80 square feet per acre.

Treatments would create openings ranging from 1 to 40 acres in size. Currently, across the Project Area, just three percent of this community exists as clearing (grass/ forb dominated 1T&1M) (Figure 3), but post-treatment 15 percent of the xeric ponderosa pine cover type would exist as openings. Some of these openings would not have any trees and others would have a canopy closure from 1 to 10 percent. Large and mature dominant and subdominant trees would generally be retained except when these trees are damaged, diseased or declining.

Prescribed burning after thinning activities would remove seedlings and smaller trees as well as reduce woody fuels. The resulting stands would support a variety of structural stages where patches of trees and clearings intermingle in a landscape mosaic.

Open forests resulting from treatment would facilitate the development of grasses (1T&1M), shrubs (2T&2S) and fine fuels that could carry low intensity ground fires without torching of tree crowns. If ground fires are permitted to burn through these stands occasionally, a heterogeneous landscape (which does not support large-scale, high intensity wildfire in most cases) could be maintained by discouraging ingrowth of small diameter trees. However, if fire is suppressed or mechanical means are not utilized to maintain open conditions, stands would revert to the dense conditions that currently exist.

There would likely be an increase in the diversity of understory plants within many of the treated pine stands. The reduction in canopy cover would increase the amount of sunlight reaching the ground, and increase the availability of moisture and nutrients for understory vegetation, allowing a greater diversity and larger populations of understory grasses, forbs and shrubs. Disturbance created by prescribed fire would help stimulate the growth of some of the less shade tolerant plant species within these stands. Inclusions of aspen and oak would benefit from these treatments. A comparison of post-treatment structural stages for xeric ponderosa pine for both Alternative A and Alternative B is shown in Figure 8. The comparison displays a shift of acres from mid-aged to grass/forb stages under Alternative B.

Mesic Ponderosa Pine Treatment Areas

Like in xeric ponderosa pine stands, Alternative B would alter the structure of mesic ponderosa pine stands by treating 3,684 acres, or 87 percent of the mesic ponderosa pine in the Project Area, with a combination of thinning and created openings. The existing structure of mesic ponderosa pine stands are similar to those of xeric stands with a preponderance of mid-aged trees and dense stands, with 70 percent of the area having canopy closure greater that 40 percent; clearings comprise just 4 percent of the area for this cover type. The

management treatments discussed under xeric ponderosa pine also apply to mesic stands with two exceptions:

1. Thinned stands would have a larger residual basal area than in the xeric stands with overall densities ranging between 40 and 120 basal area square feet per acre.
2. Created openings would be smaller than in the xeric stands, ranging from 0.5 to 20 acres in size.

As in the xeric ponderosa pine, Alternative B would break up the homogeneity of the treated mesic ponderosa pine stands. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, across the Project Area, the percent of mesic ponderosa pine that exists as openings (grass/forb) would increase from 4 percent to 19 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 20 percent, leaving 80 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 9 illustrates how Alternative B would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

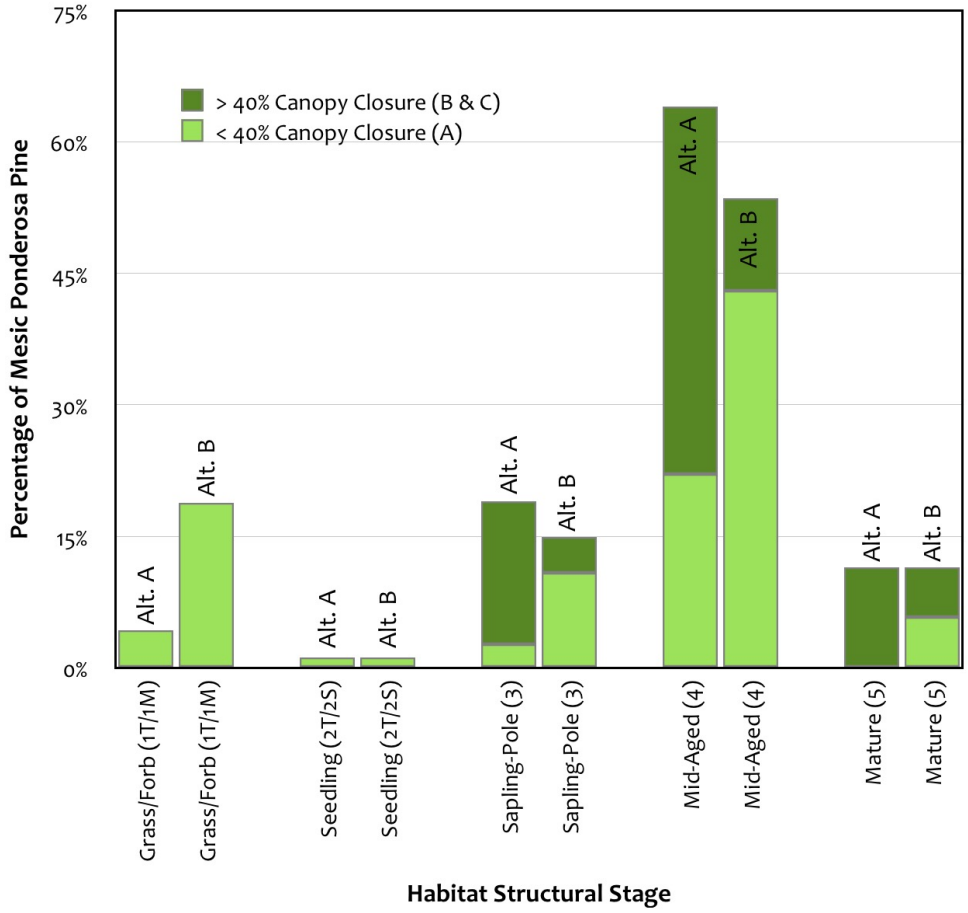

Figure 9. Alternatives A and B Structural Stages for Mesic Ponderosa Pine.

Effects of the thinning and created openings would be the same as discussed for xeric ponderosa pine. A comparison of structural stages for mesic ponderosa pine for both Alternative A and Alternative B is shown in Figure 9. The comparison displays a shift of acres from mid-aged (Structural Stage 4) to grass/forb stages (Structural Stages 1T&1M) under Alternative B.

Mixed Conifer Treatment Areas

Alternative B would treat approximately 603 acres, or approximately 87 percent, of the mixed conifer forest in the Project Area with a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Post-treatment, openings in mixed conifer would increase from 13 percent to 27 percent. The area with canopy closure greater than 40 percent would be reduced from 72 percent to 22 percent. Figure 10 illustrates how Alternative B would change the structure of the mixed conifer community on National Forest System lands within the Project Area boundaries.

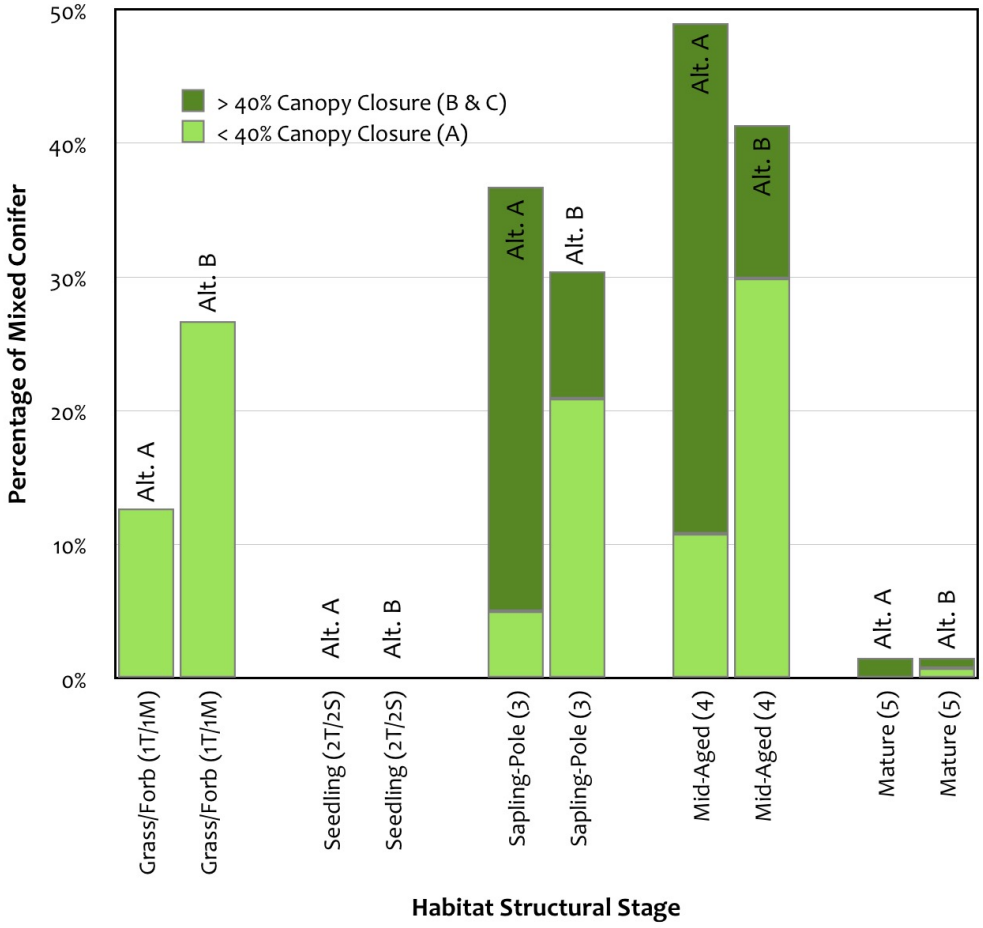

Figure 10. Alternatives A and B Structural Stages for Mixed Conifer.

Stands would be thinned to a residual stand basal area ranging from 60 to 120 square feet per acre. This is a higher basal area than for other vegetation types because mixed conifers have smaller root systems and therefore a greater dependency on surrounding trees for support. Areas that have understory trees that could provide ladder fuels could be thinned from below removing the more flammable understory trees and leaving more or less even-aged stands of the larger cohorts.

In other areas, patchy openings would be created to encourage regeneration and provide an increase in age class diversity. Areas with evidence of disease or insect infestation (i.e., dwarf mistletoe, white pine blister rust, spruce budworm or bark beetles) would be priority areas for creating these openings. Openings would range in size from a quarter acre up to 40 acres with most being less than 10 acres. Small clumps of trees may be left scattered across the larger (greater than 1 acre) openings to create structural diversity and provide seed for natural regeneration.

The result of these proposed treatments would be to increase the age and spatial diversity of the mixed conifer stands within the treatment areas. A comparison of structural stages for mixed conifer for both Alternative A and Alternative B is shown in Figure 10. The comparison displays a shift of acres from mid-aged (Structural Stage 4) and sapling pole (Structural Stage 3) to grass/forb (Structural Stage 1T&1M) stages under Alternative B.

Lodgepole Pine Treatment Areas

Alternative B would treat 588 acres, or approximately 93 percent, of the lodgepole pine in the Project Area. Like other treed cover types, the treatments would include thinning and creation of openings in the forest canopy. Currently, all of the lodgepole pine stands in the Project Area have a canopy closure greater than 40 percent and all existing stands are sapling-pole or mid-aged trees. There are no mature or seedling stands and no areas of grass/forb openings. Post-treatment, the lodgepole pine in the Project Area with canopy closure greater than 40 percent would be reduced from 100 to 25 percent and 25 percent of the lodgepole pine cover type would exist as openings. Figure 11 illustrates how Alternative B would change the structure of the lodgepole pine community on National Forest System lands within the Project Area boundaries.

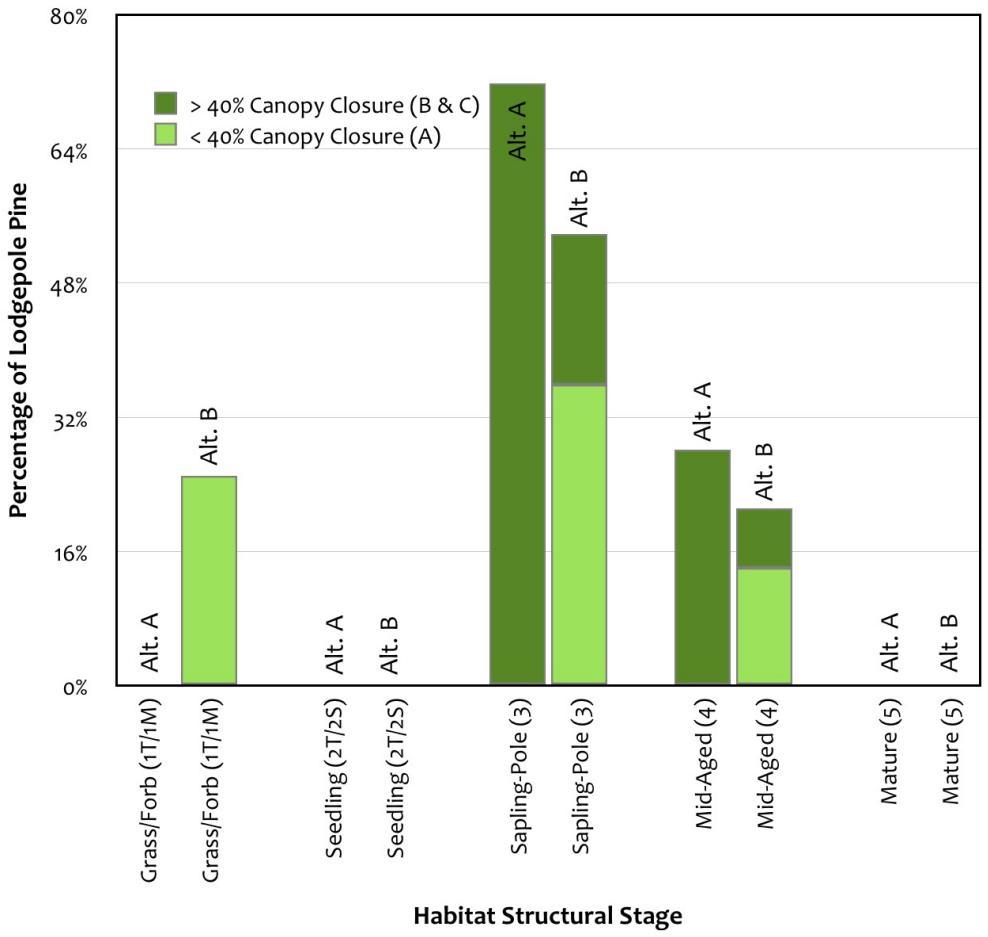

Figure 11. Alternatives A and B Structural Stages for Lodgepole Pine.

Lodgepole pine is more susceptible to windthrow than other forest types in the Project Area, and therefore, thinning would be limited. Sanitation thinning would be implemented in areas of insect and disease such as dwarf mistletoe, gall rust and mountain pine beetle. There would also be some thinning from below to remove most small diameter regeneration that is less than 6 inches DBH. A limited amount of regeneration of all size classes would be retained in thinned stands if available.

Openings would be created of irregular size and shape and would range from between 0.25 to 30 acres in heavily infested or insect damaged areas. Lodgepole pine trees would also be removed from places that support aspen trees for the benefit of this species.

A comparison of structural stages for mixed conifer for both Alternative A and Alternative B is shown in Figure 11. The comparison displays a shift of acres from mid-aged (Structural Stage 4) to grass/forb (Structural Stage 1T&1M) stages under Alternative B.

Forest Insects and Disease

The proposed actions would have an effect on the occurrence and spread of many forest insects and disease in the treated areas including mountain pine beetles. A few years after treatment, trees in the thinned areas would be under less competitive stress and therefore, less susceptible to attack by insects and disease. Insect and disease mortality would likely be limited in extent by the mosaic of structural stages, the increased vigor of the trees due to lower stand densities, and the larger number of openings. Over time, as the trees within the thinned areas grow, stand densities and average diameters would increase. Long-term, these stands could again develop conditions which would increase their risk to bark beetles. Maintaining openings and more open stand conditions through periodic fire would reduce this effect.

There may also be a short period of increased risk of insect attack in the residual trees following treatment. The ground disturbance from the thinning and the heat from the burning can put the trees that remain on-site under stress and more susceptible to bark beetle attack. This effect can last up to two years following treatment.

Aspen Treatment Areas

Alternative B would treat 121 acres, or 93 percent of the aspen stands, to improve the health and extent of aspen in the Project Area. There would likely be additional treatment areas in conifer stands that include an aspen understory component. Therefore, the actual extent of lands managed for the health and propagation of aspen could be much larger than the 121 acres of identified aspen. The intent of treatment in pure clones is to restore health and vigor to sudden aspen decline, or SAD. The intent of treatment where aspen is an understory component it to increase landscape heterogeneity and overall distribution of the species.

The treatments would include the removal of competing conifer trees and some cutting of aspen to encourage new growth. In areas with SAD, coppice (clear cutting) may be used to promote propagation of new suckers. By reducing competition and propagating younger trees, the health and vigor of the stands would be improved and the remaining and new aspen would have increased resistance to insects and disease. Where there are inclusions of aspen within conifer stands that would be treated, the conifers would be removed from the perimeter of these inclusions to encourage the expansion of aspen clones. The preservation and expansion of these aspen inclusions would maintain some species diversity within these conifer dominated stands. Aspen provides many benefits to the landscape, including natural fuel breaks, species diversity and important wildlife habitat.

The effect of these treatments would be to maintain and, in some areas, increase the amount of aspen across the landscape. This result would be achieved by cutting aspen trees in some stands, which would represent a short term decrease in the abundance of aspen, followed by an increase in abundance within several years. Under proposed management clearings amount to approximately 20 percent (24.8 acres) of the landscape would be created within aspen stands. In most cases, these areas would regenerate as healthy aspen. Reductions in canopy density would also occur as a result of sanitation thinning.

Shrubland Treatment Areas

The objectives of shrubland treatments on 28 acres, or 42 percent of the existing scrublands in the Project Area, would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and hand thinning would be used to thin or remove shrubs stimulate grass and other ground cover. These treatment areas would function as fuel breaks. The proposed treatments would need periodic maintenance to retain their effectiveness as fuel breaks. Treatment areas would be more open and likely support greater herbaceous production and diversity.

Cumulative Effects

This section presents the potential cumulative effects of Alternative B (Proposed Action) including past, present and future foreseeable actions in and adjacent to the Project Area on the composition and condition of the forest vegetation. The cumulative effects analysis covers a period of time starting with Euro-American settlement and extends 10 years into the future. The cumulative effects analysis area includes the Crossons-Longview Project Area as well as adjacent private and public lands where on-going or foreseeable future vegetation management projects could affect the forest vegetation of the Project Area.

Existing conditions with the Crossons-Longview area is largely the result natural and anthropogenic disturbances. Humans had a large influence during the mid to late 1800's. This period is characterized by widespread logging, settlement and wildfire followed by a period of fire suppression and reduced logging as is further described in Alternative A, Cumulative Effects.

There have been several large and intense wildfires as described in the Effects Common to all Alternatives Section and, in recent years, vegetation treatments have been initiated to reduce wildfire hazards in the area.

Urban development is expected to continue in the vicinity of the Project Area on private lands. This may fragment habitat, isolate species populations, and increase the risk of weed invasion and the incidence of high intensity wildfire.

The proposed actions under Alternative B The proposed timber operations and prescribed fire treatments in the Crossons-Longview Project Area under Alternative B would occur on approximately 2.2 percent of the South Platte Ranger District. Proposed treatments would reduce the density of treated forest stands and improve landscape heterogeneity reversing changes that have resulted from decades of fire suppression. They would reduce the risk of large-scale, high intensity wildfire as well as insect and disease infestations in the vicinity of the Project Area. Current and proposed treatments within and adjacent to the Project Area would have a positive effect on forest vegetation.

Alternative C

Direct and Indirect Effects

Alternative C proposes the treatment of 6,326 acres and no construction of temporary roads to facilitate forestry operations. Forest management activities under this Alternative would treat approximately half the area of Alternative B but the nature of activities applied on the ground would be the same. Figure 12 illustrates differences in the areas treated under both alternatives for all vegetative types. Discussions of effects provided under Alternative B apply here with the only noteworthy difference being the amount of land that is managed.

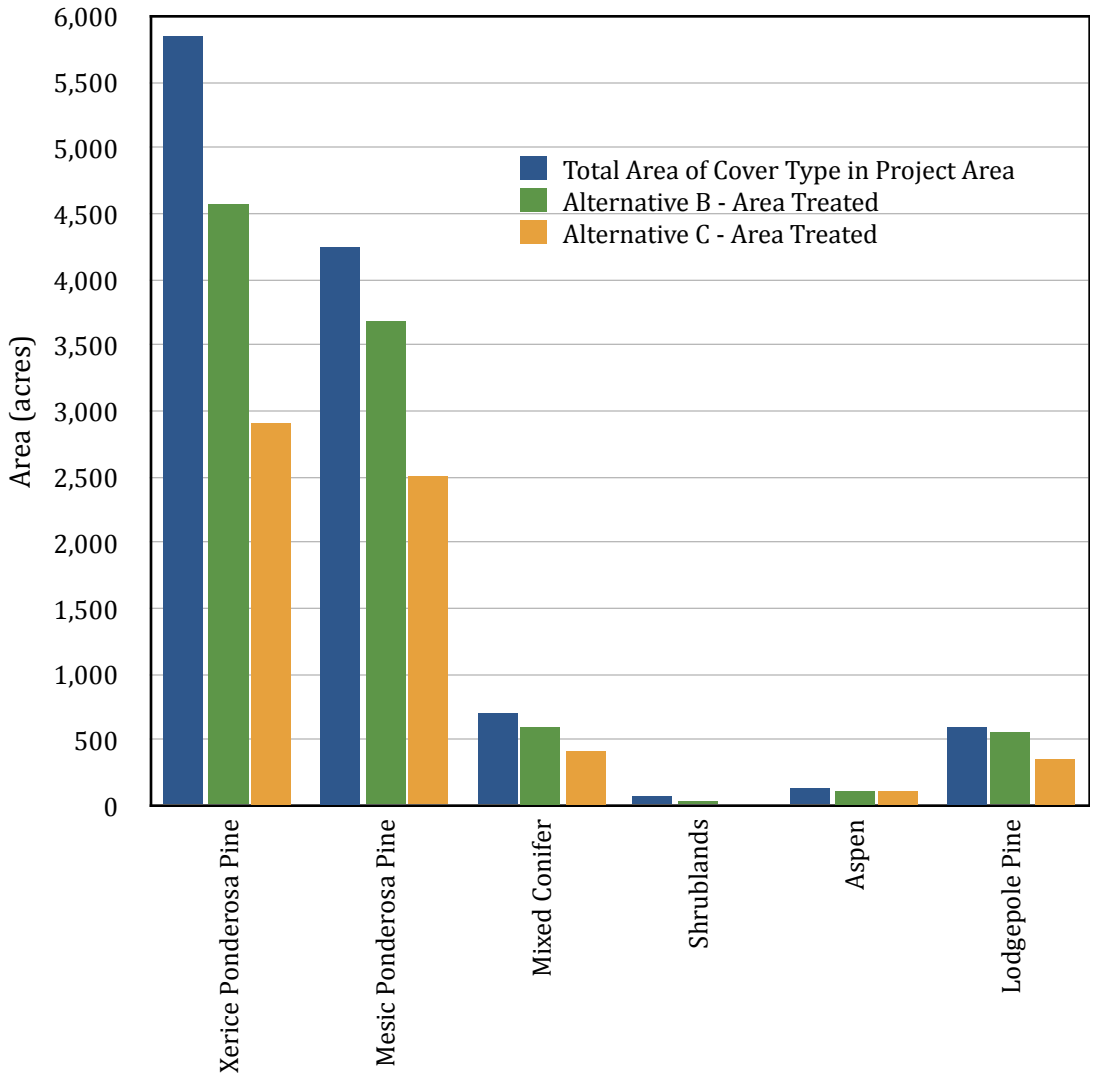

Figure 12. Comparison of the Area of each Cover Type to Areas Treated by Alternative.

Xeric Ponderosa Pine Treatment Areas

Alternative C, like Alternative B, would break up the homogeneity of the xeric ponderosa pine stands in the Project Area, but to a lesser degree. Alternative C would treat 2,919 acres, or approximately 50 percent, of the xeric ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, across the Project Area, the percent of xeric ponderosa pine that exists as openings (grass/forb) would increase from 3 percent to 11 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 37 percent, leaving 69 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 13 illustrates how Alternative C would change the structure of the xeric ponderosa pine community on National Forest System lands within the Project Area boundaries.

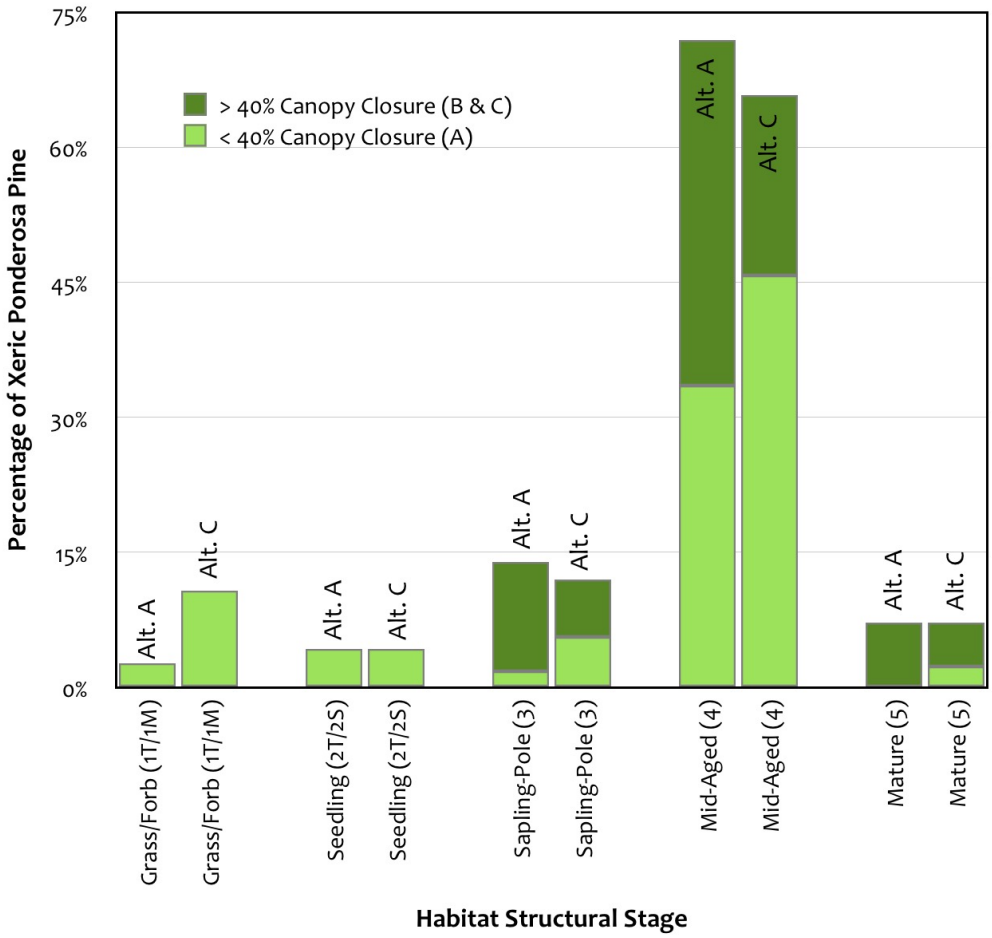

Figure 13. Alternative A and Alternative C Structural Stages for Xeric Ponderosa Pine.

Proposed treatments would include a combination of thinning and created openings. As in Alternative B, where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Treatment specifications within treated stands, and the effects of these treatments,

would be the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the xeric ponderosa stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B. The risk of a large-scale, high intensity wildlife would be reduced but to a lesser degree than Alternative B.

Mesic Ponderosa Pine Treatment Areas

Alternative C would break up the homogeneity of the xeric ponderosa pine stands in the Project Area, but to a lesser degree than Alternative B. Alternative C would treat 2,500 acres, or approximately 59 percent, of the mesic ponderosa pine in the Project Area. These treatments would convert 25 percent of the treated area to openings (grass/forbs). Post-treatment, across the Project Area, the percent of mesic ponderosa pine that exists as openings (grass/forb) would increase from 4 percent to 14 percent. The area of mesic ponderosa pine in highly dense stands (canopy closure greater than 40 percent) would decrease from 70 percent to 36 percent, leaving 64 percent of the mesic ponderosa pine in stands with less than 40 percent canopy closure. Mechanical treatments would create a diversity of habitat structural stages to resemble historical conditions that were maintained by natural disturbance regimes prior to Euro-American settlement. Figure 14 illustrates how Alternative C would change the structure of the mesic ponderosa pine community on National Forest System lands within the Project Area boundaries.

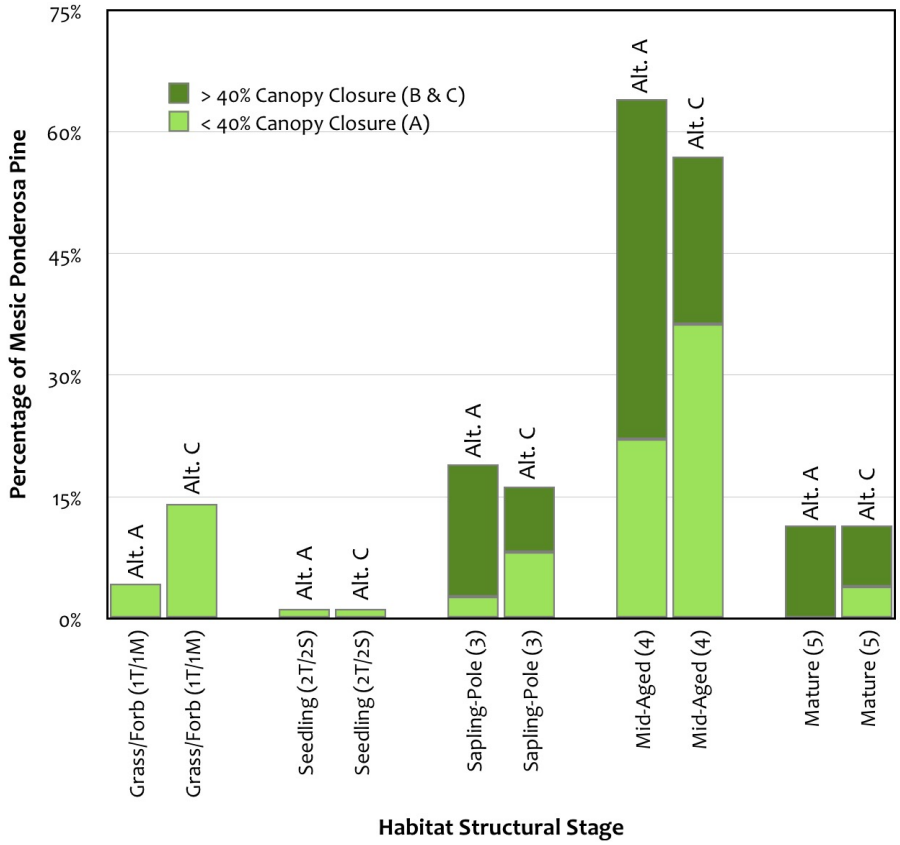

Figure 14. Alternative A and Alternative C Structural Stages for Xeric Ponderosa Pine.

Proposed treatments would include a combination of thinning and created openings. As in Alternative B, where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Treatment specifications within treated stands, and the effects of these treatments, would be the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the mesic ponderosa stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B. The risk of a large-scale, high intensity wildlife would be reduced but to a lesser degree than Alternative B.

Mixed Conifer Treatment Areas

Alternative C would treat approximately 422 acres, or approximately 61 percent, of the mixed conifer forest in the Project Area with a combination of thinning and created openings. Where possible, opportunities would be taken to remove damaged and diseased individuals or pockets of disease or insect damage. Post-treatment, openings in mixed conifer would increase from 13 percent to 22 percent. The area with canopy closure greater than 40 percent would be reduced from 71 percent to 37 percent, leaving 63 percent of the mesic mixed conifer stands with less than 40 percent canopy closure. Figure 15 illustrates how Alternative C would change the structure of mixed conifer on National Forest System lands within the Project Area boundaries.

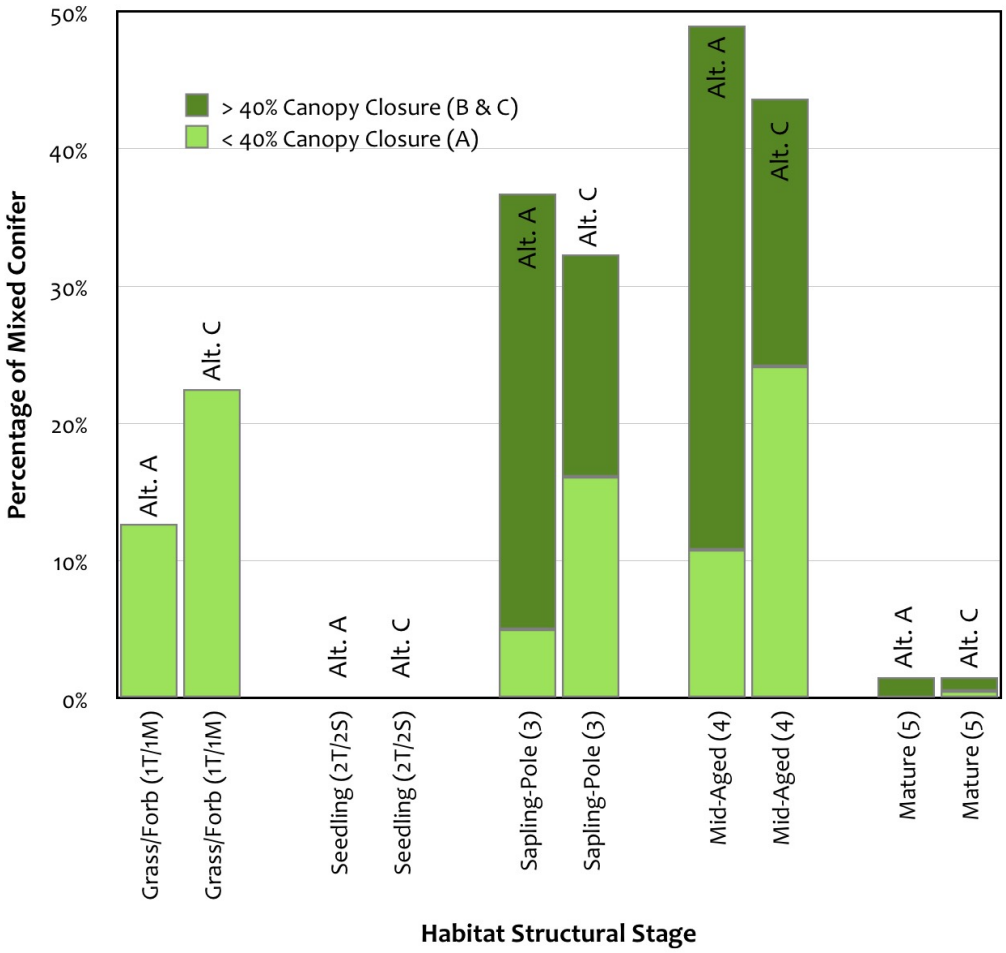

Figure 15. Alternative A and Alternative C Structural Stages for Mixed Conifer.

Treatment specifications within treated stands would be the same as discussed for Alternative B. The effects of these treatments would be generally the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the mixed conifer stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B.

Lodgepole Pine Treatment Areas

Alternative C would treat 354 acres, or approximately 59 percent, of the lodgepole pine in the Project Area. Like other treed cover types, the treatments would include thinning and creation of openings in the forest canopy. Currently, all of the lodgepole pine stands in the Project Area have a canopy closure greater than 40 percent and all existing stands are sapling-pole or mid-aged trees. There are no mature or seedling stands and no areas of grass/forb openings. Post-treatment, the lodgepole pine in the Project Area with canopy closure greater than 40 percent would be reduced from 100 to 52 percent and 16 percent of the lodgepole pine cover type would exist as openings. Figure 16 illustrates how Alternative C would change the structure of the lodgepole pine community on National Forest System lands within the Project Area boundaries.

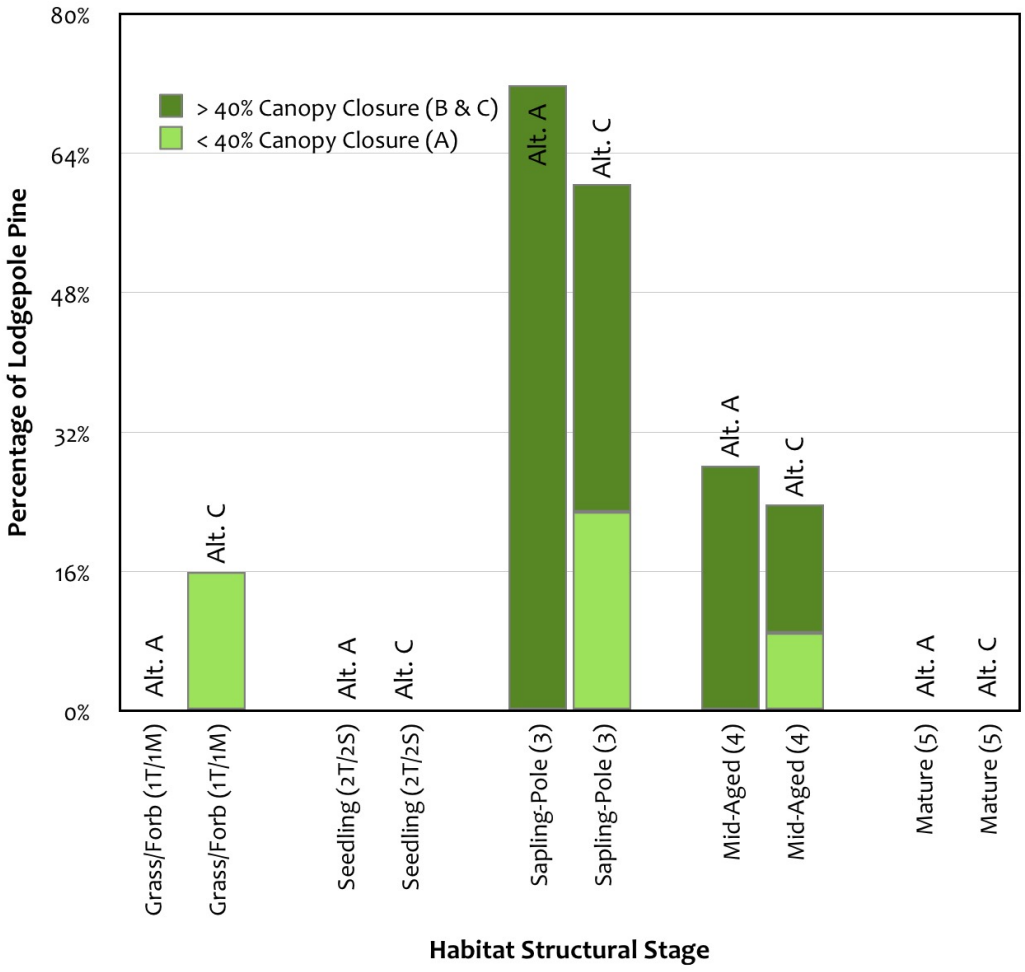

Figure 16. Alternative A and Alternative C Structural Stages for Lodgepole Pine.

Treatment specifications within treated stands would be the same as discussed for Alternative B. The effects of these treatments would be generally the same as discussed for Alternative B. However, although Alternative C would make progress towards improving the resiliency of the lodgepole pine stands in the Project Area to insects, disease and wildfire, it would be to a lesser degree than Alternative B.

Forest Insects and Disease

The effects on forest insects and disease in treated areas would be the same as discussed for Alternative B. Across the Project Area, the reduced amount area of treatment would result in a smaller improvement of the resiliency of the forested area to insects and disease as compared to Alternative B.

Aspen Treatment Areas

Alternative B would treat 115 acres, or 92 percent of the aspen stands, to improve the health and extent of aspen in the Project Area. As in Alternative B, there would likely be additional treatment areas in conifer stands that include an aspen understory component. Therefore, the actual extent of lands managed for the health and propagation of aspen could be larger than the 115 acres of identified aspen. The treatment specifications and effects on treated areas would be the same as discussed for Alternative B. However, the lower amount of treatment of conifer stands would reduce the opportunities to encourage the expansion of aspen where they exist as inclusions in conifer.

Shrubland Treatment Areas

The objectives of shrubland treatments on 16 acres, or 24 percent of the existing scrubland, would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and hand thinning would be used to thin or remove shrubs stimulate grass and other ground cover. These treatment areas would function as fuel breaks. The proposed treatments would need periodic maintenance to retain their effectiveness as fuel breaks. Treatment areas would be more open and likely support greater herbaceous production and diversity.

Cumulative Effects

Cumulative effects under Alternative C are similar to those under Alternative B except approximately half as much area would be treated. Because fewer acres are treated under this alternative, the risk of large-scale, high intensity wildfire would be reduced from the existing condition but to a lesser degree than Alternative B. There would also be less improvement in the resiliency of the forested areas to insect and disease. The risk of large-scale disturbances from all of these factors is higher than Alternative B but an improvement as compared to Alternative A.

3.1.3 Special Status Plants Affected Environment

The Regional Forester has identified sensitive species for Region 2, and the Pike and San Isabel National Forests, and Cimarron and Comanche National Grasslands (PSICC) have further refined this list, to include only those species with the potential to occur within its administrative boundaries. The elevation range is 6,096 to 9,128 feet with the bulk of the study area falling between 7,500 and 8,500 feet. The threatened,

endangered, and RFSS list for the Pike and San Isabel National Forest was used to identify those species that could occur in the Crossons-Longview Project Area. Based on review of the list and research of other records (e.g., Colorado Natural Heritage Program, 1997), it was determined that the habitat in the Crossons-Longview Project Area could be suitable for 11 sensitive plant species.

Rydberg's Golden columbine

Rydberg's Golden columbine (*Aquilegia chrysantha* Gray var. rydbergii Munz) is a perennial herb in the buttercup family (*Ranunculaceae*), flowering from June through July, and fruiting in July (Ladyman, 2005). It is likely to be pollinated by hawkmoths (Ladyman, 2005). Golden columbine is found in montane and subalpine mountains, particularly in rocky ravines along streams (Ladyman, 2005) in Douglas-fir forests. It frequently occurs on northwest-facing slopes. Tree cover in these areas varies from 20 to 60 percent, and shrub cover ranges from 10 to 80 percent (Ladyman, 2005). Extant populations of golden columbine are on the Pikes Peak batholith and the Fountain Formation. Soils are of the Legault-Rock outcrop complex where golden columbine is known. It occurs at elevations from 5,200 to 8,500 feet (Colorado Natural Heritage Program, 2009). This variety of golden columbine is endemic to central Colorado (Ladyman, 2005). It has been documented in El Paso County. There are two documented occurrences on the South Platte Ranger District along with at least one additional record nearby (Ladyman, 2005). Golden columbine is ranked as G4T1Q by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. There are potential threats to some populations from recreational uses along roads and trails, and from invasive species.

Narrowleaf grapefern

Narrowleaf grapefern (*Botrychium lineare* W.H. Wagner), also called narrow-leaved moonwort, is a perennial herb in the adder's-tongue fern family (*Ophioglossaceae*). Spores are produced in June and July (Spackman et al., 1997). Narrowleaf grapefern is found in deep grass and forb meadows, sagebrush, cirqueland, and potentially other habitats (Beatty et al., 2003). It has been found among the riparian transition vegetation associated with aspen at Pikes Peak. The known sites of narrowleaf grapefern are over the Pikes Peak granite formation. Locally, it occurs in coarse, decomposed granite. The soils of the Pikes Peak narrowleaf grapefern site are aquolls. This species is found at elevations ranging from 7,900 to 11,000 feet (Beatty et al., 2003). Narrowleaf grapefern ranges from Washington and Montana south to California and Colorado (NatureServe 2014). Local distribution includes two recorded sites El Paso County along the Pikes Peak toll road (Colorado Natural Heritage Program, 2009). Sites for narrowleaf grapefern are in the Fountain Creek Headwaters watershed. Narrowleaf grapefern is ranked G2 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. It is rare range-wide with only nine known populations. Narrowleaf grapefern is small and easily over-looked, and may not be present every year. It may be threatened by recreational activities, but more by potential noxious weed encroachment. Narrowleaf grapefern typically occurs in areas of past disturbances, so it is possible that it could appear in many parts of the Crossons-Longview Project Area, including priority treatment areas. The proposed activities could provide improved habitat conditions 20 to 50 years following the proposed treatments.

Lesser yellow lady's-slipper

Lesser yellow lady's-slipper (*Cypripedium parviflorum* Salisb.) is a perennial herb in the orchid family (*Orchidaceae*). It flowers from May to July. Fruiting occurs from June to August (Spackman et al., 1997). It inhabits a wide variety of habitats in the lower montane including aspen groves and moist ponderosa pine/ Douglas-fir forests, and in subalpine wetlands (Spackman et al., 1997). It is most often on cool, shaded, northfacing slopes (Mergen, 2006). This species has been found in association with a variety of geological formations including Pikes Peak batholith. Locations are known on moist sites in Sphinx soils. It occurs at elevations of 7,400 to 8,500 feet (Spackman et al., 1997). Lesser yellow lady's-slipper ranges across most of North America, south to California, New Mexico, Arkansas, and Georgia (NatureServe, 2014). Lesser yellow lady's-slipper is ranked G5 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S2. It is listed in the CITES Appendix II list, restricting international trade. Threats include over-collecting, timber harvest operations, fire suppression, unregulated recreation, and invasive species. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. There is a single site for C. parviflorum within the Project Area boundary, near the southwestern corner, dating from 1998; the site is a couple of miles in diameter (Steve Olsen, personal communication). Yellow lady's-slipper habitat is more widespread in the Crossons-Longview Project Area, including moist aspen stands with graminoid-dominated understories. Removal of encroaching conifers and opening of tree canopy would improve conditions for this orchid.

Slender Cottongrass

Slender cottongrass (*Eriophorum gracile*) is a perennial graminoid in the sedge family (*Cyperaceae*). It fruits in late spring–mid summer and occurs in meadows, bogs, shores, usually peaty, acidic substrates; it occurs at elevations up to 13,000 feet (Flora of North America, 2008). It is known from mountainous areas of Colorado and Wyoming and the Sandhills region of north-central Nebraska and southern South Dakota. Thirty-six documented occurrences include 15 on National Forest System lands in Colorado and Wyoming. Its global rank is G5 and in Colorado it is classified S2 (NatureServe, 2014). In Colorado it is typically found in fens and subalpine wet meadows with saturated soils and occurs at elevations of 7,000 to 11,140 feet (Decker et. al. 2006). Probable threats to this species include hydrologic alterations, grazing, motorized vehicle use, peat mining, invasive species, and global climate change (Decker et. al. 2006).

Adder's-mouth

Adder's-mouth [*Malaxis brachypoda* (Gray)] is a perennial herb in the orchid family (*Orchidaceae*). It flowers in July and fruits in August (Spackman et al., 1997). It is typically found in wetland sites, including bogs, mires, swamps, swales, and wet meadows (Catling and Magrath, 2002). Populations are typically small. The local site for adder's-mouth is over granite of the Pikes Peak batholith. Adder's-mouth records occur in Legault-Rock outcrop complex and Legault family soils. It is found in montane areas at elevations ranging from 7,200 to 8,000 feet (Spackman et al., 1997). Adder's-mouth ranges across Alaska and Canada south to Minnesota, Illinois, and New Jersey, but there are outlying populations in California and Colorado (NatureServe, 2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. The local population is disjunctive from the major part of the species range. The primary threats to adder's-mouth include effects of small population size, hydrologic alterations, residential and commercial development, collection, fire, recreation,

timber harvest and fuels reduction, road construction and maintenance, livestock grazing and herbivory, exotic species invasion, climate change, and pollution; specific threats vary for each occurrence (Anderson, 2006).

Rocky Mountain monkeyflower

Rocky Mountain monkeyflower (*Mimulus gemmiparus* W.A. Weber) is an annual herb in the figwort family (*Scrophulariaceae*). It is a unique annual species because it reproduces predominantly with asexual propagules. It is a regional endemic species and occurs at elevations of 8,400 to 11,120 feet in montane to subalpine environments. It grows in moist, seepy areas, usually on ledges or under overhangs at the base of cliffs. Soils are generally thin (Beatty et. al., 2003). Its range is limited to eight known locations in the mountains along Colorado's Front Range. The Middle Fork of the Saint Vrain holds the only extant population where stable metapopulation dynamics may occur. Three of the eight known locations are on National Forest System lands, two of those are in Pike National Forest: Guanella Pass and Hankins Gulch (Beardsley and Steingraeber, 2013). Because most known locations of monkeyflower occur next to trails or roads, the primary threat is trampling by hikers and trail maintenance; populations are also susceptible to disturbances that could alter soil conditions, affect hydrology, or increase competition with other species. Ecological disturbances could include succession, wildfire, drought, rock fall, flash flood, erosion, global warming, tree blowdown, and invasion of exotic plants (Beatty et. al., 2003).

Degener's Beardtongue

Degener's beardtongue (*Penstemon degeneri* Crosswhite) is a perennial herb in the family figwort (*Scrophulariaceae*). It is typically 0.5 to 1.5 feet tall, with 2 to 10 tubular, blue flowers on the top portion of the stems (NatureServe, 2014). It occurs at elevations of 6,000 to 9,500 feet in pinyon-juniper woodlands, ponderosa pine parklands with oak brush and bunchgrasses, and montane meadows. It is known only from Fremont, Custer and Chaffee counties (Colorado Rare Plant Guide, 2014). Of the 14 occurrences of in USDA Forest Service Region 2, five are in Pike-San Isabel National Forest (Beatty et. al., 2004). Motorized recreation is considered to be the primary threat to the species (Rondeau et al., 2011). Depending on intensity and frequency, other threats may include non-native plant invasion, grazing and trampling, extensive herbivory, succession, and global environmental changes (Beatty et. al., 2004).

Rock cinquefoil

Rock cinquefoil (*Potentilla rupincola* Osterhout) is a perennial herb in the rose family (*Rosaceae*). It flowers from mid-June to August (Spackman et al., 1997). It is known from 23 occurrences in four counties in north-central Colorado. It is found primarily in cracks on granite rock outcrops between 6,500 and 10,900 feet in elevation. Eight occurrences are known from lands administrated by the USDA Forest Service Region 2, including seven on the Roosevelt National Forest and one on the Pike National Forest (Anderson, 2004). It is ranked G2 by NatureServe (2014). The primary threats to rock cinquefoil are exotic species invasion, residential and commercial development, secondary impacts of grazing, right-of-way management, off-road vehicle use and other recreation (Anderson, 2004).

Autumn willow

Autumn willow [*Salix serissima* (L.H. Bailey) Fernald] is a perennial shrub in the willow family (*Salicaceae*). It flowers from early June to early July. It occurs in wet thickets, fens, brackish marshy strands, lakeshores, treed bogs, gravelly stream banks, and lakeshores at elevations up to 9,900 feet (Flora of North America, 2008). It is found from Alberta to Newfoundland and south to Minnesota and New York, with disjunctive populations in the Black Hills of South Dakota, southeastern Wyoming, and north-central Colorado (NatureServe, 2014). Autumn willow is most often associated with areas of permanently saturated soils where peat is present. In Region 2, these areas are classified as calcareous or rich fens. Such habitats are scarce in Region 2, and so occurrences of *S. serissima* are also rare. Although it appears in peatlands, it is not clear that the species is entirely restricted to them (Decker, 2006). Potential threats to the species include peat mining, recreational use, alteration of fire regimes, and competition from invasive plant species. Any activity that disrupts saturated soils and peat formation is likely to have a negative impact; the most serious threat is hydrologic alteration of peatland habitats (Decker, 2006).

Ute ladies'-tresses

Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial herb in the orchid family (*Orchidaceae*). It flowers from July through August. It occurs at elevations of 4,200 to 6,000 feet in early- to mid-seral, moist to wet conditions, where competition for light, space, water, and other resources is normally kept low by periodic or recent disturbance events, such as alluvial banks, river floodplain habitats, shores of lakes and reservoirs, in mesic meadow-type vegetation maintained by lake level fluctuations or seasonal flooding of gravel bars, and human-developed dams, reservoirs, and irrigation ditches (NatureServe, 2014). It is found in Colorado in Boulder, El Paso, Jefferson, Larimer, Moffat and Weld counties (Colorado National Heritage Program, 2014). Habitat may be threatened by grazing or haying after flower production and invasion of sites by non-native plants.

Selkirk's violet

Selkirk's violet (*Viola selkirkii Pursh* ex Goldie) is a perennial herb in the violet family (*Violaceae*), flowering in May and June. Selkirk's violet grows in montane to subalpine cold mountain (aspen) forests, and in moist woods and thickets. The area where Selkirk's violet has been found is on the Pikes Peak batholith. Soils where Selkirk's violet has been located were wet and near the base of alders. Soils are of the Sphinx series. Elevations range from 8,500 to 9,100 feet (Spackman et al., 1997). Selkirk's violet ranges from British Columbia to Greenland, south to Washington and New Mexico. Distribution in Colorado includes Douglas County, where there are two recorded sites near Devil's Head on the South Platte Ranger District (Colorado Natural Heritage Program, 2009). Selkirk's violet is ranked as G5 by NatureServe (2014). It is tracked by the Colorado Natural Heritage Program and is ranked S1. The Colorado populations of Selkirk's violet are disjunctive from the greater range of the species. Habitat may be threatened by unregulated motorized recreation.

3.1.4 Special Status Plants Environmental Consequences

Effects Common to All Alternatives

All sensitive species are negatively impacted by noxious weeds, climate change, direct damage, collection and alteration to keystone ecosystem processes. Actions that create early seral states are most likely to facilitate spread and establishment of noxious species.

Alternative A (No Action)

Direct and Indirect Effects

Alternative A (No Action) would have no direct effects on the sensitive plants in the Crossons-Longview Project Area because no vegetation treatments would be implemented. However, Alternative A (No Action) could have indirect effects on sensitive plants and habitats over time. Without treatment, conifers would continue to encroach into the open areas where these sensitive plants could occur. This could eventually lead to a decline in habitat quality and loss of individuals as shading changes growing conditions on the site. This effect would be especially pronounced on Degener's beardtongue which requires woodland conditions.

Loss of tree canopy cover would continue in some areas due to the effects of insects and disease. This could improve conditions for sensitive plants. Habitat conditions for sensitive plants could decline with increased competition from other plants which also favor open canopied conditions, including several species of noxious weeds. The lack of fire would have a negligible effect on sensitive plants. They could benefit from the nutrient release from fire.

Cumulative Effects

Past and current activities have altered plant occurrences and their habitats. These activities have the potential to cumulatively affect plants and include: historic grazing, timber harvest and thinning, fire suppression, prescribed fire, mining, motorized and non-motorized recreational use, road and trail construction, urban development, and noxious weed infestation and treatment.

There would be continued maintenance of existing forest roads and trails in the Project Area. Other roads would be maintained by the state, county, and by private individuals. Development would continue to occur on private land in the area. Concurrent with these would be the likely increase in traffic on roads in the vicinity. Dispersed recreation use would also continue on National Forest System lands.

Alternative B (Proposed Action)

Direct and Indirect Effects

The Proposed Action includes the treatment of 9,574 acres and construction of temporary roads to facilitate forestry operations.

Temporary Roads

Temporary roads represent the greatest threat to community composition and rare plants as top soils would be removed, sub-soils would be compacted and roads would serve as a corridor for the spread of noxious weeds. It is anticipated that these effects, with the exception of weed infestations, would be short lived, as temporary roads would be restored at the conclusion of forestry operations.

Treatment activities can cause light to moderate ground disturbances to soils by displacement and compaction on skid trails and landings totaling up to 15 percent of the treatment area. These activities could bury, dislodge, damage or stress target species. The amount of disturbance to the soils and plants would vary considerably. The most heavily disturbed areas, such as log landings, process areas and the bottoms of skid trails would be the most disturbed, take the longest to recover and have the greatest potential for succession to an undesirable vegetative state. The least disturbed sites, such as the tops of skid trails, could recover quickly with minimal effects on community composition.

Vegetation Treatments

Treatments may disturb needle-cast “mulch” where activities occur. In these areas, the potential of noxious weed encroachment is greater. Additionally, rare plants could be buried by tree chipping or mastication operations.

Fuel Break construction would cause some soil compaction, and may require soil disturbance in some situations. This could dislodge herbaceous plants and break stems of shrubs where the actions occur. In these areas, the potential of noxious weed encroachment is greater. Fuels management by mechanical or hand treatment can indirectly impact sensitive plants by causing changes in vegetation composition and successional pathways of that vegetation, changing local hydrologic patterns, changing the fire regime or by changing the soil characteristics of the habitat.

Prescribed Fire

Prescribed fire may cause some light ground disturbance, and some incidental soil compaction. Above-ground parts of plants, both herbaceous and woody, would be consumed, but root material would rarely be damaged enough to prevent their regrowth. The direct effect of fire is the potential scorching or mortality of individuals or populations from fire or heat. However, due to the timing of the prescribed fires, no plants would be actively growing at the time.Fire can lead to changes in forage condition, and this can cause changes in the foraging behavior of livestock and wildlife within the area.

Burning hand-piled slash also has the potential to eliminate the herbaceous layer below the pile for years after the pile has burned since high intensity fires could sterilize the soil. Mechanical treatment and hand treatment may directly impact sensitive species by trampling and crushing plants, displacing soil and plants, or smothering plants with slash, chips, or soil.

Fire could be detrimental to sensitive plants by facilitating the spread of noxious weeds. Conversely, fire may be beneficial to these species because growth of mycorrhizal associates may be stimulated by nutrient release after fire. Any undiscovered populations of the sensitive plants having appropriate habitat in the area would recover along with the remainder of the community. Because of nutrient release following the fire, their

populations may expand. As a keystone ecosystem process in the forests of Colorado, fire can play an important role in maintain the distribution and composition of vegetative communities including rare plants.

Noxious Weeds

Noxious weed invasion potentially poses a negative impact to all plant habitats. The removal of vegetation in any circumstance creates an early seral state that is optimal for colonization by noxious species. Weed infestation following a burn has the potential to extirpate populations of uncommon plants. Noxious weeds, once established, could indirectly impact sensitive plant species through allelopathy (the production and release of plant compounds that inhibit the growth of other plants), changing the fire regime, or direct competition for nutrients, light, or water. Subsequent weed control efforts could also negatively impact sensitive plants. Noxious species known to be within the Project Area include Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), leafy spurge (*Euphorbia esula*) and hounds tongue (*Cynoglossum officinale*).

In general, all sensitive species would be negatively impacted by direct disturbance or invasion by noxious species. Eight of the 11 sensitive species occur in riparian areas, near wetlands or on moist soils. Plant responses to increased light levels vary by species. Treatments for noxious weeds could have a negative effect on sensitive plants by direct impacts from equipment or being inadvertently sprayed with herbicides.

Specific Effects by Sensitive Species

Rydberg's golden columbine may be threatened by the use of the use and maintenance of existing roads and trails. Proposed forest operations could improve habitat for the narrowleaf grapefern for 20 to 50 years as it typically occurs in areas of past disturbances. The lesser yellow lady's-slipper is threatened by timber harvest operations, fire suppression, unregulated recreation or the use of trails for forest operations. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. Removal of encroaching conifers and opening of tree canopy would improve conditions for this orchid. Slender cottongrass is likely impacted by hydrologic alterations, grazing, motorized vehicle use which could increase along project roads. The primary threats to adder's-mouth include hydrologic alterations, residential and commercial development, fire, recreation, timber harvest and fuels reduction, road construction and maintenance and herbivory. Rocky Mountain monkeyflower is impacted by succession and wildfire. Degener's beardtongue is impacted by motorized recreation is considered to be the primary threat to the species. The primary threats to rock cinquefoil could be impacted by road construction and maintenance and recreation. Potential threats to autumn willow recreational use and alteration of fire regimes. Ute ladies'-tresses is early- to mid-seral species which requires moist to wet conditions, flooding and limited competition; project impacts on this species could be positive. Selkirk's violet habitat may be threatened by unregulated motorized recreation or use of trails for forest operations.

Cumulative Effects

Recreation is a frequent use of the Forest within the Analysis Area. Motorized touring is prevalent as are hunting, cycling, camping, hiking, and horseback riding during certain times of the year. Roads in particular increase soil erosion, increase sedimentation, and facilitate the spread of noxious weeds. Motorized and non-

motorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and ground disturbance.

Without proper noxious weed management during and after forest operations, the proposed action has the potential to facilitate establishment of noxious weeds throughout the Project Area. The potential for invasion by noxious weeds is especially high on skid trails, landings, process areas, along trails used for forestry operations and temporary roads (when in use and subsequent to restoration). Once established, noxious weed populations can displace native vegetation, lower ecological value (such as forage) and alter fire regimes. Similar changes would occur throughout the Forest as treatments are implemented.

Several other current and proposed actions on the Forest, such as the Platte Canyon Powerline Rebuild and Reauthorization could result in cumulative impacts on species that are sensitive to recreational disturbances. Adder's mouth, Rocky Mountain monkey flower, rock cinquefoil, autumn willow and Selkirk's violet in particular are disturbed by recreational use. The above species may be found in places where there is recreation because they colonize early seral environments or desire stronger light that may be found along trails. Similar conditions exist along powerlines and maintenance activities could impact these same plants. It should be noted that the above species may occur in places where they could be impacted by recreational disturbances, or that these places are where they are most likely to be observed unlike less accessible areas. None of the identified species are critically imperiled. No adverse cumulative effects are expected.

Alternative C

Direct and Indirect Effects

The overall effect of forest treatments on special status plants would be similar in Alternative B and Alternative C; however, few acres would be affected under this alternative and temporary roads would not be constructed.

This alternative would be less detrimental to rare plants than Alternative B because there would be less soil disturbance and likely a lower incidence of weed introduction and spread. All rare plants are sensitive to disturbance. Adder's-mouth, Rocky Mountain monkeyflower, Degener's beardtongue, rock cinquefoil, autumn willow and Selkirk's violet are identified as also being sensitive to recreational use. These plants in particular would benefit from the restriction of road development under this Alternative.

Cumulative Effects

Cumulative effects under Alternative C are similar to those under Alternative B except approximately half as much area would be treated. Because less area is treated under this alternative, the risk of large-scale, high intensity wildfire within the region would increase.

Rare plants which are negatively affected by thinning via disturbance or competition by noxious species would benefit from the smaller impacts of Alternative C while conditions for species that respond favorably to increased light levels or early seral states would not benefit as much as under Alternative B.

3.2 Fire-Fuels/Air Quality

3.2.1 Fire-Fuels Affected Environment

Historical Conditions

Fire has historically played a significant role in shaping the fire-adapted ecosystems of the interior western states. At the turn of the 20th Century, selective logging, livestock grazing, and fire prevention and suppression activities began to change the composition, structure, and function of these fire-adaptive ecosystems. Extended human development, fire suppression, prolonged fire exclusion, and climate changes have created denser vegetative conditions in these fire-adapted ecosystems that predispose areas to severe wildfire threats. Historical conditions for the Crossons-Longview Project Area can best be described as areas with wildfires spatially widespread, having significant stand-replacing events.

The historical ponderosa pine forest was likely quite open with fewer trees, greater age diversity between stands, and larger openings than the area displays today. Under historical conditions, studies have indicated that fire typically served to maintain open mature stands, as well as to maintain some areas as openings. Brown et al. (1999) and Kaufmann et al. (2000) provide evidence that frequent, mixed severity fires characterized the ponderosa pine stands before European man settled in the areas (1000 to 1870). Although there were areas of intense fires, these areas were relatively small in extent and critical in creating openings of 20 to 40 acres that were maintained by the dry site conditions until regeneration occurred. The open forest was protected from large-scale fires because of the distance between tree crowns and the openings (USDA Forest Service, 2002a). Mixed severity fires would have limited the growth of Douglas-fir, which does not tolerate fire well, to sites where fires were infrequent, particularly wetter, north-facing slopes. These fires would also have kept the forest more open by limiting the growth of understory trees.

Frequency and fire patterns created a varied burn pattern that in turn created a sustained vegetative pattern across the landscape. This mosaic pattern would be maintained as the patch-like variations of age classes, densities, and openings caused mixed severity fires. Some stands would have had a multitude of age classes from seedlings to trees more than 400 years old. There were probably few snags (standing dead trees) and cavities in live trees. A few stands would have been nearly even-aged due to stand-replacing fires followed by even-aged regeneration.

One key to the sustainability of the pre-European forest was the open condition. The open forest would have been somewhat protected against large-scale fires because of the distance between tree crowns and larger openings. Openings may have covered 20 to 25 percent of the area, and some of these openings may have persisted for decades due to climatic and seed source limitations. Regeneration would have begun immediately on other burned sites. Therefore, post-fire patterns of regrowth would have resulted in variations both in space and time, contributing to the complexity of the landscape.

Fuels Conditions and Measures

Several measures are used to explain forest condition as it relates to fire hazard and threat from large-scale, high intensity fire. One measure of forest condition is the condition class system created under the National Fire Plan (USDA Forest Service, 2001a). This system describes three condition classes to identify risk conditions within fire regimes. The three condition classes were developed to describe the departure from historic fire regime conditions. Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, grazing, introduction, and establishment of exotic plant species, insects and disease (introduced or native), or other past management activities. Table 4 displays the acreages in each of the Condition Classes within the Crossons-Longview Project Area and vegetation treatment target areas.

Table 4. Condition Classes in the Crossons-Longview Project Area[2]

Condition class	Project Area (acres)	NFS Lands (acres)	Vegetation Treatment Area (acres)	Vegetation Treatment Areas (%)
Condition Class 1	298	122	65	1%
Condition Class 2	6,684	3,974	2,456	26%
Condition Class 3	15,725	11,637	7,043	74%
Totals	22,707	15,733	9,564	100%

Condition classes consider canopy base height and canopy bulk density as factors that contribute to crown fire hazard. "*Canopy base height is the lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy. Canopy base height is an effective value that incorporates ladder fuels such as shrubs and understory trees as well as the lower branches of mature trees. Canopy base height is often measured at the lowest height above ground where at least 30 lbs/ac/ft of available canopy fuels is present*" (USDA Forest Service, 2006). The lower the canopy base height is to the ground, the easier it is for a surface fire to become a crown fire. Canopy bulk density is defined as "*the mass of available canopy fuel per unit canopy volume. It is a bulk property of a stand not an individual tree. It is represented as the available canopy fuel load divided by canopy depth*" (Scott and Reinhardt, 2001).

There are additional factors such as Torching Index and Crowning Index that are to be taken into consideration with canopy base height, crown bulk density, and surface fuel loading when assessing crown fire initiation and overall fire hazard. Research has shown that crown fire initiation and spread are most influenced by canopy base height, canopy bulk density, and surface fuel loads. Fire behavior and severity depend on the properties of the various fuel (live and dead vegetation and detritus) strata and the continuity of those fuel strata horizontally and vertically (Graham et al., 2004).

[2] Note that the acre totals might not match the totals presented for the entire Project Area, etc. due to not all acres being classified in the VCC system.

Crown fires are part of the mixed severity historic disturbance regime. However, crown fires that have occurred in recent wildfires do not fit into the mixed severity fire regime because they cover large areas with high intensity fire. Historic crown fires were generally limited in scale by open forest conditions. Table 4 shows that the majority of vegetation treatment areas are in Condition Class 3, which means that they have been altered substantially from historic fire regimes.

In addition to the general fuel models, the surface and ladder fuel components are important considerations. The restoration treatments will change canopy base height and crown bulk density that will alter the fuel profile to make the area more resilient to fire. Thinning treatments will open up the canopy and reduce crown bulk density. Treatments that involve understory removal will raise the canopy base height. Surface fuel loads may be increased due to the treatments unless the residual material is removed. Removal can be mechanical (chipping, roller chopping) or with the use of prescribed fire to burn slash piles, or broadcast burning to remove activity fuels. The removal of ladder fuel components would be incorporated into treatments to reduce the potential for crown fire initiation.

Fire History/Fire Hazard

Fire history is a factor in evaluating fire risk. Six major wildfires have burned partly within or adjacent to the Crossons-Longview Project Area in the last 20 years (Table 5). Some of these wildfires have been significant in the state of Colorado. The Buffalo Creek Fire in 1996 raised the awareness of the impacts of wildfires on homes, people and water supplies. The Hayman Fire in 2002 is still the largest wildfire in Colorado history at over 135,000 acres.

Table 5. Past Wildfires Within and Adjacent to Crossons-Longview Project Area

Fire Name	Year	Size (acres)
Buffalo Creek	1996	11,900
Hi Meadow	2000	10,800
Snaking	2000	2,312
Hayman	2002	138,114
Lower North Fork	2012	4,140
Lime Gulch	2013	511

Vegetation management and mechanical treatments can be effective in reducing the threat of crown fire (Graham et al., 1999). Treatments that reduce density and change the composition of stands would reduce the probability of crown fire, decrease severity of impacts, reduce the threat to high-value areas, and enhance fire-suppression effectiveness and safety (Pollet and Omi, 2002). In forested stands that have developed without regular disturbance, combinations of mechanical harvest/thinning and prescribed fire are the most effective technique for altering the fuels matrix (Graham et al., 2004).

The ratings for fire hazard increase relative to the amount and continuity of surface and canopy fuels. As the amount of fuel on a given landscape increases, fuel profiles become more horizontally and vertically

continuous and the intensity of a wildfire in that landscape would be expected to increase correspondingly. Stands with low crowning index and torching index are the less susceptible to crown-fire initiation and spread.

Changes in structural stage is the criterion used in this analysis for assessing changes in the fire hazard of stands in the Crossons-Longview Project Area. This analysis assigns fire hazard ratings to the various structural stages and uses changes in those ratings to compare Alternative A (No Acton) to changes resulting from the implementation of treatment activities shown in Alternative B (Proposed Action) and Alternative C. The indirect effects of the proposed treatments include lands located not only in the treatment areas but also lands adjacent to the treatments.

Table 6 displays the assigned fire hazard rating for each structural stage represented in the Crossons-Longview Project Area. These ratings are used in the comparison of effects of the alternatives.

Table 6. Fire Hazard Ratings Associated with Vegetation Structural Stages

Structural Stage	Decsription	Estimated Crown Cover	Fire Hazard Rating
1	Grass/Forb	NA	Low
2	Seedlings	<40%	Low
3A	Sapling/Pole	<40%	Moderate
3B	Sapling/Pole	>40%	High
3C	Sapling/Pole	>40%	High
4A	Mid-Aged	<40%	Moderate
4B	Mid-Aged	>40%	Very High
4C	Mid-Aged	>40%	Very High
5	Mature	<40%	Moderate
5	Mature	>40%	Very High

3.2.2 Fire-Fuels Environmental Consequences

The proposed vegetation treatments for this project would meet the purpose and need of the project as well as implement a variety of fuels management related objectives as directed under the regulatory framework identified above, and would be based on forest health practices. These treatments would also provide wildland fire suppression advantages and include life/safety/property benefits in and around the WUI. Additional benefits include:

- Reintroducing fire into a fire dependent ecosystem.
- Improving the vigor of treated ponderosa pine stands to increase resistance to mountain pine beetle and pine engraver beetle attacks.

- Returning nutrients back into the soil through prescribed burning and/or mechanical mastication of residual vegetative material.
- Protecting soils and the watershed from the effects of intense wildfire.
- Enhancing plant and animal habitat by releasing hardwood stands from competing conifer encroachment.
- Giving firefighters a safer place to work in the event of a wildfire by breaking up the continuity of the fuels and reducing the threat of a large-scale, high intensity fire in the project area.

Alternative A (No Action)

Only existing and planned activities, previously approved under other NEPA documents, would occur as a result of this alternative. No vegetation management treatments; proposed thinning, creating openings, prescribed burning, and removing trees and fuel breaks would be implemented in the Crossons-Longview Project Area. Ecosystem trends and processes would continue on the current trend. Changes toward the desired future conditions as outlined in the Forest Plan would not occur. Management direction outlined in the National Fire Plan, Healthy Forests Restoration Act, and Community Wildfire Protection Plans would not be met. Areas within the Project Area would be expected to have fire hazard ratings moving towards high and very high, as vegetative biomass increases and stand structures become more complex through annual forest growth. Fire behavior would become more erratic based upon the vegetative changes. When wildfires would occur, such changes in fire behavior would potentially have negative impacts to forest resiliency, watersheds and wildlife habitat, as well as losses to private property within the Crossons-Longview Project Area.

Fire suppression activities would continue; however these suppression activities could become more difficult and dangerous as forest structure complexity increases under this alternative. The Project Area would continue to have a high risk of extreme fire behavior in many locations. Forest health and vigor, and associated resistance to insects and disease would continue to decline.

Direct and Indirect Effects

No direct effects would occur because no actions would be taken under Alternative A (No Action). Indirect effects on forest stand structures and subsequently on wildfire behavior may occur if no treatments are planned or implemented in the Crossons-Longview Project Area. With no treatment, vegetative material would add volume and structure to the fuel matrix. Continued needle and litter deposition would add to the surface fuel loading. Understory vegetation would continue to grow vertically which would essentially lower the canopy base height and overstory crowns would continue to grow together increasing the canopy bulk density of the stands thereby making them susceptible to large-scale, high intensity wildfire. Fire behavior, especially how it relates to surface to crown fire transition in forested stands, would have the potential to become more intense. Crown fire may be more easily sustained once initiated.

Growth of conifers in aspen stands could eventually convert these natural firebreaks into stands, which are unable to alter the direction and rate of fire spread. In some ponderosa pine stands, lack of management and natural disturbances could allow shade-tolerant species such as Douglas-fir to become established in places besides north aspects. Over time, this encroachment would eventually convert the stand from a fire-tolerant

species to a fire-intolerant species with low growing crowns that are easily accessed by surface fires making these stands more susceptible to stand replacing fire.

Overall, the indirect effects of no action would combine with effects from other activities in the Crossons-Longview Project Area. As the fire hazard in the Project Area continues to move toward high and very high, the sustainable forest conditions, diverse wildlife habitats, recreational opportunities and sustainable watershed conditions are at greater risk from large-scale, high intensity wildfires. In addition, the risk of property damage, and public and firefighter exposure to wildfire would increase.

Firefighters would be required to take more aggressive actions such as utilizing mechanized equipment and more personnel to keep fires small resulting in increased suppression costs and more negative ecological effects from suppression actions. The probability of a fire escaping initial containment actions may increase, fires may become larger and more intense, more resources may be needed to suppress wildfires. Suppression costs would increase; negative ecological effects would increase, and firefighter exposure to erratic fire behavior would increase.

Ponderosa Pine

The xeric ponderosa pine treatment area includes those areas that would have historically been characterized by very open stand conditions with frequent low intensity fires. Under Alternative A (No Action) the trend toward more closed stand conditions would continue on some of these sites. Nearly 50 percent of the xeric ponderosa pine is rated as having a very high fire hazard and another 13 percent is rated as a high fire hazard.

In the absence of disturbance, more of this area would progress to the mature stage and develop crown covers of greater than forty percent. Openings would continue to exist where site conditions do not support trees. However, areas that are capable of supporting trees would likely become denser in the absence of fire or tree removal. In the absence of periodic fires, seedlings that establish in the more open areas would grow and develop into small trees. These denser, multi-storied stands would be more susceptible to crown fire propagation because of the ladder fuels provided by the smaller under story trees. Trees within these denser stands would be under additional stress due to more competition for site resources. This additional stress can make these stands more susceptible to injury from insects and disease. Therefore, future fires may burn with high intensity causing impacts to sustainable forest conditions, diverse wildlife habitats, recreational opportunities and sustainable watershed conditions.

The potential changes over time within the mesic ponderosa pine stands would be similar to the xeric ponderosa pine under Alternative A (No Action). Younger sapling-pole stands would progress into the mature stage. Without disturbance most of these mesic ponderosa pine stands would develop crown covers over forty percent. Over time these areas would become more homogenous with less variation in density and structural stage.

The mesic ponderosa pine in the project area have a higher percentage of high and very high fire hazard ratings than the xeric ponderosa pine. About 52 percent of the mesic ponderosa pine are rated as a very high fire hazard and another 16 percent are rated as a high fire hazard.

Mixed Conifer

Under Alternative A (No Action), the mixed conifer stands would continue to mature. The amount of Douglas fir would be expected to increase on these sites as the less shade tolerant limber pine and ponderosa pine die out and are replaced by the more shade tolerant firs. In the absence of disturbance, younger stands would not be initiated and the forest stands would become more homogenous. Ladder fuels in the intermediate zone would continue to increase the probability of crown fire initiation. More than 70 percent of the mixed conifer stands are rated as high or very high fire hazard.

Lodgepole Pine

The lodgepole pine stands are all greater than 40 percent crown closure and have high or very high fire hazard ratings. Under Alternative A (No Action), the lodgepole pine stands would continue to mature, although many of them are already at or near their maximum crown density. In the absence of disturbance, younger stands would not be initiated and the forest stands would become more homogenous. In the absence of disturbance, Douglas fir and other shade tolerant species would become a larger component in lodgepole pine stands. These trees would increase ladder fuels and increase the potential for crown fires. The mature lodgepole pine stands would also be at risk from insect outbreaks which could increase the fire hazard in those areas.

Aspen

Under Alternative A (No Action) the amount of aspen cover type within the Crossons-Longview Project Area would likely decline over time. Some of the aspen stands in the area have an established conifer component. In the absence of fire or conifer removal, these sites would eventually convert to conifers as the aspen is shaded out and no new sprouts are initiated. On sites where aspen is self replicating, sudden aspen decline may result in more open grass or shrub dominated communities developing. As the older aspen die out and new aspen sprouts are not produced, shrubs and grasses may become the dominant vegetation in these areas.

Shrublands

Shrublands in the project area are composed of Gambel oak and Mountain-mahogany communities. They occupy only 67 acres in the Crossons-Longview Project Area. The Gambel oak communities have become decadent over time in the absence of fire. Gambel Oak becomes denser as it ages and shades out grasses and other ground cover. Under Alternative A (No Action) these communities would continue to fill in and the oak shrubs would dominate these sites. These shrub-dominated areas do not provide the variety of vegetation that more seral communities do and they may be more prone to more intense wildfires due to the larger amounts of woody fuels. Mountain-mahogany communities have also become decadent over time in the absence of fire. They would continue to mature and increase in density under Alternative A (No Action).

Cumulative Effects

Alternative A (No Action) would not address National, Agency, Forest, or local direction for reducing wildland fuel accumulations beyond existing forest management activities in the short-term. The cumulative effects from not undertaking actions to reduce wildland fuel accumulations would result in increasing fire hazard and risk as fuel accumulations build above current levels. As the fire hazard in the Project Area continues to

move toward high and very high, the sustainable forest conditions, diverse wildlife habitats, recreational opportunities and sustainable watershed conditions are at greater risk from large-scale, high intensity wildfires.

Alternative B (Proposed Action)

A variety of vegetation treatments are proposed under Alternative B (Proposed Action). This alternative would treat up to 9,574 acres in a variety of forest and vegetation types. Tree thinning, prescribed fire and mechanical fuel treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Direct and Indirect Effects

Ponderosa Pine Treatment Areas

Under Alternative B (Proposed Action), up to 4,581 acres of xeric ponderosa pine and 3,684 acres of mesic ponderosa pine would be treated, resulting in changes to the structure of many of these forest stands. The treatments would change the fire regime in the created openings from mixed severity to ground fire. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas. There will remain some areas of dense ponderosa pine that would carry crown fires, but they would be limited in size and not connected to other dense areas. The result would be mixed severity fire regime in the treated areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

Currently 61 percent of the xeric ponderosa pine forests have crown cover greater than 40 percent and there are few openings or seedling dominated stands within these areas. Following the implementation of the proposed treatments up to 27 percent of the area would be in openings and only about ten percent of the area would have crown covers greater than 40 percent.

Changes in the xeric ponderosa pine structural stages under Alternative B (Proposed Action) would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the highest fire hazard category of 39 percent (Figure 17). There would also be a reduction in the high fire hazard rating by 12 percent (Figure 17). The low and moderate fire hazard ratings categories would increase substantially. The effects of these proposed treatments would be to move stand conditions toward the open forest conditions that would be more resilient to surface fires and have a lower risk of sustaining a crown fire. Areas that are currently Condition Classes III and II would be moved toward the historical Condition Class I.

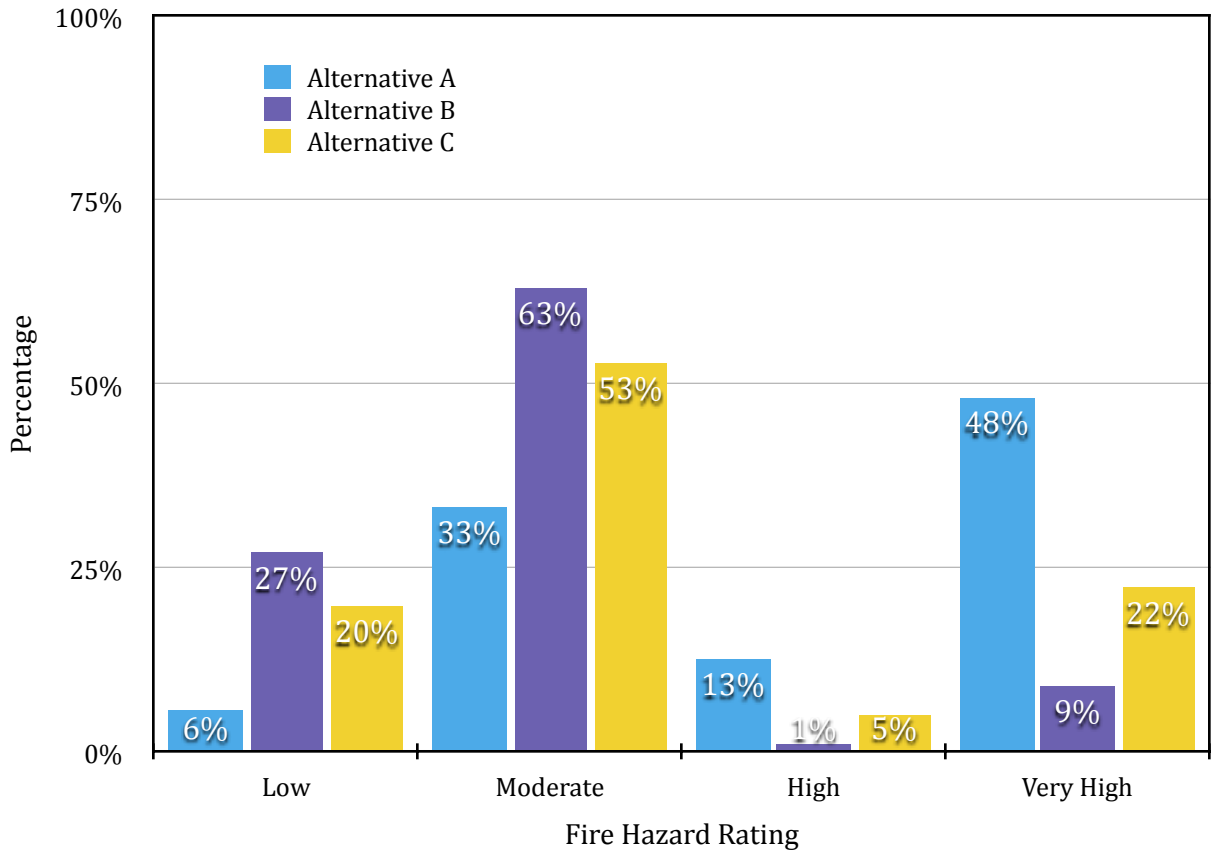

Figure 17. Alternative Comparison of Fire Hazard Ratings of Xeric Ponderosa Pine

The mesic ponderosa pine areas are currently dominated by closed canopied stands with 68 percent of the area having crown covers of greater than 40 percent. Like the drier pine sites, there are few openings within the mesic ponderosa pine areas. Following the vegetation treatments proposed under Alternative B (Proposed Action), about 26 percent of the mesic pine treatment areas would be in openings and 20 percent of the area would have crown covers greater than 40 percent.

Changes in the mesic ponderosa pine structural stages under Alternative B (Proposed Action) would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of 35 percent (Figure 18). There would also be a reduction in the high fire hazard rating by 13 percent (Figure 18). The low and moderate fire hazard categories would increase substantially. The ladder fuels component would be removed in these stands thereby lowering the risk of sustaining a crown fire, a result of fire moving from a surface fire into the crown canopy. Under Alternative B (Proposed Action) the objective to create more open forest conditions and a greater range of residual stand densities would be achieved. Areas that are currently Condition Classes III and II would be moved toward the historical Condition Class I.

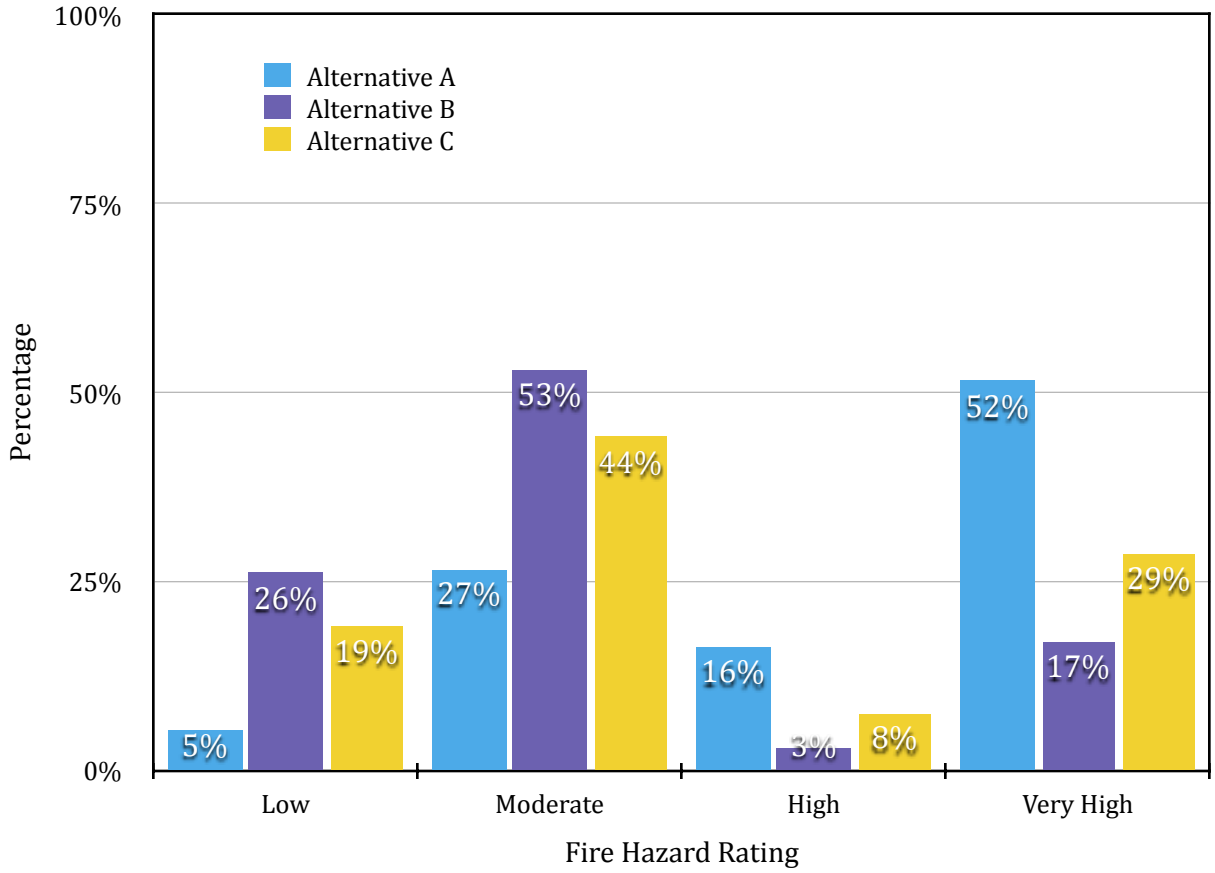

Figure 18. Alternative Comparison of Fire Hazard Ratings of Mesic Ponderosa Pine

Mixed Conifer Treatment Areas

Alternative B (Proposed Action) includes treating up to 603 acres of mixed conifer forest. The treatments would change the fire regime in the created openings from mixed severity to ground fire. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas. There will remain some areas of dense mixed conifers that would carry crown fires, but they would be more limited in size and not connected to other dense areas. The result would be mixed severity fire regime in the treated areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

The proportions displayed represent the goal for the prescribed treatments and help illustrate the potential effects of the treatments on the forest structure. Previously these areas most likely were developed under a

mixed severity fire regime (Crane, 1982) that would have resulted in a greater variety of stand structures and ages. Currently stand density has increased due to the lack of natural disturbances and suppression efforts. Understory trees, that provide ladder fuels, are present across a larger proportion of the mixed conifer forest than would have existed historically, now leaving the area at high risk for crown fire initiation or extensive crown fires. Currently 73 percent of the mixed conifer treatment areas have a fire hazard rating of high or very high.

Changes in the mixed conifer stands under Alternative B (Proposed Action) would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of 23 percent (Figure 19). There would also be a reduction in the high fire hazard by 29 percent (Figure 19). The low and moderate fire hazard categories would increase substantially. The effects of treatment would be to decrease the potential for large-scale, high-intensity wildfire. Following treatment, those stands currently in Condition Class III and II would move toward the historical Condition Class I.

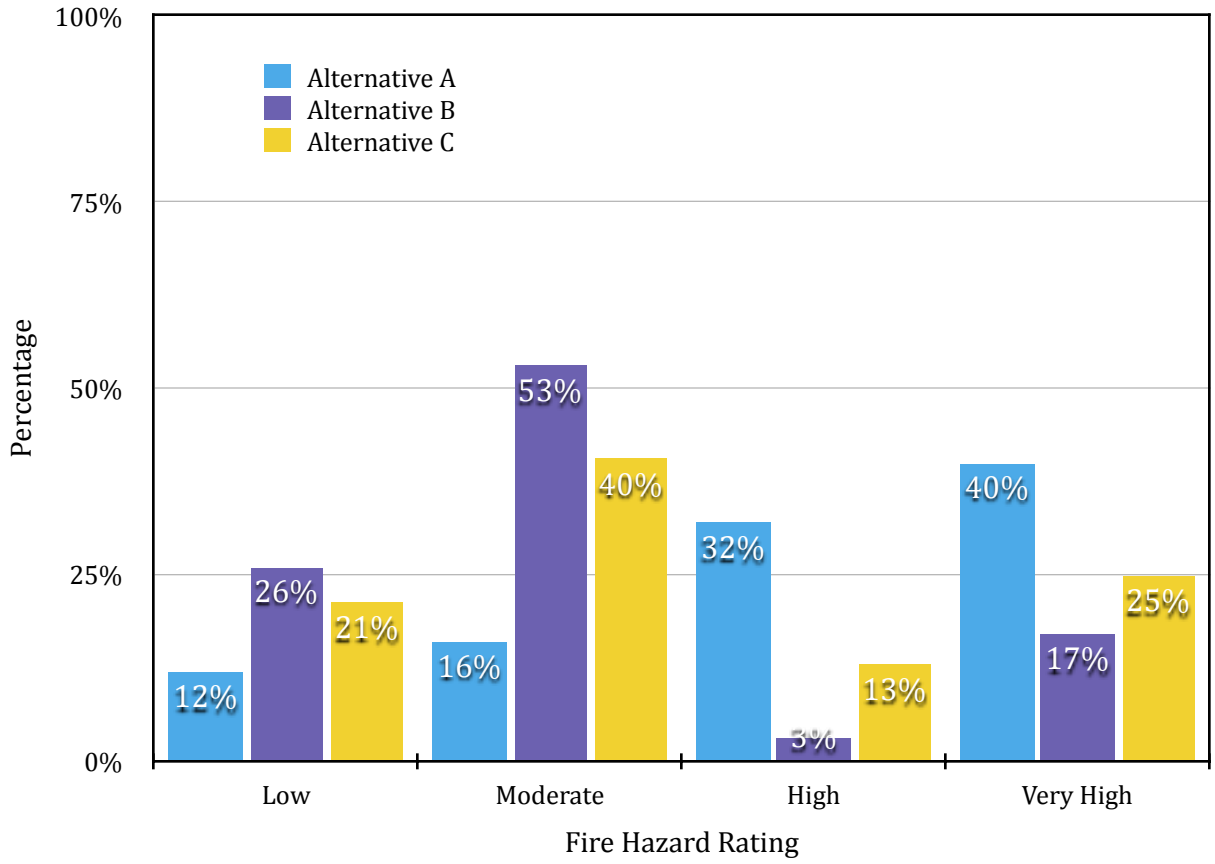

Figure 19. Alternative Comparison of Fire Hazard Ratings of Mixed Conifer

Lodgepole Pine Treatments

Alternative B (Proposed Action) includes treating up to 557 acres of lodgepole pine forest. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas.

There will remain some areas of dense lodgepole pine that could carry crown fires, but they would be more limited in size and not connected to other dense areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

The proportions displayed represent the goal for the prescribed treatments and help illustrate the potential effects of the treatments on the forest structure. The actual proportions may vary somewhat from those displayed depending on the conditions found on the ground during implementation. Currently all of the lodgepole pine treatment areas have a fire hazard rating of high or very high.

Changes in the lodgepole pine stands under Alternative B (Proposed Action) would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of 14 percent (Figure 20). There would also be a reduction in the high fire hazard by 26 percent (Figure 20). The low and moderate fire hazard categories would increase substantially. The effects of treatment would be to decrease the potential for crown fire Initiation and sustained crown fire. Following treatment, those stands currently in Condition Class III and II would move toward the historical Condition Class I.

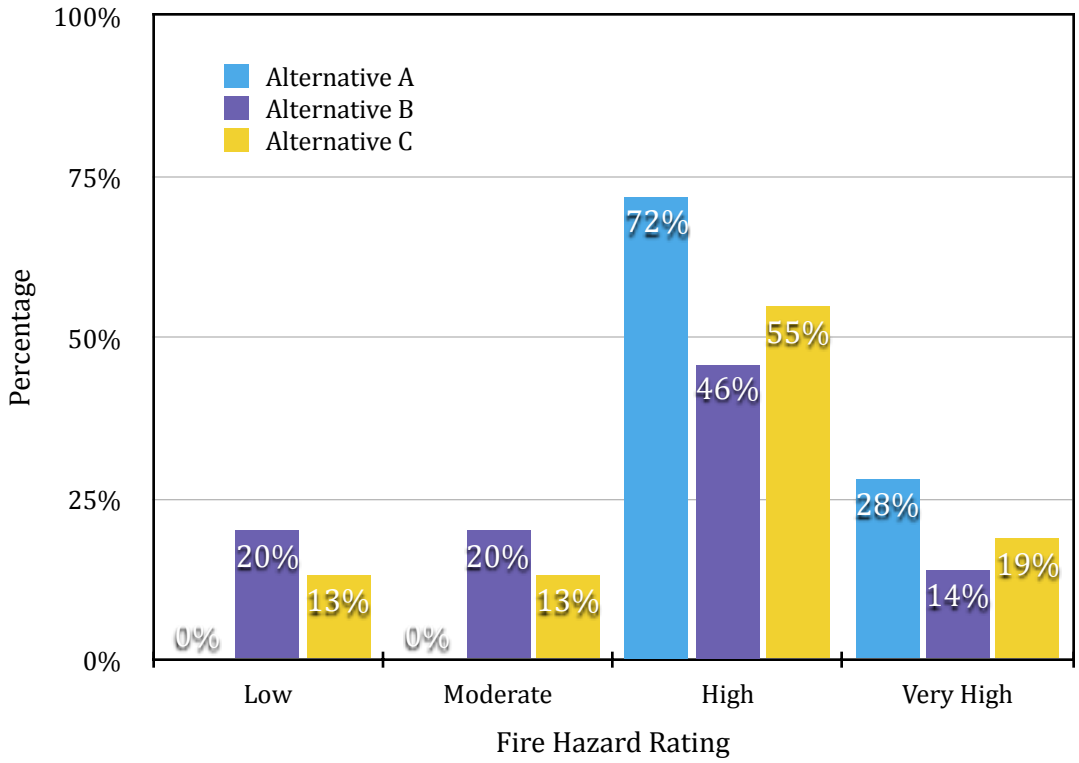

Figure 20. Alternative Comparison of Fire Hazard Ratings of Lodgepole Pine

Aspen Treatment Areas

Under Alternative B (Proposed Action) up to 121 acres of aspen would be treated. The objective of the proposed treatments within the aspen stands would be to restore the health and vigor of the existing aspen stands and expansion of their current extent. The proposed treatments include the removal of competing conifer trees and some cutting and burning of aspen to encourage new growth. The effect of these treatments would be to maintain and, in some areas, increase the amount of aspen across the landscape. Aspen does not carry wildfire, so enhancing and expanding aspen would reduce the fire hazard in those areas.

Shrubland Treatment Areas

Under Alternative B (Proposed Action) up to 28 acres of shrublands would be treated. These treatment areas are of very limited size to change the fire hazard in larger areas, but they could function as fuel breaks, which would expand the effectiveness of those treatments. The materials created from the treatments in shrublands would likely need to be burned, either piled or broadcast burned. The proposed Gambel oak treatments would promote suckering. Therefore, the treatment areas would need periodic maintenance to retain their effectiveness as fuel breaks. Broadcast burning could be used to maintain the shrublands function as fuelbreaks.

Fuelbreaks

Up to 1,000 acres of forest would be treated to create fuelbreaks under the Alternative B (Proposed Action). The fuelbreaks would be part of the treatments identified and described above. Fuelbreaks are defined as a natural or manmade change in fuel characteristics, which affects fire behavior so that fires burning into them can be more readily controlled (National Wildfire Coordination Group, 2008). The main goal of these fuelbreaks would be to disrupt the continuity of forest fuels at strategic locations and slow the progress of a wildfire or modify its behavior so that fire suppression efforts are more effective.

Fuelbreaks would be created and maintained at strategic locations throughout the Crossons-Longview Project Area. The fuelbreaks would likely be located where natural features, such as ridge tops, or manmade features, such as roads, would increase their effectiveness. Many of these areas may not be accessible from roads and would be created using hand treatments or methods not requiring tree removal. The activities required to construct a fuelbreak would vary depending on the existing conditions, but would likely include thinning, brush and conifer removal and created openings, as well as the use of prescribed fire. Prescribed fire would be used to create the fuel breaks by broadcast burning, and remove activity fuels by burning slash and brush piles.

The effects of these fuelbreaks would be similar to those discussed above for the various forest types. Similar to the openings within the ponderosa pine treatments, these fuelbreaks would be maintained through periodic prescribed fire or mechanical treatments that would maintain the open forest conditions. However, the fuel breaks may be maintained more frequently through re-cutting or broadcast burning every few years.

Cumulative Effects

The effects of treatment actions taken under Alternative B (Proposed Action), combined with the effects of other actions that have occurred in the Crossons-Longview Project Area, would create cumulative impacts on fire hazard. The proposed treatments under this alternative would alter overstory canopies, understories, and surface and ladder fuels that would combine to substantially lower the fire hazard ratings. The reduction of fire hazard would contribute to less erratic fire behavior resulting in more effective fire suppression actions, increased firefighter safety, public safety, and less damage to natural resources. In addition, Alternative B (Proposed Action) would begin moving the vegetative conditions away from current Condition Classes II and III toward the historical vegetative conditions (Condition Class I). The proposed actions under Alternative B (Proposed Action) in combination with more recent and future foreseeable vegetation treatments in surrounding areas would have a cumulative effect by reducing the fire hazard of the Crossons-Longview Project Area, thereby restoring sustainable forest conditions that are resilient to fire, while providing for diverse wildlife habitats, recreational opportunities, and sustainable watershed conditions.

Alternative C

A variety of vegetation treatments are proposed under Alternative C that are very similar to those in Alternative B (Proposed Action) but are limited in scope because minimal temporary roads would be used. This alternative would treat up to 6,326 acres in a variety of forest and vegetation types, focused mainly within 0.5 miles of existing roads. Tree thinning, prescribed fire and mechanical fuel treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Direct and Indirect Effects

Ponderosa Pine Treatment Areas

Under Alternative C, up to 2,919 acres of xeric ponderosa pine and 2,500 acres of mesic ponderosa pine would be treated, resulting in changes to the structure of many of these forest stands. The treatments would change the fire regime in the created openings from mixed severity to ground fire. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas. There will remain some areas of dense ponderosa pine that would carry crown fires, but they would be limited in size and not connected to other dense areas. The result would be mixed severity fire regime in the treated areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

Currently 61 percent of the xeric ponderosa pine forests have crown cover greater than 40 percent and there are few openings or seedling dominated stands within these areas. Following the implementation of the proposed treatments up to 20 percent of the area would be in openings and about 27 percent of the area would have crown covers greater than 40 percent.

Changes in the xeric ponderosa pine structural stages under Alternative C would reduce the fire hazard of the Crossons-Longview Project Area, although to a lesser extent than Alternative B (Proposed Action). These changes include a reduction in the very high fire hazard category of 26 percent (Figure 8). There would also be a reduction in the high fire hazard rating by eight percent (Figure 8). The low and moderate fire hazard ratings categories would increase. The effects of these proposed treatments would be to move stand conditions toward the open forest conditions that would be more resilient to surface fires and have a lower risk of sustaining a crown fire. Areas that are currently Condition Classes III and II would be moved toward the historical Condition Class I.

The mesic ponderosa pine areas are currently dominated by closed canopied stands with 68 percent of the area having crown covers of greater than 40 percent. Like the drier pine sites, there are few openings within the mesic ponderosa pine areas. Following the vegetation treatments proposed under Alternative C, about 19 percent of the mesic pine treatment areas would be in openings and 37 percent of the area would have crown covers greater than 40 percent.

Changes in the mesic ponderosa pine structural stages under Alternative C would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of 23 percent (Figure 9). There would also be a reduction in the high fire hazard rating by eight percent (Figure 9). The low and moderate fire hazard categories would increase. The ladder fuels component would be removed in these stands thereby lowering the risk of sustaining a crown fire, a result of fire moving from a surface fire into the crown canopy. Under Alternative C the objective to create more open forest conditions and a greater range of residual stand densities would be achieved, although to a lesser extent than Alternative B (Proposed Action). Areas that are currently Condition Classes III and II would be moved toward the historical Condition Class I.

Mixed Conifer Treatment Areas

Alternative C includes treating up to 422 acres of mixed conifer forest. The treatments would change the fire regime in the created openings from mixed severity to ground fire. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas. There will remain some areas of dense mixed conifers that would carry crown fires, but they would be more limited in size and not connected to other dense areas. The result would be mixed severity fire regime in the treated areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the

treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

The proportions displayed represent the goal for the prescribed treatments and help illustrate the potential effects of the treatments on the forest structure. The actual proportions may vary somewhat from those displayed depending on the conditions found on the ground during implementation. Previously these areas most likely were developed under a mixed severity fire regime (Crane, 1982) that would have resulted in a greater variety of stand structures and ages. Currently stand density has increased due to the lack of natural disturbances and suppression efforts. Understory trees, that provide ladder fuels, are present across a larger proportion of the mixed conifer forest than would have existed historically, now leaving the area at high risk for large crown fires. Currently 73 percent of the mixed conifer treatment areas have a fire hazard rating of high or very high.

Changes in the mixed conifer stands under Alternative C would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of 15 percent (Figure 10). There would also be a reduction in the high fire hazard by 21 percent (Figure 10). The low and moderate fire hazard categories would increase. The effects of treatment would be to decrease the potential for large-scale, high-intensity wildfire. Following treatment, those stands currently in Condition Class III and II would move toward the historical Condition Class I.

Lodgepole Pine Treatments

Alternative C includes treating up to 354 acres of lodgepole pine forest. Thinning treatments would reduce crown bulk density, ladder fuels and likely canopy base height, resulting in reductions in the potential of crown fire initiation and propagation through large areas of the treated areas. There will remain some areas of dense lodgepole pine that could carry crown fires, but they would be more limited in size and not connected to other dense areas.

The treatments would result in an increase in ground fuels in many areas, especially areas that are hand treated or masticated. Prescribed fire would be the preferred method for reducing activity fuels. Broadcast burning would be used in areas that have a consistent ground fuel loading without larger fuels present. Areas that are hand treated and create contiguous areas of large fuels would be hand piled and then the piles would be burned after they have cured. The prescribed fire treatments are essential to reducing the fire hazard of the treated areas. In some situations, broadcast burning will be used to complete the treatments by not only reducing ground fuels but also killing seedling or sapling sized trees.

The proportions displayed represent the goal for the prescribed treatments and help illustrate the potential effects of the treatments on the forest structure. The actual proportions may vary somewhat from those displayed depending on the conditions found on the ground during implementation. Currently all the lodgepole pine treatment areas have a fire hazard rating of high or very high.

Changes in the lodgepole pine stands under Alternative C would reduce the fire hazard of the Crossons-Longview Project Area. These changes include a reduction in the very high fire hazard category of nine percent (Figure 11). There would also be a reduction in the high fire hazard by 17 percent (Figure 11). The

low and moderate fire hazard categories would increase. The effects of treatment would be to decrease the potential for crown fire Initiation and sustained crown fire. Following treatment, those stands currently in Condition Class III and II would move toward the historical Condition Class I.

Aspen Treatment Areas

Under Alternative C up to 115 acres of aspen would be treated. The objective of the proposed treatments within the aspen stands would be to restore the health and vigor of the existing aspen stands and expansion of their current extent. The proposed treatments include the removal of competing conifer trees and some cutting and burning of aspen to encourage new growth. The effect of these treatments would be to maintain and, in some areas, increase the amount of aspen across the landscape. Aspen does not carry wildfire, so enhancing and expanding aspen would reduce the fire hazard in those areas.

Shrubland Treatment Areas

Under Alternative C up to 16 acres of shrublands would be treated. These treatment areas are of very limited size to change the fire hazard in larger areas, but they could function as fuel breaks, which would expand the effectiveness of those treatments. The materials created from the treatments in shrublands would likely need to be burned, either piled or broadcast burned. The proposed Gambel oak treatments would promote suckering. Therefore, the treatment areas would need periodic maintenance to retain their effectiveness as fuel breaks. Broadcast burning could be used to maintain the shrublands function as fuelbreaks.

Fuelbreaks

Up to 1,000 acres of forest would be treated to create fuelbreaks under the Alternative C. The fuelbreaks would be part of the treatments identified and described above. Fuelbreaks are defined as a natural or manmade change in fuel characteristics, which affects fire behavior so that fires burning into them can be more readily controlled (National Wildfire Coordination Group, 2008). The main goal of these fuelbreaks would be to disrupt the continuity of forest fuels at strategic locations and slow the progress of a wildfire or modify its behavior so that fire suppression efforts are more effective.

Fuelbreaks would be created and maintained at strategic locations throughout the Crossons-Longview Project Area. The fuelbreaks would likely be located where natural features, such as ridge tops, or manmade features, such as roads, would increase their effectiveness. Many of these areas may not be accessible from roads and would be created using hand treatments or methods not requiring tree removal. The activities required to construct a fuelbreak would vary depending on the existing conditions, but would likely include thinning, brush and conifer removal and created openings, as well as the use of prescribed fire. Prescribed fire would be used to create the fuel breaks by broadcast burning, and remove activity fuels by burning slash and brush piles.

The effects of these fuelbreaks would be similar to those discussed above for the various forest types. Similar to the openings within the ponderosa pine treatments, these fuelbreaks would be maintained through periodic prescribed fire or mechanical treatments that would maintain the open forest conditions. However, the fuel breaks may be maintained more frequently through re-cutting or broadcast burning every few years.

Cumulative Effects

The effects of treatment actions taken under Alternative C, combined with the effects of other actions that have occurred in the Crossons-Longview Project Area, would create cumulative impacts on fire hazard. The proposed treatments under this alternative would alter overstory canopies, understories, and surface and ladder fuels that would combine to substantially lower the fire hazard ratings. The reduction of fire hazard would contribute to less erratic fire behavior resulting in more effective fire suppression actions, increased firefighter safety, public safety, and less damage to natural resources. In addition, Alternative C would begin moving the vegetative conditions away from current Condition Classes II and III toward the historical vegetative conditions (Condition Class I). The proposed actions under Alternative C in combination with more recent and future foreseeable vegetation treatments in surrounding areas would have a cumulative effect by reducing the fire hazard of the Crossons-Longview Project Area, thereby restoring sustainable forest conditions that are resilient to fire, while providing for diverse wildlife habitats, recreational opportunities, and sustainable watershed conditions.

3.2.3 Air Quality Affected Environment

Sources of air pollutants related to the proposed activities include smoke from wildland fire, smoke from prescribed burning, vehicular and equipment emissions, and dust from the use of unsurfaced roads. Dust, vehicle, and equipment exhaust emissions are very small in comparison to the overall effects. These types of emissions usually settle quickly and remain relatively close to their origin, resulting in only very localized effects. The minor amounts of emissions stemming from these sources are very short-term and localized and would not adversely affect air quality. These emissions will not be discussed further in this document.

For this analysis, the greatest potential impact on air quality would be from smoke generated by wildland fires and prescribed burning. Wildland fires generally burn at a greater intensity than prescribed burns and create more potential for degrading air quality. Smoke emissions from prescribed burning activities generally dissipate in the direction of the most common winds at the time of project on-site burning. The potential impact of prescribed fire on air quality in terms of generating smoke will be discussed as well as the risk of wildland fire and associated air quality impacts.

National Forest Land and Resource Management policies integrate prescribed burns as a tool to enhance ecosystem sustainability. Prescribed fire is proposed for the Crossons-Longview Project Area. Federal land management agencies follow the appropriate State and Federal guidelines for burning and smoke management when using prescribed fire, including the associated reporting processes. In addition to applying State and Federal guidelines the Forest Service follows its respective manual and handbook direction and requirements for fuel management activities. The use of fire within the Project Area will follow current and future regulations and management direction.

Potential Impacts of Smoke on Human Health and Air Quality Values

There are five air pollutants that are found in smoke that are of primary concern including the particulates PM10 and PM2.5, CO and O3 and NO2. Wildfires can generate heavy concentrations of PM10 and PM2.5 particulates particularly during large, multiple day fire events. These particles can enter the lungs and cause severe health complications. Smoke is also generated during prescribed fires (broadcast and/or pile burning) but to a much lesser extent. Prescribed burns are conducted at specific times of the year with favorable weather conditions for good smoke dispersion. Fall and spring seasons are typically periods of the year that allow for conducting controlled burns because conditions provide for proper dissipation of smoke.

Carbon Monoxide (CO) is a colorless, odorless toxic gas that is also an ozone precursor. It can be dangerous even in low concentrations and can cause headaches, dizziness, nausea, fatigue and even death. Areas downwind of wildfires may see levels of CO that exceed the EPA standards.

Ground-level ozone (O3) is a secondary pollutant that is not emitted directly into the air but is formed when volatile organic compounds (VOCs) and oxides of nitrogen (NOx), both components in smoke, react in the presence of sunlight. Ozone is most likely to reach unhealthy levels on hot sunny days in urban environments but can also reach unhealthy levels in the winter particularly in mountainous regions. Health effects include difficulty breathing, chest pain and lung congestion. Ozone can be transported long distances by wind, often impacting rural areas far from population centers. Wildland fire can produce significant amounts of the ozone precursors; CO, hydrocarbons and oxides of nitrogen. Ozone levels downwind of wildland fire can experience significantly elevated ozone levels. It has been also found that areas far downwind of a large fire can also experience elevated ozone levels, even well beyond the smoke plume (Jaffe and Wigder, 2012; Pfister et al., 2008).

Existing Conditions

Pollutants from urban areas could drift into the Project Area. Conversely, prescribed burning in both the Jefferson County and Park County portions of the Project Area could increase levels of pollutants downwind in Denver. However, records of existing air quality document that there are many days with sufficient air quality to allow for prescribed fire (see Figures 21 and 22). Burning would not be allowed during days with poor air quality.

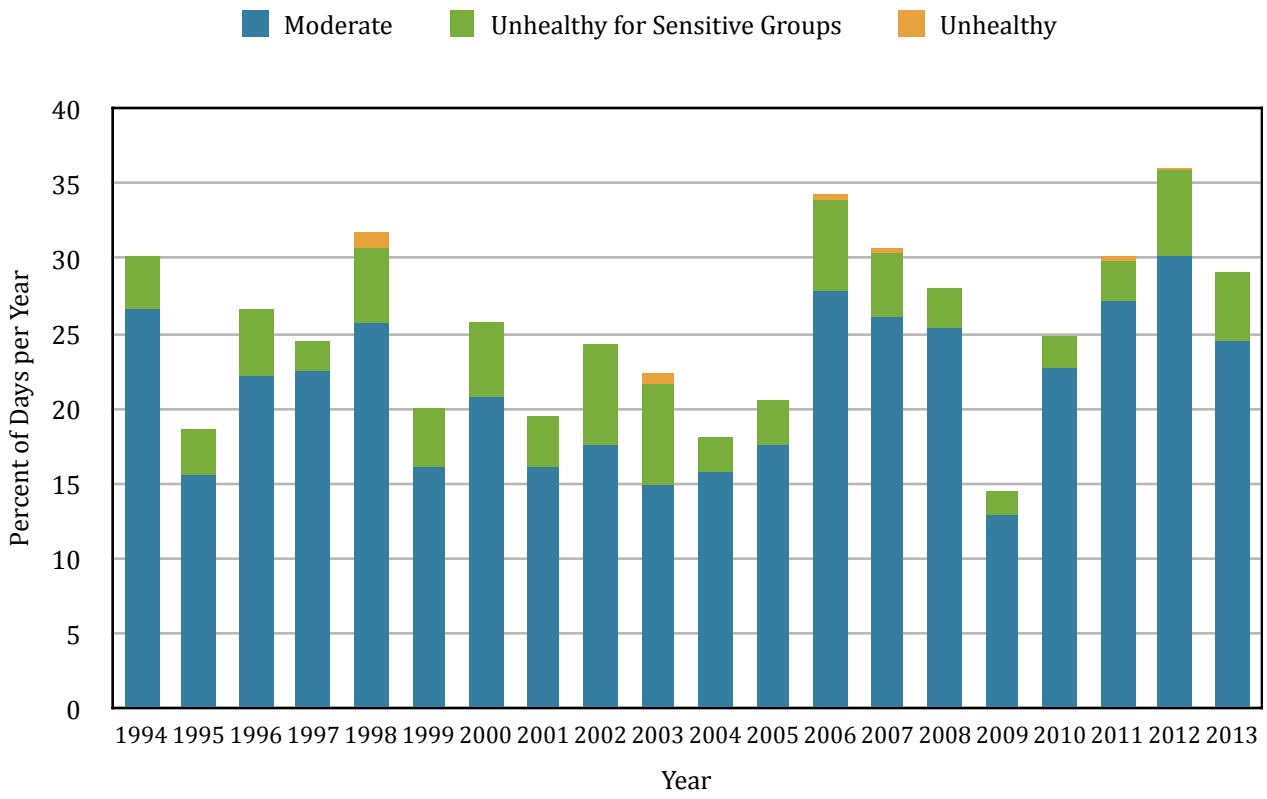

Figure 21. Air Quality Conditions Based on Air Quality Index (AQI) for Jefferson County, Colorado[3]

The Crossons-Longview Project Area spans two counties: Jefferson County and Park County. Jefferson County is in the marginal nonattainment area. The portion of the Project Area that is located in Park County is in an attainment area. Therefore, prescribed burning actions taken within the Project Area may be subject to different smoke management depending on whether the location of the burning is in Park County or Jefferson County. However, burning conducted in the Park County portion of the Project Area could affect ozone readings as well as readings of other NAAQS pollutants in a much wider area including monitors in Jefferson County. Because there is a potential for burning in Park County to affect the marginal nonattainment area in Jefferson County and monitoring stations in Jefferson County, burning activity located in the Park County portion of the Project Area may need to follow management direction for Jefferson County.

[3]All other days of the year were rated as "Good". AQI data was reported for every day of every year during this period. Data from US Environmental Protection Agency. 1994-2013. Air Quality Index Report. Jefferson County. 1994-2013.

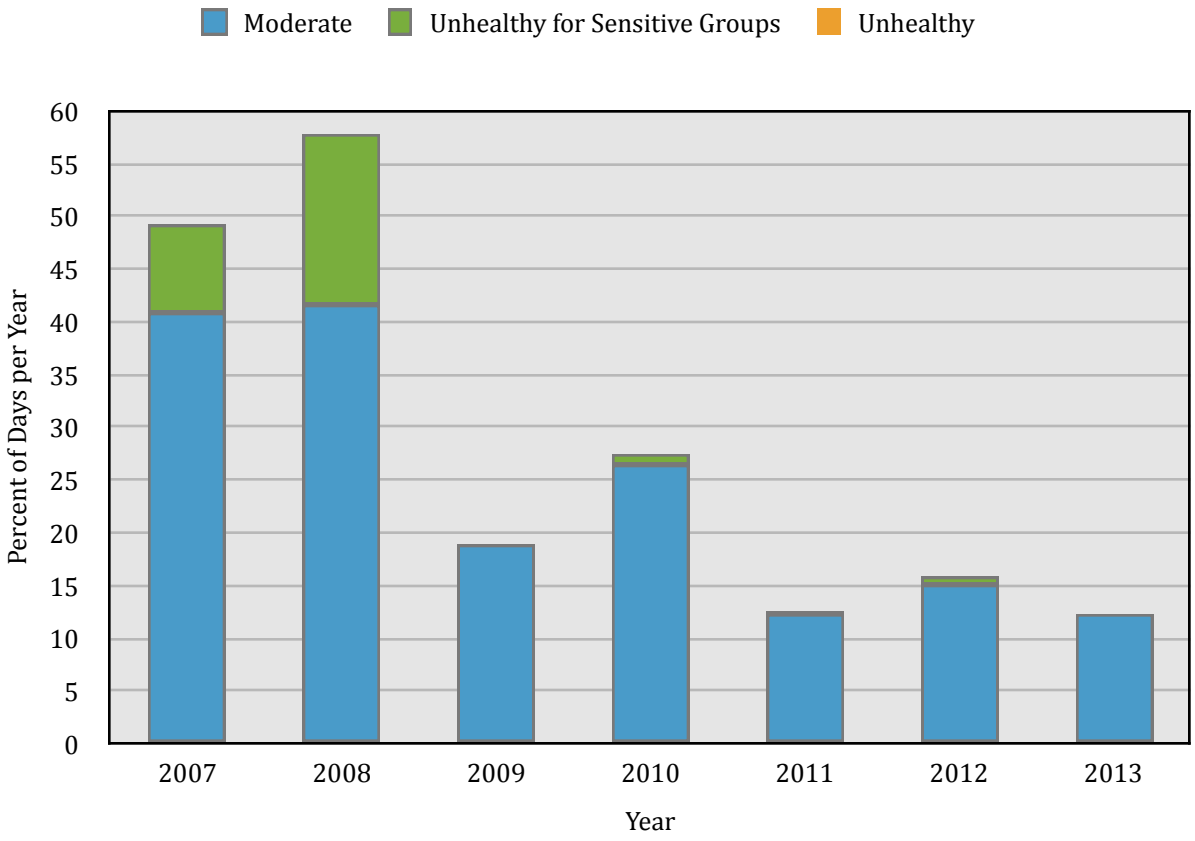

Figure 22. Air Quality Conditions Based on Air Quality Index (AQI) for Park County, Colorado[4]

3.2.4 Air Quality Environmental Consequences

Alternative A (No Action)

Under Alternative A (No Action) only existing and planned activities, approved under other NEPA documents, would occur. No vegetation management treatments would be implemented in the Crossons-Longview Project Area. Ecosystem trends and processes would continue on the current trend of increasing forest density. Progress towards the desired future conditions as outlined in the Forest Plan would not occur. Management direction outlined in the National Fire Plan and the Healthy Forests Restoration Act would not be met. Forested areas would be expected to have fire hazard ratings moving towards high and very high, as vegetative biomass increases and stand structures become more complex through annual forest growth. Fire behavior would become more erratic and intense based upon the vegetative changes.

[4] All other days of the year were rates as "Good". There were no unhealthy days during the period of record. Number of days that AQI data was reported varied from 130 to 354 days per year. Data from Environmental Protection Agency. 2007-2013. Air Quality Index Report. Park County. 2007-2013.

Direct and Indirect Effects

Alternative A would not cause any direct effects because it does not propose any new management actions. However, the lack of fuels treatments would contribute to indirect effects on forest stand structures and, subsequently, on potential wildfire behavior. Fire hazard in the Project Area is expected to increase under Alternative A (see Section 3.2.2 Fire-Fuels Environmental Consequences). The increasing hazards of large-scale, high intensity wildfire would result in a corresponding increasing risk of negative impacts to human health from smoke due to wildfire. Of particular concern would be particulate and ozone levels both in the Project Area and downwind in the Denver Metropolitan area. A large wildfire could increase ozone to unhealthy levels potentially creating warnings for sensitive groups.

Cumulative Effects

Air quality for the Crossons-Longview Project Area would generally remain in moderate to good condition. However, Alternative A would not address national, agency, forest, or local direction for reducing wildland fuel accumulations beyond existing forest management activities. The cumulative effects of not undertaking actions to reduce wildland fuel accumulations include an increasing fire hazard as fuel accumulations, already high from past management actions, build above current levels. In the long-term, greater effects to people and the environment from wildfire and fire suppression activities would be likely. Wildfires that do occur may increase in size and fire intensity, increasing smoke production. Should a fire occur, there would be a high probability that air quality would be measurably affected and particularly significant while the fire is active and producing smoke; air quality impacts could be noticeable regionally. The effects on human health and air quality related values would be expected to be significant during a wildfire event.

Wildfires in the Project Area would produce the precursors to ozone, the main pollutant in the airshed. Since Jefferson County is in a non-attainment area, it is possible that ozone levels downwind of any large wildfire in the Project Area would increase ozone levels above ambient air quality standards. A wildfire would be considered an exceptional event by the EPA, therefore, any ozone levels above standards that are a result of a wildfire would not be considered violations of NAAQS and would not affect the attainment status of the region. However, a wildfire could increase ozone to levels that may affect human health, particularly since the region already has ozone levels that historically are a concern. Wildfires are unpredictable and unscheduled, unlike prescribed burning which would be carefully scheduled on specified burn days when pollutant levels are low. Wildfires are more likely during periods of hot, dry weather when ozone levels are typically elevated. This alternative has the greatest risk of a high intensity wildfire, which, should a large, intense fire occur, would contribute more to ozone levels than any management activities. Therefore, this alternative has the greatest risk of affecting air quality and human health over the long-term.

Alternative B (Proposed Action)

Vegetation treatments proposed under Alternative B (Proposed Action) would treat up to 9,574 acres in a variety of forest and vegetation types. Tree thinning, prescribed fire and mechanical fuel treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain and improve the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Direct and Indirect Effects

The proposed activities in the Crossons-Longview Project Area could affect the air quality of the local area as well as downwind communities. Smoke from prescribed fires would contribute pollutants to the local airshed but would be temporary and transient.

The majority of the Project Area is located in Jefferson County, which is currently a marginal attainment area for ozone as determined by the EPA. Consequently, there are more restrictive requirements for burning. Smoke production may severely limit burning in some areas due to high ozone levels and the possibility that burning in the Project Area could contribute to exceedences at monitors in Jefferson County. Additionally, in Jefferson County, open burning is not permitted between October 31st and March 1st at elevations below 6,400 feet (Jefferson County Public Health, 2013). Most foothills fire departments have restrictions that allow open burning only when snow cover is present. These restrictions could limit burning on the portion of the Project Area in Jefferson County, to the point that there is a risk that the ability to complete the prescribed burns as planned may be compromised. However, only 124 acres of the xeric ponderosa pine treatment areas are below 6,400 feet in elevation. Therefore, this restriction would have minimal impact on the ability to conduct prescribed burns in those treatment areas. There may be some slash or broadcast burning, or fuelbreaks, that may be under 6,400 feet and would be restricted in timing.

Ponderosa Pine (Xeric and Mesic)

The prescribed fire activities would generate smoke that would have a direct, short-term effect on air quality. There would be a low probability that air quality would be expected to measurably change. To minimize the negative effects from smoke, prescribed fire would follow direction to minimize air quality as required through the management direction and permit requirements. The permitting process ensures that a burn can and will minimize the impacts of smoke from prescribed burning. By implementing these requirements the short-term negative effects from smoke would be minimized.

The indirect effects of treating these ponderosa pine forests would include more open stand conditions in thinned areas that would encourage the development of understory grasses and shrubs. Overtime, this type of understory, combined with the thinned conditions, would create light ground fuels and a stand structure that could carry a low intensity fire with only occasional torching of individual crowns. If ground fires are allowed to burn through these stands occasionally, the more open environment could be maintained by discouraging the establishment of understory trees. Air quality would benefit in the long-term because low intensity surface fires would generate much less smoke than large wildfires. However, if natural fire is suppressed and if there is an absence of future treatments designed to maintain open conditions, stands would eventually grow back to the denser conditions that exist today. Should this occur, the risk of large, high intensity wildfires that generate large quantities of smoke would increase, increasing the possibility that air quality would be negatively affected.

Mixed Conifer and Lodgepole Pine

The direct effects of treating up to 1,160 acres of mixed conifer and lodgepole pine forest on air quality would be due to prescribed fire activities that would generate smoke that would have a direct, short-term effect on

air quality. As discussed for prescribed fire in ponderosa pine, all prescribed burning would follow permitting direction and management policy to minimize impacts. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of treating the mixed conifer stands would be more open conditions and the lodgepole pine forest would have more openings. These more open stand conditions in treated areas would encourage the development of understory grasses and shrubs. These stand conditions may benefit air quality in the long-term because wildfires burning through these areas may be would likely be less intense and easier to control, therefore, generating less smoke.

Aspen

The direct effects of treating up to 121 acres of aspen on air quality would be minor, short-term smoke emissions from broadcast burning, if utilized to remove conifers and rejuvenate aspen. The indirect effect of these treatments would be to maintain and, in some areas, increase the amount of aspen across the landscape. Aspen provides many benefits to the landscape, including natural firebreaks, species diversity and important wildlife habitat. The proposed treatment activities in aspen stands would not change air quality, and any expected changes would be at or below the level of detection for the activities proposed. Air quality effects would be considered none to slight.

Shrubland

The direct effects of treating up to 28 acres in Gamble oak and mountain mahogany on air quality would be minor, short-term air quality effects of pile burning in the treated areas. Air quality would not change, or expected changes would be at or below the level of detection for the activities proposed. The indirect effects of these treatments would be to contribute to an overall decrease in wildfire intensity as a result of proposed activities throughout the Project Area. This would reduce the risk of air quality impacts during wildfire events. Air quality effects would be considered none to slight.

Fuel Breaks

The direct effects of creating up to 1,000 acres of fuelbreaks on air quality would be minor, short-term air quality effects from equipment exhaust and dust emissions associated with mechanical treatment and travel on roads. The prescribed fire activities would generate smoke that would have a direct, short-term effect on air quality. As discussed for prescribed fire in ponderosa pine, all prescribed burning would follow permitting direction and management policy to minimize impacts. There would be a low probability that air quality would be expected to measurably change.

Cumulative Effects

Alternative B would address national, agency, forest, and local direction for reducing wildland fuel accumulations beyond existing forest management activities in the short-term. The proposed treatments under this alternative would restore the treated portions of the Project Area to a condition that is more resilient to fire. This would lower the risk that a large, high intensity wildfire could be sustained in the Project Area. Fires that do occur in the future would likely be smaller, less intense and would consume less fuels and

therefore produce less smoke. Should fire suppression be required, it would be more likely to be effective. All of these factors would mean that future fires would produce less smoke and be shorter in duration than is likely under the existing condition or long-term under Alternative A.

The proposed actions under Alternative B (Proposed Action) in combination with recent and future foreseeable vegetation treatments in surrounding areas could be cumulative if multiple areas are burned at one time. However, adequate smoke management techniques coordination through the permitting process would minimize any short-term effects on air quality.

Wildfires produce the precursors to ozone, the main pollutant in the airshed. Since Jefferson County is in a non-attainment area, it is possible that ozone levels downwind of a large, high-intensity wildfire in the Project Area would increase ozone levels above ambient air quality standards. A wildfire would be considered an exceptional event by the EPA, therefore, any ozone levels above standards that are a result of a wildfire would not be considered violations of NAAQS and would not affect the attainment status of the region. However, a wildfire could increase ozone to levels that may affect human health, particularly since the region already has ozone levels that historically are a concern. Wildfires are unpredictable and unscheduled, unlike prescribed burning which would be carefully scheduled on specified burn days when pollutant levels are low. Wildfires are more likely during periods of hot, dry weather when ozone levels are typically elevated. The management activities proposed by this alternative would reduce the severity of wildfires in the Project Area improve the likelihood that fire fighting efforts would be successful. Should a large, high intensity fire occur in the Project Area, it would contribute more to ozone levels than any management activities. Therefore, this alternative has the lowest risk of affecting air quality, and therefore human health, over the long-term.

Jefferson County, including the Project Area, is considered marginal attainment for ozone by the EPA. Therefore, any ozone produced by prescribed burning is a concern both within the Project Area and in the larger marginal attainment area. Prescribed burning would not be conducted on days when ozone levels above or at risk of rising above the NAAQS due to cumulative effects in the region. The sensitivity of the region to ozone may limit the number of days that are available for prescribed burning. This factor may drive management decisions as to how to deal with fuels created by the proposed activities. Should smoke management requirements severely limit the timing and amount of burning that can be completed, other management options may need to be considered for removing fuels created by the forest treatments.

Alternative C

Vegetation treatments proposed under Alternative C would treat up to 6,326 acres in a variety of forest and vegetation types. Tree thinning, prescribed fire and mechanical fuel treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain and improve the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Like Alternative B, the proposed activities in the Crossons-Longview Project Area could affect the air quality of the local area as well as downwind communities. Smoke that could be generated from these activities would contribute pollutants to the local airshed but would be temporary and transient.

As discussed for Alternative B, a project-level smoke management plan would be developed for each prescribed fire. A burn permit would be required and authorized by the appropriate authority, depending on the location of the burn. The execution of prescribed fires would occur on days with appropriate smoke dispersion as required by Regulation 9 of the Colorado Department of Public Health and Environment.

This alternative would also be subject to the same restrictive open burning requirements in Jefferson County as discussed under Alternative B. Alternative C proposes a smaller area of treatments but more burning may be required because of the reduced ability to remove fuels by mechanical methods.

Direct and Indirect Effects

As discussed for Alternative B, the proposed activities in the Crossons-Longview Project Area could affect the air quality of the local area as well as downwind communities. For all treatment areas, the effects on air quality from the proposed activities would be the similar to those discussed for Alternative B. The effects would depend on the amount of prescribed fire required in Alternative C. It is possible that more prescribed fire would be required to reduce fuels generated by the treatments that would not be able to be removed by mechanical methods. Therefore Alternative C would generate similar or potentially more smoke than Alternative B.

Cumulative Effects

Like Alternative B, Alternative C would address national, agency, forest, and local direction for reducing wildland fuel accumulations beyond existing forest management activities in the short-term. Cumulative effects would be the same as discussed for Alternative B although the risk of a large, intense wildfire would not be reduced as much as that Alternative.

3.3 Watershed/Soils

3.3.1 Watershed Affected Environment

There are 8 sixth-level watersheds in the Crossons-Longview Project Area (Table 7 and Figure 23). The total watershed area is greater than the Crossons-Longview Project Area because portions of the watersheds are located outside of the Crossons-Longview Project Area boundaries (Table 7 and Figure 23). The Crossons-Longview Project Area covers approximately 22,729 acres and the Vegetation Treatment Areas cover approximately 9,600 acres. The total watershed area for the 8 watersheds is 169,639 acres.

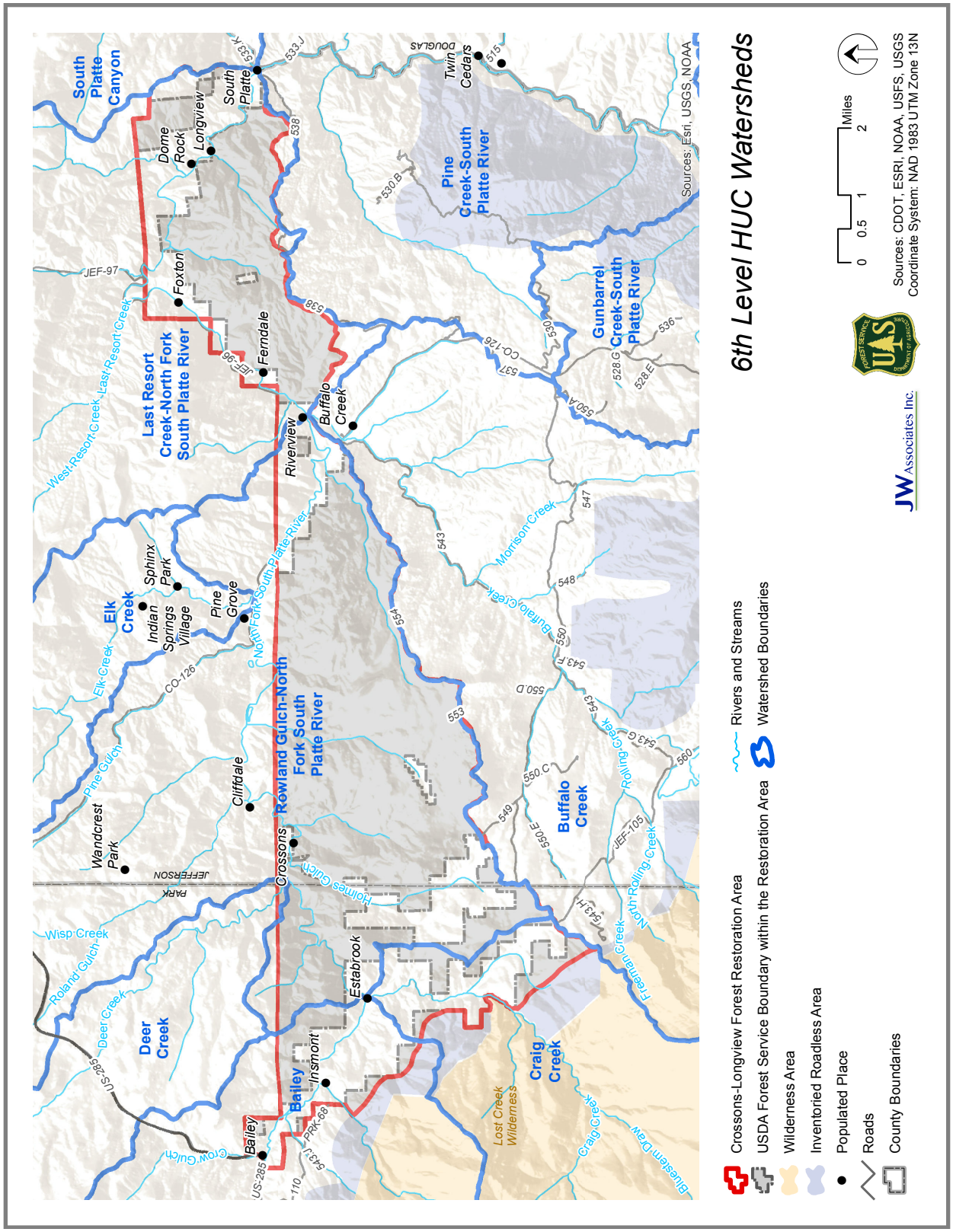

Figure 23. Crossons-Longview Project Area Watersheds

Table 7. Crossons-Longview Project Area Watersheds

Sixth-level Watershed	Hydrologic Unit Code (HUC)	Watershed Area (acres)	Watershed Area in Crossons-Longview Project Area (acres)	Watershed Area in Crossons-Longview Project Area (%)
Bailey	101900020204	15,563	1,985	12.8%
Buffalo Creek	101900020303	20,827	35	0.2%
Craig Creek	110200020203	35,538	1,909	5.4%
Deer Creek	110200020301	17,252	46	0.3%
Last Resort Creek-North Fork South Platte River	110200020305	30,895	6,066	19.6%
Pine Creek-South Platte River	110200020408	16,139	2	0.0%
Rowland Gulch-North Fork South Platte River	110200030304	18,323	12,684	69.2%
South Platte Canyon	110200030701	15,102	2	0.0%
	Totals	169,639	22,729	13.4%

Throughout the Project Area, precipitation is variable and ranges from less than 16 inches at lower elevations to approximately 24 inches per year at the highest elevations. January is typically the driest month of the year. Snow provides the majority of precipitation at the higher elevations, occurring in the winter months. At lower elevations the highest precipitation months are July and August when rain occurs primarily from high intensity summer storms, typically as thunderstorms.

Peakflows vary from snowmelt dominated above 7,500 feet to summer rainfall dominated below 7,500 feet. Runoff from melting snow accumulated during the winter month's accounts for a majority of the volumetric discharge draining the watersheds. Snowmelt runoff results in peak streamflows during the months of May and June, when discharge increases dramatically. Streamflows during the late summer fall and winter are typically much lower and originate mainly from groundwater discharge. Streams and creeks in the area are generally high gradient, linear (little meandering) and often tightly confined.

The North Fork of the South Platte River runs through the project area. It is the largest stream and is somewhat lower gradient, more sinuous and carries high streamflow compared to the other streams. The North Fork of the South Platte River also carries water diverted from the western slope. Water from Dillon Reservoir in the Blue River, which is one of the headwaters of the Colorado River, is diverted through the Roberts Tunnel into the North Fork of the South Platte River above the project area and provides municipal water supply for Denver and Aurora.

Watershed Assessment

The potential of a watershed to deliver sediments following wildfire depends on forest and soil conditions, the physical configuration of the watersheds, and the sequence and magnitude of rain falling on the burned area. High-severity fires can cause changes in watershed conditions that are capable of dramatically altering runoff and erosion processes in watersheds. Water and sediment yields may increase as more of the forest floor is affected by fire.

The Upper South Platte Watershed Assessment (Front Range Watershed Protection Data Refinement Work Group, 2009) identified and prioritized sixth-level watersheds based upon their risks of generating flooding, debris flows and increased sediment yields following wildfires that could have impacts on water supplies (Front Range Watershed Protection Data Refinement Work Group, 2009). The Crossons-Longview Project Area watersheds were all part of the Upper South Platte Watershed Assessment. Some of the components of that watershed assessment are used here to describe the existing conditions of watersheds in the Crossons-Longview Project Area.

The watersheds in the Crossons-Longview Project Area were rated on ruggedness, road density, and soil erodibility. The details of those ratings are contained in the Crossons-Longview Forest Restoration Project Environmental Assessment, Hydrology and Soils Specialist Report (JW Associates, 2015d).

Bailey Watershed Existing Conditions

Bailey is the largest watershed (46,349 acres) in the Crossons-Longview Project Area. The North Fork of the South Platte River runs through the watershed with a number of small tributaries joining the river as it flows from Grant to Bailey along Highway 285. The North Fork of the South Platte River runs between the Platte River Mountains in the Lost Creek Wilderness to the south and Mount Logan in the Mount Evans Wilderness Area to the north. Elevations range from about 7,600 to 12,800 feet. The Crossons-Longview Project Area is in the extreme eastern portion of the watershed below the town of Bailey.

The Bailey watershed was rated as a Category 3 for ruggedness which means that it is moderately steep and is somewhat sensitive to debris flows following wildfires (Cannon and Reneau, 2000). Road density of 1.3 miles of road per square mile of watershed was rated as a Category 2. Most of the roads in this watershed are located in vicinity of the Town of Bailey. Soil erodibility was rated as very high at Category 5, compared to the other watersheds. This watershed does have a high percentage of granitic soils which increases the potential for erosion. The Bailey watershed was classified as Functioning at Risk in the Watershed Condition Framework. It received poor ratings for aquatic biota and aquatic habitat.

Craig Creek Watershed Existing Conditions

The Craig Creek watershed is about 21,625 acres in size. Craig Creek runs between the Platte River Mountains to the north and the Kenosa Mountains to the south within the Lost Creek Wilderness Area. Elevations range from about 7,600 to 12,400 feet. The Crossons-Longview Project Area is in the extreme eastern portion of the watershed just before Craig Creek joins the North Fork of the South Platte River.

The Craig Creek watershed was given the highest rating (Category 4) for ruggedness in the Project Area which means that it is very steep and is sensitive to debris flows following wildfires (Cannon and Reneau, 2000). Road density of 0.2 miles of road per square mile of watershed is very low and was rated as a Category 1. The few roads in this watershed are located at the bottom of the watershed in vicinity. Soil erodibility was rated as very high at Category 5, compared to the other watersheds. This watershed has a high percentage of granitic soils which increases the potential for erosion. The Craig Creek watershed was classified as Properly Functioning in the Watershed Condition Framework. It received a poor rating for aquatic biota.

Last Resort Creek-North Fork South Platte River Existing Conditions

The Last Resort Creek-North Fork South Platte River watershed is about 29,921 acres in size. The North Fork of the South Platte River runs through the southern portion of the watershed. East and west Resort Creek and Kennedy Gulch drain into the North Fork of the South Platte River, which joins the South Platte River at the eastern end of this watershed. Elevations range from about 6,100 to over 9,100 feet. The Crossons-Longview Project Area is in the southern portion of the watershed.

The Last Resort Creek-North Fork South Platte River watershed has one of the lower ratings (Category 2) for ruggedness. Road density of 2.4 miles of road per square mile of watershed is relatively high and was rated as a Category 3. Soil erodibility was rated as very high at Category 5, compared to the other watersheds. This watershed has a high percentage of granitic soils which increases the potential for erosion. The Last Resort Creek-North Fork South Platte River watershed was classified as Functioning at Risk in the Watershed Condition Framework. It received poor ratings for aquatic biota, riparian/wetland vegetation, aquatic habitat and rangeland vegetation.

Rowland Gulch-North Fork South Platte River Existing Conditions

The Rowland Gulch-North Fork South Platte River watershed is about 27,130 acres in size. The North Fork of the South Platte River runs through the middle of the watershed. Roland Gulch drains the northern part of the watershed into the North Fork, and Holmes Gulch and Buck Gulch drain the southern portion. Elevations range from 6,600 feet near the town of Buffalo Creek to over 8,800 feet. The Crossons-Longview Project Area is in the southern third of the watershed.

The Rowland Gulch-North Fork South Platte River watershed was given one of the lowest ratings (Category 1) for ruggedness which means that it is not steep and is not sensitive to debris flows following wildfires (Cannon and Reneau, 2000). Road density of 2.9 miles of road per square mile of watershed is the highest in the Project Area and was rated as a Category 4. Soil erodibility was rated as very high at Category 5, compared to the other watersheds. This watershed has a high percentage of granitic soils which increases the potential for erosion. The Rowland Gulch-North Fork South Platte River watershed was classified as Impaired Function in the Watershed Condition Framework. It received poor ratings for aquatic biota, riparian/wetland vegetation, aquatic habitat and forest cover.

3.3.2 Watershed Environmental Consequences

The Proposed Action is designed to improve the health of the forest and increase its resiliency to large-scale, high intensity wildfire, insect epidemics and disease. The forest condition that would be created would much more open and would more closely resemble the historic conditions. However, there is some concern that the actions required to move the forest closer to a more resilient conditions could create water quality problems.

This analysis focuses on water yield, peak flows and sediment yield. A detailed discussion of the background of potential impacts is presented in JW Associates, 2015d. The Fuel Management WEPP (FuME WEPP) model was used to predict runoff and sediment yield from forest management activities. It compares background

conditions to hillslope sedimentation from fuels management activities and wildfire. Details of the assumptions and model results are presented in JW Associates 2015d.

Watersheds for Analysis

The 6th-Level (12 code HUC) watersheds were evaluated to determine if they should be dropped from this analysis of carried forward. Several watersheds have less than 1 percent of their watershed areas proposed for vegetation treatments (Table 8). Their water quality, peak flows, water yield and sediment yield would not be affected due to the very small extent of proposed activities and the use of BMPs. The following watersheds are not analyzed further;

- Buffalo Creek
- Deer Creek
- Pine Creek-South Platte River
- South Platte Canyon

The remaining 4 watersheds identified for further analysis in Table 8 are carried forward in this analysis.

Table 8. Water Yield - Basal Area Removal Analysis by Watershed[5] - Alternative B

Watershed Name	Watershed Area (acres)	Xeric Ponderosa	Mesic Ponderosa	Mixed Conifer	Lodgepole Pine	Totals	Percent of Watershed
Bailey	46,349	156.3	67.2	28.8	45.8	298.1	0.6%
Craig Creek	21,625	37.2	26.7	60.6	278.6	403.1	1.9%
Last Resort Creek-North Fork South Platte River	29,921	1,389.1	301.8	50.0	0.0	1,740.9	5.8%
Rowland Gulch-North Fork South Platte River	27,130	1,162.0	1,435.5	99.2	232.3	2,929.0	10.8%
Totals	125,025	2,744.6	1,831.2	238.6	556.7	5,371.1	4.3%

This section describes the effects of Alternative A (No Action), Alternative B (Proposed Action), and Alternative C on the watersheds and soils of the Crossons-Longview Project Area. The analysis concentrates on the potential effects of the alternatives on water yield, peak flows, sediment yield and soil productivity (see 4. Analysis Methods). The cumulative effects assessment includes the watersheds of the Crossons-Longview Project Area (Table 8).

[5] The numbers in this table represent the number of acres within each watershed that represent 100 percent basal area removal. This analysis assumes that aspen and gambel oak would quickly resprout and not create any changes in water yield. The basal area changes in dry ponderosa, mesic ponderosa and mixed conifer were estimated to be an average of 60, 50 and 40 percent, respectively, for treated stands.

Alternative A (No Action)

Direct and Indirect Effects

Alternative A (No Action) would have no direct short term effect on the watersheds or soils of the Crossons-Longview Project Area. No vegetation treatments would be implemented under this alternative. Indirect effects include an increase in forest density over time that would have an increased risk of catastrophic wildfire compared to the existing conditions.

Cumulative Effects

This section presents the potential cumulative effects of the past, present and future foreseeable actions in the watersheds of the Crossons-Longview Project Area. Under Alternative A, there would be no vegetation treatments on National Forest System (NFS) lands in the Crossons-Longview Project Area. While the recent and on-going vegetation treatments on private lands within the Crossons-Longview Project Area would help to reduce stand densities and create a more diverse landscape, NFS lands cover twice the area compared to private lands. Without any treatments on these lands, a large portion of the Crossons-Longview Project Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer.

The cumulative effect of the past, present and reasonably foreseeable future actions on the condition of the forest vegetation in the Crossons-Longview Project Area under Alternative A, would be an area dominated by forest stands that are generally healthy but relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

Sediment, at some level, is naturally occurring in the environment. The stream systems have adapted to and function at different levels and ranges. The introduction of sediment from human associated activity, if excessive, can adversely impact stream function. Past activities, usually road related, in the Crossons-Longview Project Area have likely contributed a large amount of sediment to the streams. Existing road stream crossings and other contributions from roads in the Crossons-Longview Project Area are expected to remain unchanged.

Several streams in the Project Area have had increased sediment delivered from recent wildfires. Cumulative impacts from sediment produced by the effects of future high intensity wildfires would be expected if a large, intense wildfire burned in the Crossons-Longview Project Area. This alternative would be expected to have the largest number of acres classified at high fire risk of the alternatives. High intensity fires can cause chain reactions of events that can impact watersheds. In general, high severity burn areas experience significant duff reduction and loss in soil nutrients (Harvey et al., 1989) and soil heating (Hungerford et al., 1991). Water and sediment yields may increase as more of the forest floor is consumed (Robichaud and Waldrop, 1994; Soto et al., 1994; and Wells et al., 1979). If fire consumes the duff and organic layers of the soil and the mineral soil is exposed, soil infiltration and water storage capacities of the soil are reduced (Robichaud, 1996), which can result in increased erosion, runoff and sediment yield. Increased runoff from burned areas, combined with erosion, may result in significant sedimentation downstream (Moody and Martin, 2001). Increased water yield and peak flows would also result from a high intensity wildfire.

Alternative B (Proposed Action)

Direct and Indirect Effects

Vegetation treatments are proposed under Alternative B (Proposed Action) that would treat up to 9,575 acres in a variety of forest and vegetation types. Tree thinning, prescribed fire and mechanical fuels treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Water Yield

Water yield would be expected to increase in the short-term from tree removal and consequent reduction of evapotranspiration. This analysis criteria for increases in water yield is estimated basal removal being not more than 20 percent in a watershed (see 4.1 Water Yield). The analysis that was completed to estimate basal area removal by watershed used the following assumptions;

1. Treatments in aspen and gambel oak would not create any changes in water yield because they would quickly resprout.
2. Treatments in dry ponderosa, mesic ponderosa and mixed conifer would result in reductions in basal area of 60, 50 and 40 percent, respectively, for those areas treated. Lodgepole pine was assigned 100 percent because the treatments could include clearcuts.
3. Changes in basal area on a watershed basis were estimated by converting the basal area removal to an acre basis. For example, mesic ponderosa treated in Last Resort Creek-North Fork South Platte River is estimated to be 604 acres. Assuming 50 percent basal area removal, the basal area removal for that watershed would be estimated to be 302 acres, or 50 percent of 604 acres (Table 8).
4. Analysis Areas are the sixth-level watersheds in Table 6.

Water yield increases would not be measurable in all watersheds. This conclusion is based on the estimated basal removal of not more than 20 percent in a watershed (Table 8). This analysis shows basal area removal of less than 11 percent in all watersheds (Table 8). Water yield increases would have to adversely impact the beneficial uses of a stream before they would be considered a violation of the Forest Plan. Several recent studies have concluded that water yields have decreased substantially since the late 1800s (Elliot et al., 2010). The direct and indirect effects of Alternative B (Proposed Action) on water yields would be a slight potential to increase water yields in all watersheds listed in Table 8 but those changes would be less than measurable. The beneficial uses of streams in the watersheds that would have treatments would not be adversely impacted from potential increases in water yields.

Peak Flows

The direct and indirect effects of Alternative B (Proposed Action) could result in increases in peak flows. The most recent research findings have concluded that in snow zones, thinning less than 40 percent of a watershed would result in only a 14 percent increase in the size of peak flows (Elliot et al., 2010). Increases in peak flows by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan. For this analysis, potential peak flow increases will be evaluated by the percentage of watersheds treated by treatment type. The analysis that was completed to estimate changes in peak flows by watershed used the following assumptions;

1. Treatments in aspen and gambel oak would not create any changes in peak flows because they would quickly resprout.
2. Analysis Areas are the sixth-level watersheds in Table 9.

Table 9. Peak Flow Analysis by Watershed - Alternative B[6]

Watershed Name	Watershed Area (acres)	Vegetation Treatment (acres)	Percentage of Watershed
Bailey	46,349	516	1.1%
Craig Creek	21,625	604	2.8%
Last Resort Creek-North Fork South Platte River	29,921	3,069	10.3%
Rowland Gulch-North Fork South Platte River	27,130	5,347	19.7%
Totals	**125,025**	**9,536**	

Peak flow increases would not be measurable in all watersheds on Table 9. This conclusion is based on thinning in less than 40 percent of a watershed would result in only a 14 percent increase in the size of peak flows (Table 9). The Rowland Gulch-North Fork South Platte River watershed is estimated to be just below 20 percent of the watershed treated after full implementation of the Proposed Action. Activities in the Rowland Gulch-North Fork South Platte River watershed should be staged throughout the 10 years of expected implementation of Alternative B (Proposed Action) which would minimize the peak flow increases in that watershed. Elliot et al. (2010) also state that "In conclusion, both the available data and our understanding of hydrologic processes indicate that thinning should generally have little or no effect on the size of peak flows."

Peak flow increases would have to adversely impact the beneficial uses of a stream before they would be considered a violation of the Forest Plan. The direct and indirect effects of Alternative B (Proposed Action) on peak flows would be a potential slight increase in peak flows in Rowland Gulch-North Fork South Platte River watershed and changes in all other watersheds that are less than measurable. The beneficial uses of streams in the watersheds that would have treatments would not be adversely impacted from potential increases in peak flows.

[6] Please note that the total vegetation treatments acres to do match Alternative B (Proposed Action) because some of the watersheds were dropped from further analysis.

Sediment Yield

The direct and indirect effects of Alternative B (Proposed Action) could result in increases in sediment yield (see 4.3 Sediment Yield). However, increases in sediment yield by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan.

Changes in sediment yield were estimated using the FuME WEPP model. The model was run for three slope categories; 10, 20 and 30 percent. The model compares background average annual hillslope sedimentation to that generated from prescribed fire, thinning, wildfires and roads. These modeling runs estimate the changes for hillslopes that would be treated and are only estimates for those portions of the watersheds. The estimates of increased sedimentation were scaled to a watershed basis by the area treated in those watersheds. For example, in the Rowland Gulch-North Fork South Platte River watershed the sedimentation increase is the modeled increase times 0.197, because the treatments cover about 19.7 percent of the watershed.

The results for the FuME WEPP model are summarized by watershed in Table 10. The results show that the effects of vegetation treatments are predicted to be similar to potential sedimentation sources for prescribed fire for all watersheds. The effects of prescribed fire are predicted to be less than two percent for all watersheds (Table 10). The effects of vegetation treatments, which include increased road use, are predicted to be approximately a two percent increase over background, or less (Table 10). The combined effects of vegetation treatments, road use and prescribed fire added together are predicted to be approximately four percent, or less.

Table 10. FuME WEPP Increased Sedimentation by Watershed - Alternative B

Watershed Name	Thinning Effects	Prescribed Fire Effects	Combined Thinning & Prescribed Fire Effects
Bailey	0.1%	0.1%	0.2%
Craig Creek	0.2%	0.2%	0.5%
Last Resort Creek-North Fork South Platte River	0.9%	0.9%	1.7%
Rowland Gulch-North Fork South Platte River	1.7%	1.7%	3.3%

Roads are considered the primary contributors of sediments to streams in managed watersheds (Swanson et al., 1981; Amaranthus et al., 1985; Rice and Lewis, 1986; Bilby et al., 1989; Donald et al., 1996; Megan and Kidd, 1972; Reid and Dunne, 1984; Rothacher, 1971; Sullivan and Duncan 1981; and Swift, 1988). In a study comparing the effects of thinning and a wildfire on sediment production in the Colorado ponderosa pine forests, Libohova (2004) found that thinning treatments in ponderosa pine generated basically no sediment yield. Roads on the granitic derived soils in the Crossons-Longview Project Area can be major sources of sediment due to the highly erodible nature of these soils. No new system roads would be constructed in Alternative B (Proposed Action). Temporary roads would be used but would be reclaimed after use.

With the full implementation of the BMPs the amount of increased sediment from harvest activities would not be expected to result in a significant impact on water quality. The direct and indirect effects of Alternative B (Proposed Action) on sediment yield would be a potential slight increase in sediment yield in the short term

(less than five years) and a potential decrease in sediment in the long term (greater than five years) in the Crossons-Longview Project Area.

Wetlands

Wetlands in the Crossons-Longview Project Area would be protected by implementation of the BMPs. There would be no direct, indirect or cumulative effects on wetlands from Alternative B (Proposed Action).

Floodplains

Floodplains in the Crossons-Longview Project Area would be protected by implementation of the BMPs. There would be no direct, indirect or cumulative effects on floodplains from Alternative B (Proposed Action).

Cumulative Effects

This section presents the potential cumulative effects of the Alternative B (Proposed Action) and past, present and future foreseeable actions in the watersheds of the Crossons-Longview Project Area.

Additional fuel hazard reduction treatments may be implemented as a result of several Community Wildfire Protection Plans (CWPP) that have been developed for communities within the area. These treatments would be primarily within the wildland urban interface and treat areas at the lower elevations. Most likely within the ponderosa pine, gambel oak, and Douglas fir cover types.

There are no currently planned vegetation treatment projects on National Forest Lands in the Project Area. The scale of the treatments on private lands would be substantially less than those in Alternative B (Proposed Action). Therefore, the cumulative effects on water yield, peak flows and sediment yield would be similar to the direct and indirect effects.

Alternative C

Direct and Indirect Effects

Vegetation treatments are proposed under Alternative C that would treat up to 6,325 acres in a variety of forest and vegetation types. Tree thinning, prescribed fire and mechanical fuels treatments would all be used to reduce wildland fuels, reduce the wildfire hazard, and maintain the diversity and health of the forest vegetation within the Crossons-Longview Project Area.

Water Yield

Water yield would be expected to increase in the short-term from tree removal and consequent reduction of evapotranspiration. This analysis criteria and assumptions are the same as Alternative B (Proposed Action) that increases in water yield estimated using basal removal should not be more than 20 percent in a watershed.

Water yield increases would not be measurable in all watersheds. This conclusion is based on the estimated basal removal of not more than 20 percent in a watershed (Table 11). This analysis shows basal area removal of less than 7 percent in all watersheds (Table 11). Water yield increases would have to adversely impact the beneficial uses of a stream before they would be considered a violation of the Forest Plan. Several recent

studies have concluded that water yields have decreased substantially since the late 1800s (Elliot et al., 2010). The direct and indirect effects of Alternative C on water yields would be a slight potential to increase water yields in all watersheds listed in Table 11 but those changes would be less than measurable. The beneficial uses of streams in the watersheds that would have treatments would not be adversely impacted from potential increases in water yields.

Table 11. Water Yield - Basal Area Removal Analysis by Watershed[7] - Alternative C

Watershed Name	Watershed Area (acres)	Xeric Ponderosa	Mesic Ponderosa	Mixed Conifer	Lodgepole Pine	Totals	Percent of Watershed
Bailey	46,349	82.2	44.6	23.3	17.9	168.0	0.4%
Craig Creek	21,625	36.6	26.6	23.7	148.3	235.2	1.1%
Last Resort Creek-North Fork South Platte River	29,921	1,037.8	267.7	49.0	0.0	1,354.5	4.5%
Rowland Gulch-North Fork South Platte River	27,130	590.8	906.6	70.2	187.0	1,754.6	6.5%
Totals	**125,025**	**1,747.4**	**1,245.5**	**166.2**	**353.2**	**3,512.3**	**2.8%**

Peak Flows

The direct and indirect effects of Alternative C could result in increases in peak flows. The most recent research findings have concluded that in snow zones, thinning less than 40 percent of a watershed would result in only a 14 percent increase in the size of peak flows (Elliot et al., 2010). Increases in peak flows by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan. For this analysis, potential peak flow increases will be evaluated by the percentage of watersheds treated by treatment type. The evaluation criteria and assumptions are the same as those for Alternative B (Proposed Action).

Peak flow increases would not be measurable in all watersheds on Table 12. This conclusion is based on thinning in less than 40 percent of a watershed would result in only a 14 percent increase in the size of peak flows (Table 12). The Rowland Gulch-North Fork South Platte River watershed is estimated to be just below 12 percent of the watershed treated after full implementation of Alternative C. Activities in the Rowland Gulch-North Fork South Platte River watershed should be staged throughout the 10 years of expected implementation of Alternative B (Proposed Action) which would minimize the peak flow increases in that watershed. Elliot et al. (2010) also state that "In conclusion, both the available data and our understanding of hydrologic processes indicate that thinning should generally have little or no effect on the size of peak flows."

[7] The numbers in this table represent the number of acres within each watershed that represent 100 percent basal area removal. This analysis assumes that aspen and gambel oak would quickly resprout and not create any changes in water yield. The basal area changes in dry ponderosa, mesic ponderosa and mixed conifer were estimated to be an average of 60, 50 and 40 percent, respectively, for treated stands.

Table 12. Peak Flow Analysis by Watershed - Alternative C

Watershed Name	Watershed Area (acres)	Vegetation Treatment (acres)	Percentage of Watershed
Bailey	46,349	305	0.7%
Craig Creek	21,625	374	1.7%
Last Resort Creek-North Fork South Platte River	29,921	2,388	8.0%
Rowland Gulch-North Fork South Platte River	27,130	3,218	11.9%
Totals	**125,025**	**6,285**	

Peak flow increases would have to adversely impact the beneficial uses of a stream before they would be considered a violation of the Forest Plan. The direct and indirect effects of Alternative C on peak flows would be a potential slight increase in peak flows in Rowland Gulch-North Fork South Platte River watershed and changes in all other watersheds that are less than measurable. The beneficial uses of streams in the watersheds that would have treatments would not be adversely impacted from potential increases in peak flows.

Sediment Yield

The direct and indirect effects of Alternative C could result in increases in sediment yield. Changes in sediment yield were estimated using the FuME WEPP model. The model was run for three slope categories; 10, 20 and 30 percent. The model compares background average annual hillslope sedimentation to that generated from prescribed fire, thinning, wildfires and roads. These modeling runs estimate the changes for hillslopes that would be treated and are only estimates for those portions of the watersheds. The estimates of increased sedimentation were scaled to a watershed basis by the area treated in those watersheds. For example, in the Rowland Gulch-North Fork South Platte River watershed the sedimentation increase is the modeled increase times 0.197, because the treatments cover about 19.7 percent of the watershed.

The results for the FuME WEPP model are summarized by watershed in Table 13. The results show that the effects of vegetation treatments are predicted to be greater potential sedimentation sources than prescribed fire for all watersheds. The effects of prescribed fire are predicted to be one percent, or less, for all watersheds (Table 13). The effects of vegetation treatments, which include increased road use, are predicted to be approximately a one percent increase over background, or less (Table 13). The combined effects of vegetation treatments, road use and prescribed fire added together are predicted to be approximately two percent, or less.

Table 13. FuME WEPP Increased Sedimentation by Watershed - Alternative C

Watershed Name	Thinning Effects	Prescribed Fire Effects	Combined Thinning & Prescribed Fire Effects
Bailey	<0.1%	<0.1%	0.1%
Craig Creek	0.1%	0.1%	0.3%
Last Resort Creek-North Fork South Platte River	0.7%	0.7%	1.4%
Rowland Gulch-North Fork South Platte River	1.0%	1.0%	2.0%

Roads are considered the primary contributors of sediments to streams in managed watersheds (Swanson et al., 1981; Amaranthus et al. 1985; Rice and Lewis, 1986; Bilby et al., 1989; Donald et al., 1996; Megan and Kidd, 1972; Reid and Dunne, 1984; Rothacher, 1971, Sullivan and Duncan, 1981; and Swift, 1988). In a study comparing the effects of thinning and a wildfire on sediment production in the Colorado ponderosa pine forests, Libohova (2004) found that thinning treatments in ponderosa pine generated basically no sediment yield. Roads on the granitic derived soils in the Crossons-Longview Project Area can be major sources of sediment due to the highly erodible nature of these soils. No new system roads or temporary roads would be constructed in Alternative C.

With the full implementation of the BMPs the amount of increased sediment from harvest activities would not be expected to result in a significant impact on water quality. The direct and indirect effects of Alternative C on sediment yield would be a potential slight increase in sediment yield in the short term (less than five years) and a potential decrease in sediment in the long term (greater than five years) in the Crossons-Longview Project Area.

Wetlands

Wetlands in the Crossons-Longview Project Area would be protected by implementation of the BMPs. There would be no direct, indirect or cumulative effects on wetlands from Alternative C.

Floodplains

Floodplains in the Crossons-Longview Project Area would be protected by implementation of the BMPs. There would be no direct, indirect or cumulative effects on floodplains from Alternative C.

3.3.3 Soils Affected Environment

Soils within the Crossons-Longview Project Area are derived mostly from decomposed granite parent material. The parent rock is deeply weathered Pikes Peak Granite composed of large crystals. These large crystals then form a mass of coarse-grained material with little clay to serve as binding material and as exchange medium for soil nutrients. These soil particles are highly erodible and may be relatively unproductive due to a lack of soil nutrients.

Soils in the Crossons-Longview Project Area are generally sandy or gravelly loam textured and shallow in depth. Surface horizons are sandy loam in texture, with some organic accumulations at the surface. Rock and gravel content increases with depth. The surface soils become increasingly coarse with an increase in slope gradient. Soils range from 0 inches in the rock types to 40 inches in some timber types and valley bottoms.

The decomposed, granitic soils within the Crossons-Longview Project Area can be eroded when disturbed due to their lack of cohesion. However, due to their coarse nature, they are not easily compacted except during road or trail construction and use. Studies have found that these decomposed, granitic soils maintain high infiltration rates even when used for skid trails (Libohova, 2004).

3.3.4 Soils Environmental Consequences

Analysis Methods

The analysis of the effects of the proposed actions on soils focuses on compliance with the Forest Service Watershed Conservation Handbook FSH 2509.25 (2001b). Management Measure 13 states "Manage land treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15 percent of any activity area." For this analysis, potential soil productivity impacts will be evaluated by the percentage of soil impacts in any activity are compared to the 15 percent standard.

Alternative B

The analysis of the effects of the proposed actions on soils focuses on compliance Forest Service Handbook (FSH 2509.25) Watershed Conservation Practices Handbook. For this analysis, potential soil productivity impacts will be evaluated by the percentage of soil impacts in any activity are compared to the 15 percent standard.

Vegetation treatment activities, including felling, skidding, decking, transporting of logs off-site, and slash disposal, can affect soil resources. Potential effects to soil resources include soil compaction and displacement. Soil erosion can occur when rainstorms occur on sites where the ground cover has been removed and the infiltration rate of soils has been reduced due to compaction.

Vegetation treatments and associated soil disturbance in Alternative B (Proposed Action) would be managed to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15 percent of any land unit. No new system roads would be constructed and temporary roads would comply with BMPs.

With the full implementation of the BMPs and managing disturbances to less than 15 percent of units, the harvest activities would not be expected to result in significant impacts on soil productivity. The direct and indirect effects of Alternative B (Proposed Action) on soil productivity would be a potential slight decrease in soil productivity in the short term (less than five years) and a potential increase in soil productivity in the long term (greater than five years) in the Crossons-Longview Project Area. Long-term increases in soil productivity could be achieved from the increases in ground cover due to the opening of the forest canopy in treated areas.

Alternative C

The analysis of the effects of the proposed actions on soils focuses on compliance Forest Service Handbook (FSH 2509.25) Watershed Conservation Practices Handbook. For this analysis, potential soil productivity impacts will be evaluated by the percentage of soil impacts in any activity are compared to the 15 percent

standard. The effects of Alternative C would similar but less than those described for Alternative B (Proposed Action).

3.4 Wildlife

3.4.1 Sensitive Species Affected Environment

There are 13 sensitive species that are known to occur in the Project Area or that have suitable habitat and therefore assumed likely to occur. These species include one amphibian, seven birds and five mammals. Table 14 summarizes these species and their habitat requirements. Additional detail about each of these species can be found in the Wildlife Specialist Report for the Crossons-Longview Forest Restoration Project Environmental Assessment (JW Associates, 2015g).

Northern Leopard Frog

There have been no formal surveys for this species in the Project Area and no documented occurrences but they are known on the district (i.e., Wigwam Creek 2013), and expected elsewhere. Suitable habitat exists along the North Fork South Platte River and its tributaries.

Nationally, their population trends are downward throughout most of their range for reasons unknown at this time. The current status of leopard frogs in Colorado is uncertain. Potential risk factors include inadequate regulatory protection of smaller seasonal and semi-permanent ponds, introduced predatory fish, lack of protection at overwintering sites, water quality degradation due to chemicals, loss of migratory pathways, introduced diseases, and road-related mortality.

American Peregrine Falcon

Active American peregrine falcon eyries (nest sites) are known in the Pike and San Isabel National Forest (USDA Forest Service, 1984), and suitable habitat is available in the Project Area. Jefferson County's Cathedral Spires Park has a known nest site with seasonal closures.

Populations of American peregrine falcon decreased over the past century, largely due to pesticide poisoning. In 1977, it was reported that only four nesting pairs existed in Colorado. Through recent reintroduction efforts, the numbers have increased considerably, and the species now appears to be secure (Foster Wheeler Environmental Corporation, 1999; US Fish and Wildlife Service, 2006). Current threats to the species include the decline in habitat quality and human disturbance of nest sites during recreational activities.

Table 14. Forest Service Region 2 Sensitive Species and MIS Species [1]

Species	Documented Occurrences in Project Area?	Habitat
Amphibians		
Northern Leopard Frog (*Lithobaties pipiens*)	No Documented occurrences in Project Area but suitable habitat exists.	Northern leopard frogs occurs in a wide variety of habitats including creeks, lakes, ephemeral wetlands, and ponds and is found throughout most of Colorado in mountainous and plains habitats (Smith and Keinath, 2007). Breeding habitat is limited to permanent water sources at least 6 inches in depth that do not freeze solid (Baxter and Stone, 1985). After breeding, adult frogs can be found feeding in upland habitats of grasslands, meadows, and pastures adjacent to breeding areas. Adult frogs are highly mobile, moving at night or when vegetation is wet. They have been found up to two miles from water (Smith and Keinath, 2007).
Birds		
American peregrine-falcon (*Falco peregrinus anatum*)	No documented occurrences in Project Area. Known active nests sites exist on the Forest and in Jefferson County's Cathedral Spires Parks	The species is a rare spring and fall migrant in western valleys, foothills, lower mountains, mountain parks, and on the eastern plains. It is a rare summer resident in foothills and lower mountains. Breeding pairs nest on cliff ledges, typically in the foothills and mountain cliffs. Forages in adjacent coniferous and riparian forests. Migrants and winter residents occur mostly around reservoirs, rivers, and marshes but may also be seen in grasslands and agricultural areas (Andrews and Righter, 1992).
Bald eagle (*Haliaeetus leucocephalus*)	Has been spotted at all times of year. Recently active nest sites within 10 miles of Project Area	Range includes most of Canada and Alaska, all the contiguous US, and northern Mexico. Bald eagles are rarely seen far from aquatic environments. Breeding pairs are rare in Colorado. Although some nesting does occur, most eagles migrate in summer to northern breeding grounds but return to lower latitudes during the winter. Winter habitat for the bald eagle consists of roost trees along rivers and large bodies of ice-free water that allow access to fish.
Flamulated owl (*Otus flammeolus*)	No documented occurrences but have responded to owl surveys south FS Road 550, near the project area	Dependent on ponderosa pine, Douglas-fir and aspen in later successional stages (Reynolds and Linkhart, 1992). They are obligate cavity nesters and depend on flickers and other woodpeckers for nesting cavities. The species is almost entirely insectivorous (Ehrlich et al., 1988). It breeds in mountain ranges from Central America, north through the western US and into southern British Columbia. It winters from Mexico into Central America.
Lewis's woodpecker (*Melanerpes lewis*)	No documented occurrences but suitable habitat may exist. Known to occur on the district	A year-round resident of the foothills of S. Colorado. Occurs in lowland and foothill riparian areas, agricultural areas, and urban areas with tall deciduous trees, typically at elevations between 3,500 and 7,000 feet. Typically excavate nest cavities in soft ponderosa pine or cottonwood snags. Feed almost exclusively on emergent insects and specialize in flycatching in open habitats. (Andrews and Righter, 1992).
Loggerhead shrike (*Lanius ludovicianus*)	No Documented occurrences in Project Area but limited suitable habitat exists.	Require shrubby habitats in open country, and primarily inhabit open riparian areas, agricultural lands, grasslands, shrublands, and sometimes piñon-juniper woodlands. They are summer residents in Colorado and are found on the eastern plains, the San Luis Valley, and desert lowlands of the western slope (Colorado Partners in Flight, 2000). Nearly all breeding occurs below 8,900 feet in elevation (Andrews and Righter, 1992).
Northern goshawk (*Accipiter gentilis*)	Regular sitings are reported and there is documented nest activity in the district near the Project Area. Potential habitat occurs in the Project Area.	Inhabit mixed hardwood and coniferous forests in temperate and boreal regions from 7,500 to 11,000 feet in elevation; occasionally found below 7,000 feet in winter and during migration. Typical nest areas are mature or late successional coniferous forests, with high canopy closure and clear forest floors on north-facing moderate slopes (Hayward and Escano, 1989; Squires and Ruggiero, 1996). Territories are also frequently associated with small openings (Fitzgerald et al., 1994). Prey varies but may include red squirrels, least chipmunk, rabbits, robins, juncos, and northern flying squirrels (Erickson, 1987). Snags, downed logs, and woody debris are important components of the post-fledging family and foraging habitat.

Table 14. Forest Service Region 2 Sensitive Species and MIS Species [1]

Species	Documented Occurrences in Project Area?	Habitat
Olive-sided flycatcher (*Contopus cooperi*)	No Documented occurrences in Project Area but suitable nesting and foraging habitat is present.	A breeding resident of Colorado associated with mature spruce-fir forests between 7,000 and 11,000 feet, particularly near forest openings and edges (Wrigley et al., 2012). Nesting sites are generally located on branches of coniferous trees. Diet consists of flying insects. Prefers areas with an abundance of snags, and often forages from extended branches that allow for better visibility and unimpeded aerial sallying (Colorado Partners in Flight, 2000).
Mammals		
American marten (*Martes Americana*)	No Documented occurrences in Project Area but limited suitable habitat exists.	Habitats include tundra rockpiles and talus slopes, as well as montane woodland between 8,000 to 13,000 feet. Marten are semi-arboreal and can use trees for denning and foraging. Optimum habitat appear to be mature and old growth spruce-fir communities with greater than 30 percent canopy cover, well established understory of fallen logs and stumps, and lush shrub and forb vegetation to support prey (Burnett, 1981). Large logs and other structures provide protection from predators, access to the subnivean (i.e., beneath the snow) space where most winter prey are captured, and protective thermal conditions (Buskirk and Powell, 1994).
Fringed myotis (*Myotis thysanodes*)	No documented occurrences but suitable habitat for foraging and roosting exists.	Not common in Colorado but is found in ponderosa pine woodlands, greasewood, oakbrush, and saltbush shrublands. Caves, mines, and buildings are used as both day and night roosts. This bat reportedly winters in pinyon-juniper and ponderosa pine habitats (USDA Forest Service, 1984). Snags are also important for roost sites; density of 8 large snags per acre appears to be suitable habitat (Keinath, 2004).
Hoary bat (*Lasiurus cinereus*)	No documented occurrences but known to occur on the Pike National Forest, and is very likely within the Project Area.	Occurs throughout Colorado from the eastern plains to elevations of 10,000 feet. They are believed to be highly migratory, although migration routes have not been well documented (Ellison et al., 2003). Use trees as roost sites, typically 13-16 feet above the ground and often surrounded with foliage cover while still allowing a clear flight path from below. Frequently found in Douglas-fir and ponderosa forests, especially those near clearings or edges (Fitzgerald et al., 1994). Feed on moths, but are also known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps.
Rocky mountain bighorn sheep (*Ovis canadensis canadensis*)	No documented occurrences. The Project Area does not contain mapped bighorn sheep habitat. But a nearby herd in Water-ton Canyon could move into the area if suitable vegetation were present.	Prefer open habitats, such as alpine meadows, open grasslands, shrub steppe, talus slopes, rock outcrops, and cliffs. Diet includes grasses, forbs, and browse (Luce et al., 1999). Summer habitat is typically between 9,000 to 10,000 feet, while winter range is located in south-facing slopes around 7,000 feet (USDA Forest Service, 2008). May use areas of deciduous and conifer forests, especially where openings may have been created by clear-cuts or fire (Beecham and Collins, 2007). Slope steepness appears to be a significant feature of habitat, preferring slopes of 36 to 80 percent in Montana and Colorado, while avoiding slopes less than 20 percent (Beecham and Collins, 2007). Open forests are used in some areas for foraging and thermal cover (Beecham and Collins, 2007).
Townsend's big eared bat (*Corynorhinus townsendii*)	No documented occurrences but foraging habitat is present. It is likely that there are maternity roosts, and/or day roosts in the Project Area.	Occupies semi-desert shrublands, pinyon-juniper woodlands, and open montane forests. Frequently associated with caves and abandoned mines for day roosts, hibernacula, or nursery colonies where females roost with young during the breeding season. They will also use tree cavities and crevices on rock cliffs for refuge. The bats are relatively sedentary. They do not move long distances from hibernacula to summer roosts nor do they move or forage far from their day roosts (Fitzgerald et al., 1994).

Bald Eagle

Natural Diversity Information Source (NDIS) data indicate that bald eagle is known to occur in Park and Jefferson counties; no information is available on abundance for Park County and casual/accidental abundance is listed for Jefferson County (NDIS, 2014). No roost or nest trees have been documented in the Project Area, but bald eagles are seen on occasion in the Project Area at all times of the year. A recently active nest is located on private land near Trout Creek, approximately 10 miles southeast of the Project Area.

Survival rates of the bald eagle have recovered range-wide (USFWS, 2007). As a result of this recovery, the bald eagle was removed from the list of endangered and threatened wildlife, effective August 8, 2007. Continued threats to the species include contamination in the environment, habitat loss, and human built structures such as powerlines.

Flammulated Owl

NDIS records show that this species is known to occur but is uncommon in both Park and Jefferson Counties (NDIS, 2014). Flammulated owls are expected to occur in the Project Area where suitable habitat exists, because they have responded to owl surveys south Forest Service Road 550, near the project area. Across their range, flammulated owl habitats have declined as a result of fire suppression and the resulting closure of understories (Foster Wheeler Environmental Corporation, 1999).

Lewis's Woodpecker

NDIS data indicates the species is known to occur within Park and Jefferson counties, although abundance is listed as uncommon in Jefferson County and unknown for Park County (NDIS, 2014). The Project Area may contain suitable habitat for the Lewis's woodpecker along the North Fork South Platte River, and within mature ponderosa pine forests with large snags. Lewis's woodpeckers are known on the district (e.g., Hayman Fire area surveys, 2014). Risks to Lewis's woodpeckers include activities that reduce open or old growth ponderosa pine forests and snags, such as fire suppression and clearcutting (Anderson, 2003).

Loggerhead Shrike

There are no confirmed breeding records in the Pike National Forest (Wrigley et al., 2000). Within the Project Area, limited suitable habitat is present. No agricultural or grasslands are present, and shrublands only account for 1 percent of the existing vegetation types.

Northern Goshawk

Potential habitat does occur within the Project Area, particularly in both ponderosa pine and mixed conifer habitats of later successional stages with closed canopy. In addition, regular sightings are reported and there is documented nest activity in the district near the Project Area.

Goshawks reuse the same territory year after year and sometimes reuse the same nest. Pairs typically have one or more alternate nests within the territory (Kingery, 1998). Since they reuse established areas, they have been affected by historic and current logging operations. Birds are known to be sensitive to disturbance

during the nesting season (Richarson and Miller, 1997). The goshawk populations appear to be currently declining (Foster Wheeler Environmental Corporation, 1999).

Olive-Sided Flycatcher

The species has been documented on the Pike National Forest (Wrigley et al., 2012), and suitable nesting and foraging habitat is present within the Project Area. Fire and forest management practices that create even-aged and homogeneous stand conditions are likely to negatively affect olive-sided flycatchers.

American Marten

Limited suitable habitat does occur within the Project Area, particularly in areas with mature mixed conifer forest that has not been burned or logged in the past two decades and where the structure of down dead material is present. The main threats to American martens are habitat fragmentation and timber harvest.

Fringed Myotis

The status and occurrence of the fringed-tailed myotis are not well known in Colorado. NDIS data indicate that this species is known to occur but rare in Jefferson County and not known to occur in Park County (NDIS, 2014). Potential foraging and roosting habitat for the fringed myotis occurs in the Project Area. The species has been documented in the Pike National Forest, and may occur in the Project Area.

Hoary Bat

The species is known to occur on the Pike National Forest, and is very likely within the Project Area. It is listed as common in both Park and Jefferson Counties (NDIS, 2014). According to the Colorado Bat Conservation Plan, loss of roosting habitat due to timber harvest is likely the biggest threat to the species (Ellison et al., 2003). Loss of tree roosts due to widespread stand-replacing fire is also a threat.

Rocky Mountain bighorn sheep

Colorado Division of Wildlife (CDOW) has mapped habitat areas used by bighorn sheep in the state. According to NDIS data, bighorn sheep are in fairly common in Park County and uncommon in Jefferson County (NDIS, 2014). The Project Area does not contain mapped bighorn sheep habitat. A recent telemetry study has indicated that an important historic population is located in Waterton canyon below the confluence of South Platte and North Fork near the Project Area boundary. This herd has been observed at elevations up to 8,000 feet. Should suitable vegetation be present in the Project Area, this population could move into the area.

Available sheep habitat in the area is decreasing because of vegetation in advanced succession; increases in Gambel oak habitat and the succession of pinyon-juniper forests, which have decreased the available forage and visibility and are thought to be a major factor limiting the distribution of sheep (Colorado Division of Wildlife, 2005).

Townsend's big eared bat

According to NDIS data, this species is uncommon in Park and Jefferson Counties (NDIS, 2014). There is a known hibernaculum in the North Fork canyon on private lands. Foraging habitat is present throughout the

Project Area and it is likely that there are unknown hibernacula, maternity roosts, and/or day roosts in the Project Area. Harvey et al. (1999) show that the majority of Colorado is within the expected distribution of this species, although no large colonies have been found in Colorado.

Population trends are unknown for this species, but it is suspected that they are decreasing due to the susceptibility of the species to human disturbance. There are several documented cases where this species has disappeared as a result of spelunking and other human disturbance in caves and mines (Armstrong et al., 1994).

3.4.2 Management Indicator Species Affected Environment

The National Forest Management Act of 1976 directs the USDA Forest Service to manage habitats to maintain viable populations of existing native and desired non-native vertebrate species. In accordance with 36 CFR 219.19, fish, wildlife, and plant MIS are selected as a basis for evaluating the potential effects of federal actions on the forest biota.

MIS are selected at the Forest-scale because their population changes are believed to indicate the effects of management activities. An evaluation of the Pike and San Isabel National Forest MIS and their habitats was conducted to identify MIS for this project-level analysis. Identified MIS include Abert's squirrel, American elk and brook trout. This section briefly summarizes habitat requirements and likely occurrence of these species in the Project Area.

Abert's squirrel

The Abert's squirrel has been identified as an MIS as an ecological indicator for late succession ponderosa pine. This species is dependent on ponderosa pine-dominated stands with open understory for both nesting sites and foraging (Keith, 1965; Keith, 2003).

Long-term trends in Abert's squirrel populations have not been widely measured or monitored, but they can be deduced based on known changes to ponderosa pine habitat. Squirrel populations in Colorado were likely more abundant 150 years ago prior to logging, grazing, and fire suppression. Squirrel populations probably decreased sharply after European settlement, remained low as forests re-established themselves, and gradually increased to their present levels as older trees became established.

Elevated mountain pine beetle (*Dendroctonus ponderosae*) populations in Colorado in recent years have caused ponderosa pine mortality. However, direct effects to Abert's squirrel populations on the Pike and San Isabel National Forest or in Colorado have not been quantified. Within the Pike National Forest, mountain pine beetle has not reached epidemic levels. Other range-wide threats to Abert's habitat include forestry treatments that reduce area of mature ponderosa pine and uncharacteristically large and severe wildfires in ponderosa pine.

Abert's population in the planning area is not known, there is one monitoring plot with low quality habitat. Monitoring data for this plot indicates activity at or below Forest averages.

American elk

Elk was selected as an MIS because of the public's interest in hunting and viewing them. Elk also have specific habitat management guidelines in the 1984 Forest Plan (USDA Forest Service, 1984).

Elk tend to inhabit coniferous forests associated with rugged, broken terrain or foothill ranges. During summer elk spend most of their time in high mountain meadows in the alpine or subalpine zones or in stream bottoms (Adams, 1982). Studies of elk slope preferences indicate that elk use a variety of slopes, although they choose slopes in the 15- to 30-percent class most frequently (Skovlin, 1982). Elk may use more open areas during spring and summer because of earlier spring green-up (Edge et al., 1987). During hot summer months, elk seek shaded, cool habitats (Leege, 1984). Use of forage areas depends on proximity to cover. Use is typically concentrated to within 200 to 600 feet of cover edge. Either cover or forage may be limiting to elk, particularly on winter ranges or calving habitats (Roderick and Milner, 1991).

Global and Colorado elk populations are known to be increasing (COVERS 2001). They are intensively managed, and there are good data on population size and trends (Fitzgerald et al., 1994). Elk are expanding their range due to reintroductions, management, and habitat conversion (COVERS 2001). Elk populations have generally increased in Colorado since 1975. Elk populations are high due to limited hunting pressure and available habitat.

In the planning area, overall range for elk covers the entire planning area. Summer range encompasses the majority of the planning area at approximately 11,200 acres, winter range includes 6,100 acres and severe winter range includes 150 acres.

Brook trout

Brook trout were selected as an MIS because the public has a high concern for this species and its habitat and also has a high interest in fishing. Brook trout were retained as MIS due to a potential role as an indicator species for aquatic habitat and because they pose a recovery threat to greenback cutthroat trout (USDA Forest Service, 2005c).

Brook trout are a non-native species introduced in Colorado streams sometime after European settlement. They spread quickly throughout Colorado mountain streams competing directly with the native cutthroat trout species. Brook trout have displaced native trout from most of Colorado's high mountain streams, which is one reason that greenback cutthroat trout is a federally threatened species. Optimal stream habitat for brook trout is characterized by clear, cold water, silt-free rocky substrate in riffle-run areas, well-vegetated stream banks, abundant in-stream cover, deep pools, relatively stable flow regime and stream banks, and productive aquatic insect populations (Raleigh, 1982).

The CPW, USFWS, and many other land management agencies have reclaimed many streams and lakes to remove brook trout as part of an intensive effort to restore native trout species in Colorado (US Fish and Wildlife Service, 1998b). Brook trout do provide recreational fishing opportunities but are a minor component of the overall fishery in Colorado. Brook trout populations on the Forest tend to be located below the greenback cutthroat trout recovery areas. Because the greenback populations need to be protected from

the superior competitor non-native trout species, their populations are kept at higher elevations above natural and human-made stream barriers (USDA Forest Service, 2005b).

Impacts from logging, fires, river impoundment, road and railroad construction, land clearance for agriculture and human habitation, encroachment of introduced rainbow trout (*Oncorhynchus mykiss*) and brown trout and infection with whirling disease are the primary threats to brook trout (Larson and Moore, 1985; USDA Forest Service, 2005c). Introduction of hatchery-reared brook trout from the northeastern US has also affected native populations.

Waterways in the project area may provide suitable habitat, including the North Fork of the South Platte River. Water quality and habitat suitability in some area streams (i.e. Buffalo Creek and Spring Creek) has been compromised due to channel changes and sedimentation from the 1996 Buffalo Creek Fire. Riparian area restoration projects have been proposed and are underway to reestablish viable fisheries and reduce downstream sediment.

3.4.3 Federal Listed Species Affected Environment

Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened, endangered, or proposed species, or cause the destruction or adverse modification of their critical habitats. Federal agencies also have responsibilities to protect migratory birds as described in Executive Order (EO) 13186 of 2001. In addition, the USFS has established direction in Forest Service Manual (FSM) 2670 to guide habitat management for threatened, endangered, proposed, and sensitive (TEPS) species.

Areas designated as critical habitat for T & E species are areas that may require special management considerations and are essential for the conservation of the species. The project area does not contain any current designed critical habitat. Revisions to critical habitat would be monitored and management adjusted as appropriate should new designation occur.

A Biological Assessment for the Crossons-Longview Forest Restoration Project (JW Associates, 2015a) has been prepared to evaluate the potential effects of the proposal on listed or proposed species . That report is intended to evaluate whether implementation of the selected action may affect any plant, wildlife or fish species listed under the ESA, their proposed or designated critical habitats, or any species proposed for listing. This section summarizes the existing conditions for any threatened or endangered species that may occur in the Project Area based on the existence of potentially suitable habitat. Those species include the Mexican spotted owl (MSO), Pawnee montane skipper (skipper), Preble's jumping mouse (PMJM) and Ute ladies' tresses orchid. The Ute ladies' tresses orchid is addressed in Sections 3.1.3 Special Status Plants Affected Environment and 3.1.4 Special Status Plants Environmental Consequences.

Mexican Spotted Owl

The Mexican spotted owl occurs in forested mountains and rocky canyonlands in the southwest United States and south into several states of Mexico (Gutierrez et al. 1995; Ward et al. 1995). The species' core range occurs in central Arizona and New Mexico. In Colorado, it occurs in lower-elevation forests, usually in deeply

incised, rocky canyons in southern Colorado and along the Front Range. When the species was listed as threatened in 1993, there were twenty historic records for Colorado, with occurrences ranging from the San Juan Mountains in southwestern Colorado and from the Front Range as far north as the vicinity of Denver (USFWS 1993). The planning area contains no critical habitat as designated by the USFWS. Critical habitat is found adjacent to eastern boundary of the planning area as well as to the south in Jefferson County.

The proposed Project Area is generally lacking cool, moist canyons with large diameter trees that meet the species Primary Constituent Elements (PCEs). On the Pike and San Isabel National Forests, protected activity centers (PACs) were established at current and historic sites where owls were known or suspected to nest or roost. The closest PACs are located more than 10 miles south of the Project Area. Between 1993 and 2005 the USFS conducted extensive surveys for owls across the district. No MSO were ever detected within the Project Area. Furthermore, no reproduction was ever documented in the nearby PACs, so given the survey results on the district the likelihood of owls occurring in the Project Area is considered low. Habitat in the planning area may be utilized for foraging and can be considered dispersal habitat. Habitat modeling indicates that the Project Area contains an estimated 3,960 total acres of potentially suitable recovery owl habitat.

In addition to stand-replacing wildland fire, the MSO is threatened by the following:

- Noise and habitat disturbance from commercial, recreational, scientific, or educational activities
- Incompatible silviculture treatments
- Over-grazing
- Climate change
- Land and road development

Pawnee Montane Skipper

The skipper is listed as threatened (US Fish and Wildlife Service, 1987) and a recovery plan exists (US Fish and Wildlife Service, 1998c), but no critical habitat has been designated. Skippers occur only on the Pikes Peak Granite Formation in the South Platte drainage system in Colorado, involving portions of Jefferson, Douglas, Park, and Teller counties. The species typically occurs at an elevation range of 6,000 to 7,500 feet, though there are records as high as 8,000 feet (Wrigley et al., 2012).

Based on field studies (Environmental Research and Technology, 1988) the general characteristics of skipper habitat include tree canopy cover of 30 percent; ponderosa pine crown cover of 25 percent, Douglas-fir crown cover of 5 percent; tree density of less than 120 trees per acre in the smallest size class; overall tree density of less than 200 trees per acre; shrub and grass cover generally less than 10 percent; prairie gayfeather (*liatris punctata*) flower stem density ranging from 50 to 500 per acre; and blue grama (*bouteloua gracilis*) cover 5 percent or less, but present nearly everywhere. Skippers are dependent upon prairie gayfeather and blue grama for nectar and reproduction, respectively. Adult females deposit their eggs singly on leaves of blue grama in late summer. After hatching, larvae feed on blue grama until they pupate. From late July to October adult skippers emerge and forage for nectar on prairie gayfeather flowers, as well as a variety of other plants including hairy golden-aster (Wrigley et al., 2012).

Between 1996 and 2002, four separate fires burned approximately 48 percent (12,026 acres) of the habitat in the Project Area. There is evidence that high-severity burns may decrease habitat suitability. On-going monitoring of skippers in the 2002 Hayman Fire area has documented that areas of moderate-to-high burn severity still represent marginal habitat for the skipper even in 2012, 11 years after the Hayman fire. Burn areas also appear to be dependent upon a source population of butterflies from unburned habitats (Sovell, 2013).

Based on the current map of suitable habitat, approximately 540 acres of potentially suitable habitat is present in the planning area. Habitat mapping is general, and non-mapped area may be suitable while some portions of mapped habitat may be considered suboptimal because forest canopy cover has become too dense or ground cover is sparse.

Threats to the species in addition to high severity wildland fire include the following:

- Invasive weeds which may outcompete host plants
- Climate change and drought
- Habitat loss from natural and human causes (i.e. conifer encroachment)
- Inadequacy of existing regulatory mechanisms
- Recreational use of habitat
- Land and road development

Preble's Meadow Jumping Mouse

Preble's meadow jumping mouse (PMJM) was listed as threatened in 1998, primarily due to human development of its limited habitat along the Front Range of the Rocky Mountains (USFWS, 1998a). Sections of the South Platte River and Arkansas River drainages in Colorado are within designated critical habitat (USFWS 2003a; USFWS 2010). No critical habitat is found within the Project Area.

In general, typical habitat for PMJM is comprised of well-developed riparian vegetation with adjacent, upland habitat found at elevations between 4,650 feet and 7,600 feet, although elevations may vary across the range of the subspecies (USFWS 2003b). Suitable riparian vegetation includes a dense combination of grass, forb, and low shrub cover, and taller shrubs and trees may be present. Adjacent uplands used by PMJM are variable and can include open grasslands to ponderosa pine woodlands. The montane woodlands where PMJM has been found are dominated by ponderosa pine, Douglas-fir, spruce, and occasionally aspen, with understories of shrubs and forbs. The active period for PMJM is estimated to be May 1 through October 31; they hibernate in underground burrows during the remaining time (USFWS 2003b).

All riparian habitat in the Project Area and adjacent upland habitat (within 300 feet of 100 year flood plain) below 7,600 feet elevation is considered potentially suitable occupied habitat. The Project Area contains approximately 3,700 acres of potential habitat based on these criteria. It is likely that mapped potential habitat is more comprehensive than actual suitable or occupied habitat. Field verification surveys prior to implementation of project activities could confirm the suitability of habitat.

Threats to the species include the following:

- Invasive weeds
- Recreation
- Climate change and drought
- Inadequacy of existing regulatory mechanisms
- Modification of riparian areas vegetation or systems (i.e. through stream stabilization)
- Hydrology impairments
- Loss and fragmentation of riparian habitat from urbanization

3.4.4 Wildlife Environmental Consequences

Alternative A (No Action)

Alternative A (No Action) would have no direct effects, as no new actions would occur. Long-term, indirect effects would vary depending on habitat type. In general, Alternative A (No Action) would maintain existing habitat and protect biodiversity in the short-term. Long-term, the proportion of ponderosa pine cover type in the Project Area would be expected to rise, as this species continues to encroach into existing open areas and hardwood stands. Early successional habitats would continue to decline as pine stands progress toward later seral stages with higher average stand density and lower average tree size, which would reduce habitat diversity and not move the forest towards historic conditions. Natural disturbances, such as wildfire, would continue to return portions of the forest in which they occur to early successional stages.

There would be no direct effects of Alternative A (No Action) because no new actions are proposed. Indirect and cumulative effects would occur as a response to current conditions in the absence of active management, other than fire-suppression efforts. These effects are discussed below for each species. Effects for important ecosystems in the Project Area, as well as the species that may be affected, are summarized in Table 15.

A continuation of fire suppression policies would result in increased late successional pine forest. Dense late-successional stands are more at risk of high-intensity wildfire. Should a stand-replacing fire occur, erosion from burned hillsides could increase sediment loading in Project Area creeks and other habitats that the northern leopard frog occupies, leading to a decrease in habitat as well as a risk of direct mortality.

Table 15. Alternative A - Direct and Indirect Effects to Habitat

Habitats Proposed for Treatment	Direct Effects of Alternative A	Indirect Effects of Alternative A	Species Potentially Impacted
Shrubland	None	Gambel's oak and mountain mahogany would continue to increase in density and height. This habitat would have a continued risk of wildfire.	Rocky Mountain bighorn sheep American elk Loggerhead shrike Lewis's woodpecker Fringed myotis Townsend's big-eared bat Hoary bat
Aspen	None	Pine encroachment would continue to reduce areas dominated by aspen. Health, vigor of aspen would continue to decline.	Flammulated owl
Mesic and Xeric Ponderosa Pine forest	None	Additional dense, late-successional stands with closed canopy and reduced shrub and herbaceous understory cover would develop. Amount of snags likely to increase however, average size class of snags would decrease. A greater threat of widespread insect and disease outbreak would exist and stands would have an increased risk of wildfire returning areas to earlier successional stages.	Flammulated owl Lewis's woodpecker Olive-sided flycatcher Peregrine falcon Bald eagle Northern goshawk American marten Fringed myotis, Townsend's big-eared bat, Hoary bat Abert's squirrel American elk
Lodgepole Pine	None	Additional dense, late-successional stands with high levels of understory trees would develop. Shrub and herbaceous understory cover would decrease. The amount of snags is likely to increase however, average size class of snags would decrease. A greater threat of widespread insect and disease outbreak would exist and stands would have an increased risk of wildfire returning areas to earlier successional stages.	Northern goshawk Peregrine falcon Bald eagle Fringed myotis Townsend's big-eared bat Hoary bat American elk
Mixed Conifer	None	Additional dense, late-successional stands with high levels of understory trees would develop. Shrub and herbaceous understory cover would decrease. The amount of snags is likely to increase however, average size class of snags would decrease. A greater threat of widespread insect and disease outbreak would exist and stands would have an increased risk of wildfire returning areas to earlier successional stages.	Northern goshawk Olive-sided flycatcher Peregrine Falcon American marten American elk
Riparian/ Aquatic	None	Water quality flows would continue to be influenced by ongoing federal/non-federal activities. Higher risk of wildfire may threaten riparian vegetation and upslope soil stability, which would negatively affect water quality.	Northern leopard frog Brook trout

Forest Service Region 2 Sensitive Species

Northern Leopard Frog

A continuation of fire suppression policies would result in increased late successional pine forest. Dense late-successional stands are more at risk of high-intensity wildfire. Should a stand-replacing fire occur, erosion from burned hillsides could increase sediment loading in Project Area creeks and other habitats that the northern leopard frog occupies, would lead to a decrease in habitat as well as a risk of direct mortality.

American Peregrine Falcon

Peregrine falcons use coniferous forest and riparian foraging habitat adjacent to cliffs. Due to the variety of habitat utilized for foraging, Alternative A is not likely to have a significant impact on foraging habitat. Assuming a continuation of fire-suppression policies, late-successional pine forest would be expected to increase. Dense late-successional stands would lead to an increased risk of wildfire. Should a high-intensity wildfire occur, nesting and foraging habitat could be reduced.

Bald Eagle

As forest succession continues, increase in mature forests would be anticipated. Wildfire and insect outbreaks would continue to return some areas of the forest to early successional stages. In the absence of stand-replacing fire, habitat for the bald eagle would be expected to increase.

Flammulated Owl

The flammulated owl is dependent on ponderosa pine and aspen in later successional stages. Under this alternative, the continuation of fire-suppression policies would be expected to maintain forest succession, leading to an increase in later successional stage area. Snags are expected to increase with increased forest density. There would be an increased risk from high-intensity wildfire, which could return areas of the forest in which they occur to early successional stages. In the absence of stand-replacing fire, habitat for the flammulated owl would be expected to increase.

Lewis's Woodpecker

Continuation of fire suppression policies would continue forest succession, ultimately reducing the open ponderosa pine forests that are preferred by the Lewis's woodpecker. Additionally, dense late-successional stands resulting from fire suppression would lead to an increased risk of high-severity wildfire. Lewis's woodpecker could be temporarily displaced by a high-severity wildfire, but are adapted to post burn areas.

Loggerhead Shrike

Current loggerhead shrike habitat in the Project Area is limited. With continued forest succession in the absence of active management, available shrub lands and open area in the Project Area would be likely to decline long-term and further reduce available shrike habitat.

Northern Goshawk

The northern goshawk requires mature forest with canopy cover greater than 40 percent and areas at least 50 acres in size for nesting habitat. Under this alternative, continued forest succession would lead to an increase in forest density. Over time, some stands would become too dense for nesting, while others would mature to provide optimal nesting conditions (Greenwald et al., 2005). Foraging habitat is more varied and may include openings, forest edges, and open canopy stands. Some open foraging habitat could decrease as forest openings are reduced due to pine encroachment. The risk of high-intensity fire would increase with this alternative. Stand-replacing fire has the potential to destroy nest trees and other habitat area. Overall, in the absence of stand-replacing fire, nesting habitat would be likely to increase, while diversity of foraging habitat would likely decrease under this alternative.

Olive-Sided Flycatcher

Olive-sided flycatcher are frequently found following disturbances such as tree fall gaps, fire, and logging. Therefore, a continuation of fire suppression policies would likely limit preferable habitat conditions for the olive-sided flycatcher in the long-term. As forest understory growth continues and a dense canopy develops, foraging areas would also decline.

American Marten

The American marten depends on dense mature and old growth stands with woody debris and greater than 50 percent cover. Under the absence of active management, forest succession would likely continue, resulting in increased canopy cover and density of the forest. This change would likely benefit marten by increasing denning and foraging habitat. Prey associated with closed forest conditions would also be likely to increase. The risk of high-intensity fire and pine beetle outbreaks would increase with this alternative. If a stand-replacing fire were to occur, some optimal habitat could be destroyed. In the absence of stand-replacing events, habitat for marten would be likely to increase under this alternative.

Fringed Myotis, Townsend's big eared bat, and Hoary Bat

These bat species rely on the availability of trees, snags, rocks, caves, or mines for roosting and on a variety of forest habitats for foraging. The continuation of forest succession and fire suppression would limit foraging opportunities by creating dense forests and increasing conifer encroachment in riparian areas. Roosting habitat in snags may increase with forest succession and the absence of active management, but availability of large snags would likely decrease over time. There are also increased risks from wildfire outbreaks under this alternative. Wildfire at lower intensity levels could lead to an increase in snags, but current conditions favor high-intensity, stand-replacing events that would not benefit these species. In the absence of high-intensity fire, diversity of foraging habitat would be likely to decrease, and roosting habitat would likely increase.

Rocky Mountain bighorn sheep

Bighorn sheep depend on open areas of high visibility and access to escape cover for foraging. Long-term impacts under Alternative A would include a reduction in foraging habitat as forest succession continues.

Management Indicator Species

Abert's Squirrel

Primary habitat includes mature ponderosa pine stands in Habitat Structural Stages 4B, and 4C/5, which would most likely contain trees needed for nesting, seed and cone production, and cover if sufficient basal area and uneven age classes exist. More limited activity may occur within the 4A habitat structural stage because 4A stands comprise less basal area, less distribution of uneven age classes, and less cone production compared to structural stages 4B and 4C. Sapling stands (3A-3C) would provide additional secondary habitat such as movement corridors and cover, food from ground litter, and fungi (USDA Forest Service, 2005a). The Project Area currently provides approximately 5,073 acres of primary habitat (structural stages 4B and 5) and an additional 8,272 acres of secondary habitat (Structural stages 3A-C and 4A). Not all of this area is likely to provide suitable habitat for the squirrel based on the ground conditions. Table 16 presents this habitat by Structural Stage.

Table 16. Abert's Squirrel Habitats in Project Area

Habitat	Habitat Quality Definition	Amount of Habitat in Project Area (acres)
Primary	Habitat Structural Stages 4B, 4C and 5	5,073
Secondary	Habitat Structural Stages 3A-C and 4A	8,272
	Total	13,345

American elk

The continuation of current fire suppression policies would increasingly limit elk foraging habitat, as the growth of seral vegetation, aspen, oak, and other desirable shrubs would not be promoted. Meadow habitat would also be reduced due to conifer encroachment. Cover habitat would be maintained or increase as forest succession continues, but cover habitat is not likely to be a limiting factor in the Project Area. Long-term, this alternative is likely to produce a decrease in habitat suitability.

Optimal foraging habitat for elk is generally represented by Structural Stages 1-3a in most cover types and by 1-5 in aspen. Elk Cover Habitat is generally represented by Structural Stages 3b-5 . The continuation of current fire suppression policies under Alternative A would limit elk foraging habitat, as the growth of seral vegetation, aspen, oak, and other desirable shrubs would not be promoted and forest succession would move habitat into later successional stages. Current Successional Stage are shown in Table 17.

Table 17. Approximate Elk Habitat in Project Area[8]

Habitat Type	High Quality Foraging Habitat (acres)	High Quality Cover Habitat (acres)
Summer Range	2,292	7,760
Winter Range	1,912	5,376
Severe Winter Range	72	65

Brook trout

A continuation of fire suppression policies would result in increased late successional pine forest. Dense late-successional stands are more at risk of high-intensity wildfire. Should a stand-replacing fire occur, erosion from burned hillsides could increase sediment loading in Project Area streams. Loss of riparian vegetation would also result in an increase in water temperature until shade is restored. These changes would lead to a decrease in brook trout habitat as well as a risk of direct mortality.

Threatened and Endangered Species

Mexican Spotted Owl

Under Alternative A, vegetation on the forest would follow natural succession, disturbance, and recovery processes. Long term, the tree cover and density would continue to increase and late successional pine forest would likely increase; some additional portions of the planning area may therefore become suitable for MSO. However, the risk of high severity wild-fire, with the potential to burn MSO recovery habitat would increase. The 2012 Recovery Plan identifies stand-replacing wildfire as the primary threat to MSO persistence. Dense late-successional stands would lead to an increased risk of insect infestation and wildfire.

Pawnee Montane Skipper

Under Alternative A, vegetation on the forest would follow natural succession, disturbance and recovery processes. A small potential for disturbance of Skipper from ongoing forest uses would remain. Long-term, the tree cover and density would continue to increase. Areas that currently represent xeric ponderosa pine with suitable patchy openings supporting prairie gayfeather and blue grama may become unsuitable for Skipper habitat as forest succession continues. In addition, the risk of high severity wild-fire, with the potential to burn upland and adjacent riparian habitat would remain and increase with forest succession. As indicated with studies in the Hayman burn area, high-severity fire may alter habitat conditions such that recovery of the species into the habitat is delayed 10 years or more.

Preble's Meadow Jumping Mouse

Under Alternative A, vegetation on the forest would follow natural succession, disturbance, and recovery processes. A small potential for disturbance of PMJM from ongoing recreational activities in riparian areas or

[8] Based on general Habitat Capability Model cover types-high quality forage represented by (1,2, 3A, 4A all forested cover types, 1 shrub lands and all Aspen). High Quality cover type represented by 3b-5 forested cover types) Estimates likely over-represent available habitat. Not all areas may represent optimal habitat and optimal habitat may differ depending on season of use.

other current forest uses would remain. Long-term, the tree cover and density would continue to increase in upland habitat, resulting in decreased grass and forb cover and reduction of suitable habitat for the species. In addition, the risk of high severity wild-fire with the potential to burn upland and adjacent riparian habitat would remain. Should high-severity wildfire occur, impacted areas could become unsuitable for PMJM for many years due to changes to structure and composition of vegetation components and changes to soil including increased risk of erosion. Telemetry data indicated that PMJMs did not enter burned habitats for at least 3 years after the Hayman Fire (Hansen, 2006). If left untreated, nonnative, invasive plants may alter the post-fire dynamics of riparian areas 50 to 100 years after a wildfire (Graham, 2003).

Alternative A - Cumulative Effects

The existing habitat conditions are the result of the past and present human and natural activities on National Forest System and private lands in the Project Area. These activities, including but not limited to recreation, wildland fires, logging, and fire suppression, have altered the natural disturbance regimes of the forest. Without additional active forest management over the next 20 years, ponderosa pine density in the Project Area would likely increase and structural diversity decrease. Such conditions would reduce habitat diversity overall. The No Action Alternative would also lead to the greatest risk of wildfire spread, which could return areas of the forest in which they occur to early successional stages. Should stand-replacing wildfire occur, increased erosion, runoff, and sediment yield could negatively impact riparian and aquatic areas.

Alternative A - Population Viability

Given the absence of direct, ground-disturbing activities, Alternative A would not affect species population trends or overall viability. In the event of a stand-replacing wildfire in the Project Area, Sensitive, MIS and Threatened and Endangered species and their habitats may be adversely affected; however, the local effects would generally not impair overall population trends and/or viability of the species. Alternative A would have no effect on or contribution to meeting Forest Plan objectives for each species described.

Alternative B (Proposed Action)

Alternative B (Proposed Action) would result in short-term impacts to wildlife habitat availability during treatments; however, over the long-term, there would be improved quantity, diversity, and quality of habitat and a decreased risk of habitat loss due to stand-replacing wildfire. As a result of treatment, conifer forests would be slightly reduced in the Project Area. There would be an increase in the diversity of understory plants within many conifer stands due to a reduction in forest canopy cover and disturbance caused by thinning and prescribed fire. Treatments would open up stands and reduce the risk of disease spread. Treatment of aspen stands would remove diseased trees and reduce conifer competition, thereby improving health and vigor of remaining and new aspens. Disturbance created by prescribed fire would also help stimulate the regeneration of the less shade-tolerant plant species within these stands. Effects to habitats are provided in Table 18.

Table 18. Alternative B - Direct and Indirect Effects to Habitat

Habitats Proposed for Treatment	Direct Effects of Alternative B	Indirect Effects of Alternative B	Species Potentially Impacted
Shrubland	Tree removal and creation of openings in Gambel's oak and mountain mahogany habitat.	Enhancement of habitat for grazers, browsers, and other shrub-dependent wildlife.	Rocky Mountain bighorn sheep American elk, loggerhead shrike Lewis's woodpecker, fringed myotis, Townsend's big-eared bat
Aspen	Removal of competing conifers and cutting of aspen to encourage new growth. Removal of diseased aspen.	Improved health and vigor of aspen stands.	Flammulated owl, American elk, northern goshawk
Xeric Ponderosa Pine Forest	Opening up of canopy. Creation of forest openings of 1 to 40 acres by thinning and prescribed burn.	Movement towards historical forest conditions. Reduction of dense mature habitat type and crown cover. Decreased likelihood of high-intensity wildfire or disease.	Flammulated owl, Lewis's woodpecker, olive-sided flycatcher peregrine falcon, bald eagle northern goshawk, American marten, fringed myotis, Townsend's big-eared bat, hoary bat, Abert's squirrel, American elk
Mesic Ponderosa Pine Forest	Opening up of canopy. Creation of forest openings of .25-20 acres by thinning and prescribed burn.	Movement towards historical forest conditions. Reduction of dense mature habitat type and crown cover. Decreased likelihood of high-intensity fire or disease.	Flammulated owl, Lewis's woodpecker, olive-sided flycatcher northern goshawk, American marten, fringed myotis, Townsend's big-eared bat, hoary bat, American elk
Lodgepole Pine	Forest openings of irregular size created, diseased trees removed.	Movement towards historical forest conditions. Decreased likelihood of high-intensity wildfire or disease.	Northern goshawk, peregrine falcon, bald eagle, fringed myotis, Townsend's big-eared bat, hoary bat, American elk
Mixed Conifer	Opening up of canopy and increased age class diversity due to creation of forest openings of 1-40 acres by thinning & prescribed fire.	Movement towards historical forest conditions. Decreased likelihood of high-intensity wildfire or disease.	Northern goshawk, olive-sided flycatcher, peregrine falcon, American marten, American elk
Riparian/Aquatic	No direct treatment in riparian area. Potential for short-term impacts to aquatic habitat from sedimentation during treatment activities.	Decreased likelihood of high-intensity wildfire and the resultant bank erosion and sedimentation.	northern leopard frog, brook trout, Preble's meadow jumping mouse

Forest Service Region 2 Sensitive Species

Northern Leopard Frog

Under Alternative B - Proposed Action, no treatments are proposed for riparian areas. Conservation measures for northern leopard frog would provide additional protection for adjacent upland habitat. Best management practices would be followed to limit soil erosion and maintain water quality, and no water depleting activities would occur. Therefore, no impacts to the northern leopard frog or its habitat would be expected to occur.

American Peregrine Falcon

Suitable habitat for the peregrine falcon is located in Cathedral Spires Park; however, no vegetation treatments would occur within the park boundaries. In areas adjacent to the Cathedral Spires Park, there would be potential for short-term disturbance to foraging areas along riparian corridors and coniferous forests, but vegetation treatments would reduce the chance of a high-intensity wildfire in the long-term.

Bald Eagle

Undocumented bald eagle nest and roost sites may occur along the North Fork South Platte River. Proposed project activities would not be likely to remove potential nest and roost trees; larger pine trees would generally be retained in mesic and xeric ponderosa pine habitats, as would trees older than 200 years. Additionally, trees along riparian corridors (where bald eagle nest and roost sites are most likely to occur) would not be removed. Therefore, impacts to bald eagles are unlikely to occur under Alternative B - Proposed Action.

Flammulated Owl

Direct effects to the flammulated owl would include limited potential for individual mortality due to tree felling or other treatments. Indirect impacts may occur due to changes in habitat, particularly in mature mixed conifer habitat, which would have reduced canopy cover and become less dense in treated areas. Approximately 3,660 acres of mature ponderosa pine and mixed conifer (Structural Stages 4B/4C and 5) are proposed for treatment. The flammulated owl appears to be a habitat specialist with low fertility (small clutch size), which is generally an adaptation to a stable environment (Hayward and Verner, 1994). Therefore, the flammulated owl would be sensitive to any habitat modification. Conservation measures applied for raptors and migratory birds would limit impacts by imposing spatial and temporal restricts around active nest sites limiting impacts.

In mature mixed conifer habitat, more open conditions would reduce the extent and intensity of a potential high-intensity fire. Changes in the distribution and size of snags (potential nest trees) would also be important. Some reductions in snags could occur, but overall existing snags would be retained per project standards. Overall, long-term impacts to flammulated owl may include a slight reduction of mature mixed conifer habitat but a corresponding increase in habitat stability due to the reduction in the extent and intensity of a potential high-intensity fire in this habitat type. Increased aspen growth and vigor may also benefit flammulated owls.

Lewis's woodpecker

Short-term impacts associated with harvesting and other treatment activities could occur, including temporary avoidance due to noise. Conservation measures applied for raptors and migratory birds would limit impacts by establishing spatial and temporal restrictions around active nest sites. Vegetation prescriptions under Alternative B - Proposed Action would encourage habitat conditions that the Lewis's woodpecker prefers including open pine forests and burned areas with abundant snags and stumps. Existing snags, which are utilized for nesting, would be retained where they are not a hazard per project design criteria. Habitat for this species would be maintained or improved in the long-term in the Project Area.

Loggerhead Shrike

Very limited suitable nesting and foraging habitat is available for the loggerhead shrike within the Project Area, and no known breeding pairs have been documented. Therefore, no adverse effects to the species are anticipated under Alternative B - Proposed Action. Increased shrubland may provide some benefit to shrikes by providing some additional foraging area.

Northern Goshawk

Direct impacts to northern goshawks include the limited potential for loss of unknown active nests due to tree felling or prescribed fire. However, pre-treatment surveys would be required per project conservation measures and would limit these risks. Should a nest be located a no-treatment zone of at least 30 acres would be designated with a seasonal restriction on activities within ½-mile of the nest. The most likely direct effects on goshawks would be disturbance by project activities from project noise and activity. Other long-term indirect effects include a reduction in potential goshawk nesting habitat. Moderately dense mature forest habitat (mature greater than 40 percent crown cover) contributes to nesting and some forage habitat. This habitat type would decrease in the Project Area in ponderosa pine and mixed conifer forests. However, treatment in mature successional stages with closed canopy cover (Structural Stages 4B/4C and 5) would be limited to approximately 3,660 acres. The impact on the overall habitat available in the Forest would be minor. Existing snags, which are important for post-fledging family and foraging habitat, would be retained where they are not a hazard. Coarse woody debris is also important to some goshawk prey species. These features would be retained to or above Forest Plan standards per project design criteria.

Olive-Sided Flycatcher

Short-term impacts to the Olive-sided fly catcher associated with harvesting and other treatment activities may occur, including temporary avoidance due to noise. The loss of nesting sites or individuals is possible; however, thinning efforts under Alternative B - Proposed Action would retain mature trees. Conservation measures applied for raptors and migratory birds would establish spatial and temporal restrictions for active nest sites, limiting impacts. In addition, treatment in preferred nesting habitat, in mature mixed conifer forest (Structural Stages 4B/4C and 5), would be limited to approximately 190 acres. Treatments would not occur in mature mixed conifer with a canopy closure less than 40 percent, reducing the potential for nest destruction. Patchy openings would be created to encourage regeneration and provide an increase in age class diversity.

Standing dead trees that are not a safety hazard would be retained. These measures would improve olive-sided flycatcher in the long-term by providing more forest edge habitat, and maintaining existing snags.

American Marten

Suitable habitat for the American marten is limited within the Crossons-Longview Project Area. Forest thinning and other vegetation prescription activities under Alternative B - Proposed Action could result in a reduction of existing American marten habitat from reduced canopy cover and loss of understory and den materials. Mature mixed conifer (Structural Stages 4B/4C and 5) proposed for treatment include approximately 190 acres. Existing snags that are not a safety hazard would be retained thus reducing the impacts to some of the existing habitat that may be in the area. More forest edge habitat, which may be utilized by the American marten, would also be created by the proposed activities.

Fringed Myotis, Townsend's big eared bat and Hoary Bat

Suitable habitat for bat species occurs throughout the Project Area, including xeric and mesic ponderosa pine areas, as well as mixed conifer sites. Combined, these vegetation types account for an estimated 92 percent of the vegetation distribution within the Project Area. Removal of Douglas-fir and ponderosa pine could have direct impacts including a loss of roosting habitat, loss of existing roosts, and potentially the loss of individuals. Removal of ponderosa pine stands along drainage bottoms or at transition zones would have the greatest potential to impact roost sites. However, vegetation prescriptions would create openings ranging in size from 1 to 40 acres on xeric ponderosa and mixed conifer areas, and between 0.5 to 20 acres on mesic ponderosa sites. Creation of forest openings would benefit bats in the long-term by creating new forest edge habitat. In addition, under Alternative B - Proposed Action, trees identified as older than 200 years and existing snags which are not a hazard would be retained. These measures would help to maintain suitable roosting and foraging habitat within the Project Area.

Rocky Mountain bighorn sheep

Direct impacts on bighorn sheep would include the limited potential for disturbance during treatments in the Project Area. Indirect effects would most likely include improvement of habitat, as treatments in shrubland habitat would enhance habitat for bighorn sheep. Treatments in conifer habitat may also increase potential habitat for this species; treatments in ponderosa pine habitat would provide openings of 1 to 40 acres in size, which would offer better forage and increase the potential for horizontal visibility. The Forest Service is working with Colorado Parks and Wildlife (CPW) to implement management actions that would enhance bighorn sheep habitat while meeting the purpose of and need for this project.

Management Indicator Species

Abert's squirrel

Under Alternative B, displacement of Abert's squirrels due to short-term disturbances to nesting and foraging sites could occur. Treatments may also result in the transition from more mature structural stage (4B,C,5) to less mature structural stage in some of the Project Area, resulting in less ideal habitat for the Abert's squirrel. Table 19 presents potential treatment areas by habitat quality level. It is likely that the actual area treated

would be less than the numbers shown due to topography, accessibility, and other limitations (no treatment in areas of 60 percent slope or greater and mechanical treatment only on areas with 35-60 percent slope).

Table 19. Alternative 2 Treatment in Abert's Squirrel Habitats in Project Area

Habitat	Habitat Quality Definition	Existing Habitat in Project Area (acres)	Habitat Treated in Alternative B (acres)
Primary	Habitat Structural Stages 4B, 4C and 5	5,073	4,295
Secondary	Habitat Structural Stages 3A-C and 4A	8,272	2,945
	Total	13,345	7,240

American elk

Overall the long term, treatments in xeric and mesic ponderosa pine habitat would reduce the risk of stand replacing fire and move the forest towards the historical range of variability. Treatment would reduce competition for light, moisture, and nutrients, thereby accelerating the development of mature and old growth ponderosa pine stands, which would be desirable for Abert's squirrel in the long-term. Requirements for all project work would remain within Forest Plan standards to preserve squirrel stands within treatment areas would minimize impacts on the species. .

Proposed treatments could have some short-term negative impacts on elk and elk habitat due to fire, smoke, or disturbance or destruction of understory shrubs, forbs, and grasses from project-related activities. Grasses and forbs would likely return to the disturbed areas in a year or two, while shrubs and seedling/sapling trees would take several years to return. The proposed treatments are expected to have long-term beneficial impacts on elk forage quantity and quality in the Project Area. Thinning and burning would open up forested areas and allow for more forage production, while cutting small openings in aspen stands would promote its regeneration and also provide better-quality elk foraging habitat as new aspen suckers, grasses, forbs, and browse plants develop from cutting and burning treatments. While exact changes to successional stage have not been modeled, proposed treatment within elk habitat would generally move cover from more mature to less mature structural stages optimizing habitat for elk foraging, as discussed in section 6.1.2. Elk forage quality and quantity would therefore improve over pre-project levels for the approximately 10,000 acres summer range, 5,600 acres winter range and 110 acres severe winter range proposed for treatment (Table 20). Winter and summer cover habitat has the potential to be decreased as project activities move forested habitat to earlier successional stages, but cover is not likely to be a limiting factor for elk in the Project Area.

No new permanent roads would be constructed in the project area, therefore no long-term changes to road density would occur and road density is not anticipated to be a limiting factor in elk habitat.

Table 20. Approximate Elk Habitat in Project Area - Alternative B[9]

Habitat Type	High Quality Foraging Habitat (acres)		High Quality Cover Habitat (acres)	
	Existing Condition	Area Treated by Alternative B	Existing Condition	Area Treated by Alternative C
Summer Range	2,292	2,145	7,760	6,575
Winter Range	1,912	1,550	5,376	3,876
Severe Winter Range	72	72	65	62

Brook trout

There would be no direct effects to brook trout or its habitat as a result of proposed vegetation treatments. Project activities could result in minor runoff and sedimentation increases and ash litter due to prescribed fires, as well as ground disturbance with subsequent erosion from heavy machinery and vehicles in the Project Area. However, BMPs for soils and watersheds would limit or avoid these problems. In the long-term, project treatments would reduce the risk of erosion into Crossons-Longview Project Area streams from intense wildfire or precipitation events. Treatments would likely not result in a measurable change in brook trout populations or trends.

Threatened and Endangered Species

Mexican Spotted Owl

MSO are not known to occur in the Project Area, although non-breeding individuals may occur but are likely to be limited. Should any owls be present in roost stands adjacent to treatment stands, they may be slightly temporarily disturbed by machinery and human noise. This level of disturbance is not expected to impact the fitness level of affected owls, since the species is relatively tolerant of humans and machinery (Delaney et al., 1999; Johnson and Reynolds, 2002; Swarthout and Steidl, 2003). Additionally, much of the MSO recovery habitat in the planning area is excluded from mechanical thinning and harvest treatments that use heavy equipment or machinery because of slope constraints of prohibiting harvesting equipment on slopes greater than 35 percent.

Approximately 2,600 acres potentially suitable foraging habitat (i.e. recovery habitat) could be temporarily disturbed in the Project Area. Of this area, based on slope constraints, approximately 1,216 acres would be treated with mechanical treatment and 1,390 with hand treatment only. Understory vegetation and existing coarse woody debris would be crushed by heavy machinery or consumed by prescribed fire, which could have a slight temporary negative effect on owl prey. However, both of these habitat components would recover and likely increase shortly after treatments are complete.

Long-term, Alternative B (Proposed Action) would address the primary threat to the MSO: high-intensity wildfire. Fuel reduction and prescribed burn treatments in recovery habitat would reduce the hazardous fuel loads and the likelihood of high-intensity wildfire in these areas. Thinning treatments and prescribed burns

[9] Based on general Habitat Capability Model cover types-high quality forage represented by (1,2, 3A, 4A all forested cover types, 1 shrub lands and all Aspen). High Quality cover type represented by 3b-5 forested cover types) Estimates likely over-represent available habitat. Not all area may represent optimal habitat and optimal habitat may differ depending on season of use.

would create small openings and thinned stands that increase horizontal diversity and create snags, canopy gaps, and large logs, as well as perpetuate understory shrubs, grasses, and forbs, which are important habitat components to the owl, its prey, and other wildlife (USFWS, 1995). The treatments proposed are consistent with the 2012 Recovery Plan guidelines for fuels and forest management practices in MSO habitat; the overall result would aim to mimic natural processes and would introduce additional diversity into the forest structure. In addition, owl habitat would benefit from the reduced risk of stand-replacing fire. Stands that are potentially capable of producing suitable breeding and non-breeding owl habitat would therefore be encouraged to develop, and would be more protected from loss due to fire.

Pawnee Montane Skipper

Alternative B would treat approximately 415 acres of potentially suitable Skipper habitat, including 240 acres of hand treatment and 175 acres of mechanical treatment. Within this habitat, thinning and burning activities may directly affect skipper eggs, larvae, or pupae through dislodging or crushing from vehicles and equipment and foot traffic or burned during prescribed fire activities. No direct effects to adult skippers are expected because under project conservation measures, all activities will avoid skipper habitat during the active flight season. Habitat in treatment areas, particularly in mechanical treatment areas, would be affected by crushing of vegetation and disturbance of soil from heavy machinery. In all treatment areas, coarse woody debris may be altered as much content may be added, removed, or changed in size. Understory cover is anticipated to recover within 3 years of mechanical treatment or less than 2 years after hand thinning and prescribed burning. Conservation measures would stagger treatments throughout the Project Area in space and time. As a result, skippers will have local refuges of undisturbed habitat adjacent to sites undergoing treatment, and can then repopulate treatment units when the understory vegetation has recovered (Sovell, 2013).

Project activities will be implemented so that disturbance to skippers will be minimized, however some individuals may be harmed, harassed, or killed. Given the conservation measures and naturally patchy distribution of the species these risks are expected to be acceptably low and of short duration in any one location. The long-term effect is expected to be positive for skippers because the amount and distribution of host plants is expected to increase with an appropriate reduction in tree cover, improving habitat conditions over a large area. Alternative B includes specific language to allow for thinning activities to improve skipper habitat by reducing density.

Prebles Meadow Jumping Mouse

Approximately 2,100 acres of potential PMJM habitat falls within the potential treatment area, 1,000 acres with potential mechanical treatment, and 1,100 acre with potential hand treatment. This represents approximately 57 percent of the total potential PMJM habitat within the Project Area. Individual PMJM may be disturbed, injured, or killed by project activities in upland habitat adjacent to riparian areas. Currently, suitable upland habitat would be affected by heavy machinery in areas proposed for mechanical treatment; existing herbaceous vegetation and small shrubs would be crushed, the soil surface would be disturbed, and coarse woody debris would be altered. During project operations upland habitat would be temporarily unsuitable or of reduced quality. Disturbed areas are expected to recover in 3 years of mechanical treatment,

and 2 years or less after hand thinning and prescribed burning. No mechanical treatments are proposed for riparian areas.

The effects of management activities on upland habitat would be mitigated through the use of project specific conservation measures. However, the chance that individuals may be harmed, harassed, or killed is still present. But given the rare occurrence of the species these risks are expected to be acceptably low and of short duration in any one location. The long-term effect is expected to be positive for PMJM because the amount of grass, forb, and shrub cover would increase with the reduced tree cover, subsequently improving habitat conditions over a large area. The risk of losing suitable habitat and subpopulations of PMJM to widespread stand-replacing fire would also be moderated in comparison to pre-treatment conditions.

Alternative B- Cumulative Effects

No other forest health or fuels treatment projects have recently occurred or are proposed in the planning area in the foreseeable future. Additional projects on Forest Service land in the South Platte District including mechanical treatment and prescribed fire treatments on up to 9,109 acres for the Harris Park Fuels Management Project and up to 1,107 acres in the Payne Gulch project, as well as ongoing forest treatment projects associated with the Upper South Platte Watershed Protection and Restoration Project. The Proposed Action, along with these projects could result in short term displacement of wildlife and temporary habitat change, but in the long term would contribute to lower risks of stand-replacing fires, reduced susceptibility to insect and disease epidemics, and stimulate regeneration and new growth of vegetation throughout the Project Area and the South Platte Ranger District. Motorized and non-motorized recreation would continue within and outside the Project Area, which would contribute to the impacts of human activity on wildlife.

Privately owned forest, agricultural, and residential lands within and adjacent to the Project Area may also provide suitable habitat. Continued fuel treatments pasture use on private lands would likely continue to affect habitat, thereby increasing the importance of habitat on NFS lands. In addition to forestry and agricultural activities, other management at the state and federal level would continue to impact MIS species. Specifically, state management of deer and elk harvest would continue to be one of the factors that affect elk and bighorn sheep populations in and around the project area. For example. Colorado Parks and Wildlife has plans to issue hunting permits for the population of big horn sheep in Waterton Canyon, adjacent to the project area.

The incremental contribution of Alternative B, enhancement of habitat throughout the Project Area, when combined with other past, present, or reasonably foreseeable future actions, would have minor long-term, but generally beneficial cumulative effects on habitat quality in the South Platte district.

Alternative B- Species Viability

Abert's Squirrel

Alternative B (Proposed Action) treatments would have long-term beneficial effects on Abert's squirrel habitat suitability. Short term effects may occur to Abert's squirrel due to disturbance from treatment activities. Long term, treatments in ponderosa pine habitat would mimic natural succession and disturbance processes and would create a mosaic of habitat conditions over time In general, Alternative B (Proposed

Action) would contribute to meeting Forest Plan objectives for Abert's squirrel. Assuming standards, objectives, and guidelines are met Forest-wide, there would be adequate habitat to maintain Abert's squirrel populations across the Forest under Alternative B (Proposed Action).

American Elk

Treatments proposed in Alternative B (Proposed Action) would provide long-term improvements to foraging habitat in elk overall, summer, and winter range within the Crosons-Longview Project Area. The incorporation of small patch cuts would ensure diversity of cover types in the long term. Overall cover would be affected by the removal of forest vegetation during mechanical treatments; however, cover is not likely to be the limiting factor in the forest. In general, Alternative B (Proposed Action) would contribute to meeting Forest Plan objectives for elk. Assuming standards, objectives, and guidelines are met Forest-wide, there would be adequate habitat to maintain elk populations across the Forest under Alternative B (Proposed Action).

Brook Trout

Alternative B (Proposed Action) is intended to reduce or eliminate the potential for a future high-intensity wildfire in the Project Area, which could ultimately have significant effects on the viability of brook trout locally. Effects to brook trout are expected to be minimal and short term. In general, Alternative B (Proposed Action) would contribute to meeting Forest Plan objectives for brook trout and to maintaining adequate habitat for brook trout populations in the Forest.

Mexican Spotted Owl

Implementation of the proposed Crossons-Longview project may affect, is not likely to adversely affect the threatened Mexican spotted owl. The proposed project would have no effect on critical habitat because none has been designated in the Project Area.

Pawnee Montane Skipper

Based on the effects analysis and considering management actions, stipulations, and conservation measures, implementation of the proposed Crossons-Longview project may affect and is likely to adversely affect the Pawnee Montane Skipper but is not likely to jeopardize the continued existence of the species

Prebles Meadow Jumping Mouse

Based on the effects analysis and considering management actions, stipulations, and conservation measures, implementation of the Crossons-Longview project may affect and is likely to adversely affect the Preble's Meadow Jumping Mouse but is not likely to jeopardize the continued existence of the species. The proposed project would have no effect on critical habitat because none has been designated in the Project Area.

Alternative C

Alternative C was developed in response to a concern that increasing access through the use of temporary roads could cause some negative effects. Like Alternative B (Proposed Action), Alternative C is designed to move the forest towards historical forest conditions and reduce wildlife hazards but proposes that minimal

temporary roads would be built to accomplish the project's purpose and need. Alternative C impacts to wildlife would be similar to those described for Alternative B - Proposed Action.

Forest Service Region 2 Sensitive Species

Northern Leopard Frog

Effects would be the same as discussed for Alternative B.

American Peregrine Falcon

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for the short-term effects discussed in Alternative B - Proposed Action, such as disturbance to foraging areas along riparian corridors.

Bald Eagle

Effects would be the same as discussed for Alternative B.

Flammulated Owl

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for effects discussed in Alternative B - Proposed Action, including reduced density in mixed conifer habitat and potential loss of snags. However, proposed treatments in mixed conifer habitat in the planning area are limited therefore impacts would be limited under all action alternatives.

Lewis's Woodpecker

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for the short-term effects discussed in Alternative B - Proposed Action, such as noise disturbance, but would increase the possibility for the long-term impacts discussed in Alternative A, including reduction of preferred open ponderosa pine forest habitat.

Loggerhead Shrike

Effects would be the same as discussed for Alternative B.

Northern Goshawk

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for the short-term effects discussed in Alternative B - Proposed Action, such as potential loss of unknown active nests due to tree felling or prescribed fire. However, this alternative would increase the possibility for the long -term impacts discussed

in Alternative A, including forest succession which would allow some stands to become too dense for nesting while others would mature to provide optimal nesting conditions.

Olive-Sided Flycatcher

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for the short-term effects discussed in Alternative B - Proposed Action, such as noise disturbance, but would increase the possibility for the long-term impacts discussed in Alternative A, including reduced forage areas as forest understory growth continues and a dense canopy develops.

American Marten

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could reduce the area of impacts for effects discussed in Alternative B - Proposed Action, including loss of existing habitat from reduced canopy cover and loss of understory and den materials. However, suitable marten habitat is limited within the Project Area, therefore this alternative is not expected to have significantly different impacts than Alternative B - Proposed Action.

Fringed Myotis, Townsend's big eared bat and Hoary Bat

The effects of this alternative would be similar to the effects of Alternative B - Proposed Action. By not constructing temporary roads, the disturbance to roosting and foraging habitat and direct disturbance of individuals would be reduced. However, the ability to remove fuels would be lessened and the area that could be treated would be reduced. New forest edge habitat would also be reduced by limiting the amount of openings created. As a result, the long-term improvements to habitat would be reduced.

Rocky Mountain bighorn sheep

This alternative is not expected to have significantly different impacts than Alternative B - Proposed Action. By not constructing temporary roads, the ability to remove fuels would be lessened and the area that could be treated would be reduced. This could potentially reduce the area of long-term improvements to bighorn sheep forage areas and shrubland habitat.

Management Indicator Species

Abert's squirrel

Alternative C would treat approximately 4,788 acres of potential Abert's squirrel habitat (Table 21). The effects of this alternative would be similar to the effects of Alternative B. Project activities may result in some transition of mature ponderosa pine habitat to earlier structural stages that would not represent ideal optimal habitat for the species in the short term, but allowing for the forest to return to the historical range of variability and support development of mature stands with open-understory in the long term, thus increasing suitable habitat for the squirrel . By not constructing temporary roads, the ability to remove fuels will be

lessened and the area that can be treated will be reduced, reducing short term disturbance as well as long-term habitat improvement for Abert's squirrel.

Table 21. Abert's Squirrel Habitat in Project Area - Alternative C

Habitat	Habitat Quality Definition	Existing Habitat in Project Area (acres)	Habitat Treated in Alternative C (acres)
Primary	Habitat Structural Stages 4B, 4C and 5	5,073	2,712
Secondary	Habitat Structural Stages 3A-C and 4A	8,272	2,076
	Total	13,345	4,788

American elk

The effects of this alternative would be similar to the effects of Alternative B. By not constructing temporary roads, the ability to remove fuels will be lessened and the area that can be treated would be reduced. In total, the area proposed for treatment under Alternative C include approximately 5,500 acres of summer range and 3,000 acres of winter range (Table 22). The area of optimal foraging and cover habitat in the Alternative C treatment areas are shown in Table 22. No severe winter range is proposed for treatment. This could reduce the area of impacts for the short-term effects discussed in Alternative B - Proposed Action, but would increase the possibility for the long-term impacts discussed in Alternative A.

Table 22. Approximate Elk Habitat in Project Area - Alternative C[10]

Habitat Type	High Quality Foraging Habitat (acres)		High Quality Cover Habitat (acres)	
	Existing Condition	Area Treated by Alternative C	Existing Condition	Area Treated by Alternative C
Summer Range	2,292	1,233	7,760	4,299
Winter Range	1,912	748	5,376	2,252
Severe Winter Range	72	0	65	0

Brook trout

As with Alternative B - Proposed Action, the exclusion of temporary road construction in treatment application would have no direct effects to brook trout or its habitat. The likelihood of minor runoff, sedimentation increases, and ground disturbance would be less likely under this alternative.

Alternative C- Cumulative Effects

Cumulative effects under Alternative C would be similar to those discussed under Alternative B. Due to the reduction in treated area under Alternative C, the contribution to overall forest health in the South Platte district would be less. Overall, the incremental contribution of Alternative B, enhancement of habitat

[10] Based on general Habitat Capability Model cover types-high quality forage represented by (1,2, 3A, 4A all forested cover types, 1 shrub lands and all Aspen). High Quality cover type represented by 3b-5 forested cover types) Estimates likely over-represent available habitat. Not all area may represent optimal habitat and optimal habitat may differ depending on season of use.

throughout the Catamount Project Area, when combined with other past, present, or reasonably foreseeable future actions, would have minor long-term, but generally beneficial cumulative effects on Forest Service SS and MIS and species habitat quality in the South Platte district.

Alternative C- Species Viability

Proposed treatment activities in Alternative C would have similar effects to species viability as described under Alternative B. Contributions to meeting Forest Plan objectives for MIS species would be reduced due to reduction in overall treatment area. However, assuming standards, objectives, and guidelines are met, there would be adequate habitat to maintain MIS species populations across the Forest under Alternative C.

3.5 Recreation/Visuals

3.5.1 Recreation Affected Environment

The National Visitor Use Monitoring (NVUM) process estimated that there were approximately 4,281,000 national forest visits to the Pike and San Isabel National Forest during a 2011 sampling timeframe (USDA Forest Service, 2014). Specific visitor use estimates are not available in the NVUM results for the Crossons-Longview Project Area. The Project Area is not the highest use area on the Forest and has limited developed recreational sites and amenities. However, due to its proximity to Denver, the area is still heavily used. The primary recreational activities in the Crossons-Longview Project Area and along adjacent routes include hiking, mountain biking, river access for kayaks and rafts, camping, hunting, fishing, rock climbing, particularly in the Cathedral Spires, Chair Rocks, and Raleigh Peak areas, shooting, horseback riding, picnicking, Christmas tree cutting, and sightseeing.

Access

The primary public access routes to and within the Project Area include the following:

- US Highway 285 – providing a connection to the northwest point of the Project Area at Bailey
- Park County Roads 68 and 70 – providing access from Bailey south to NFSR 549 and 550
- NFSR 549 – providing access to Buck Gulch
- NFSR 550 – providing southern access near Buffalo campground and Park County Road 126
- Jefferson County Road 126 – primary route from US Highway 285 to center of the Project Area
- Jefferson County Road 96 and Douglas County Road 97 – providing access to the northeastern section of the Project Area.

Access to the remainder of the Project Area is via a combination of classified and unclassified forest system roads, as well as a number of private roads that are largely closed to public access. Parking is only allowed on forest lands where there is a sign showing a parking location marked with P.

Dispersed Recreation Activities

Hiking and mountain biking on system and non-system trails are popular in the Project Area. Trails are mostly non-motorized with steep slopes and many rock outcrops, as well as open vistas and meadows. Portions of the popular Colorado Trail go through the southwestern and southeastern portions of the Project Area. There are numerous trails in Buck and Miller Gulches that are highly rated for mountain biking.

Mountain biking is very popular and is probably one of the primary recreational uses in the area, drawing many users from the Denver metropolitan area. Some illegal Off Highway Vehicle (OHV) use occurs in the area. See below for further description of system trails in the Project Area.

Shooting occurs throughout the area. There is a private commercial gun club (Buffalo Creek Gun Club) that has target shooting and a shooting range for both pistol and rifle just outside the Project Area off of NFSR 550.

Hunting is an important recreational activity in the Project Area, in part because of its proximity to the Denver Metropolitan area. The Top of the World Area is particularly attractive to hunters. Big Game hunting occurs in Game Management Units (GMU) 501 and 51 within the Project Area. Hunting is primarily for deer and elk. Deer Recreation days totaled 2,511 within GMU 501, with 643 hunters, and a 41 percent success rate or 278 deer harvested. Elk recreation days totaled 3,390, with 573 hunters and a 21 percent success of 123 elk harvested. In GMU 51, recreational days for deer totaled 3,252 with 503 hunters, 245 deer harvested for a success ratio of 49 percent. Elk hunters totaled 545 hunters and 3,848 recreation days, with 113 elk harvested, for a 21 percent success rate.

There are no established campsites in the Project Area, however dispersed primitive tent and RV camping occur throughout the area. Camping is allowed in designated primitive sites without amenities such as tables or toilets. It is estimated that 60 percent of campers use tents and 40 percent camp in RVs. There are several established campgrounds just outside of the Crossons-Longview Project Area, as discussed below.

Kayaking is increasing along the North Fork of the South Platte River. Water releases in the North Fork and South Platte River result in stable streamflows that are more desirable for kayaking. The North Fork flows come from the Roberts tunnel, the South Fork flows come from Cheesman Reservoir releases. At the confluence of South Platte and North Fork of the South Platte there is an old historic hotel structure at this location, which is a good stopping point of historical interest for picnics, etc.

There are numerous other dispersed activities in the Project Area. Fishing is popular, particularly in the North Fork of the South Platte river. Rock climbing is popular in the Cathedral Spires, Chair Rocks and Raleigh Peak Areas. Other visitors to the forest engage in target shooting, horseback riding, picnicking, scenic driving, Christmas tree cutting, and sightseeing.

Developed Recreation

Developed recreation opportunities in the Project Area include National Forest System trails. There are several campgrounds located to the south of the Project Area. Figure 24 provides a map of trails and campgrounds within the Project area and project vicinity.

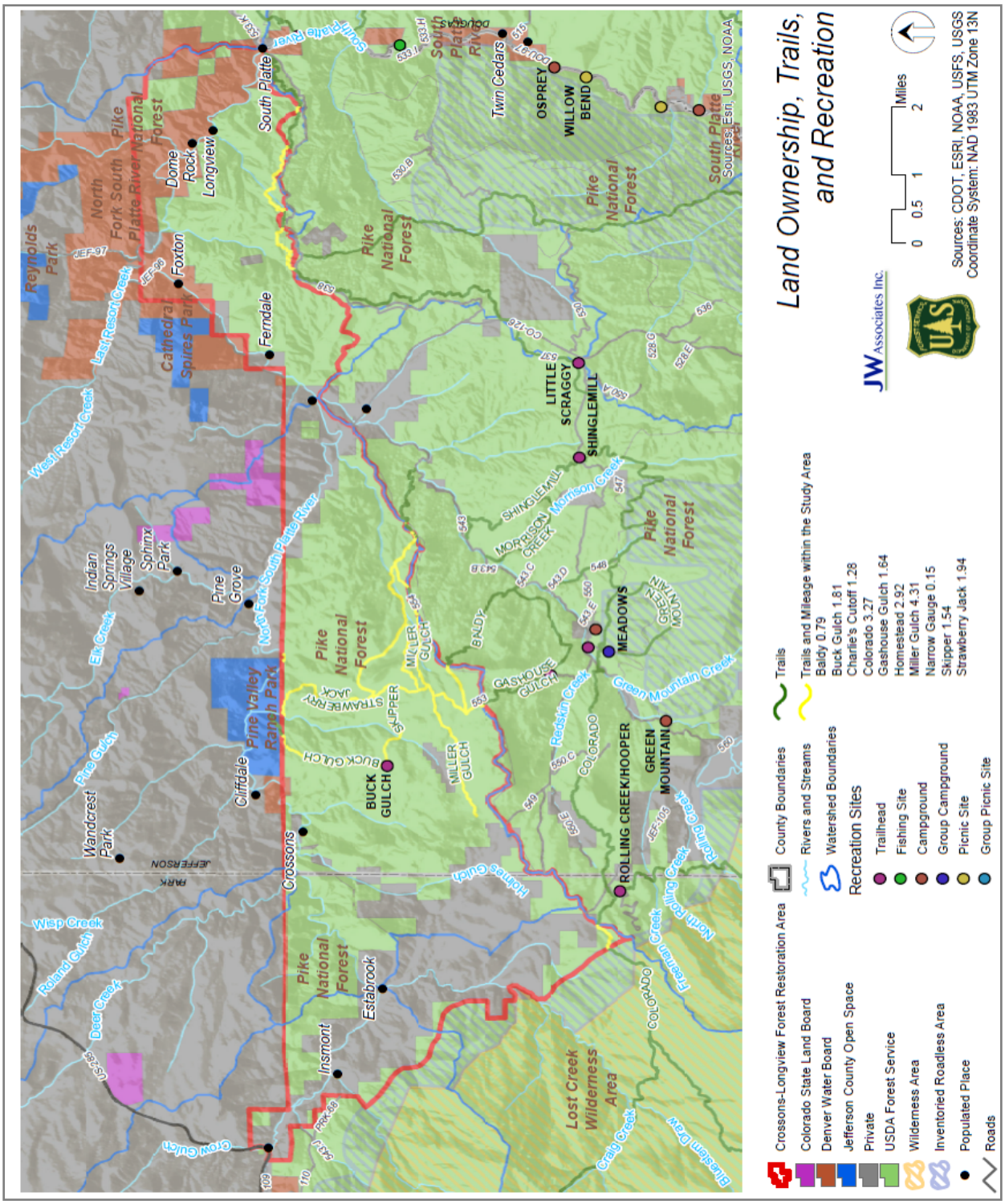

Figure 24. Project Area Trails and Developed Campgrounds within vicinity of Project Area

Campgrounds

There are several developed campgrounds in the vicinity of the Crossons-Longview Project Area but outside of the Project Area. These include three Forest Service campgrounds: Green Mountain Campground, Buffalo Campground, and Meadows Group Campground. Dispersed primitive (no facilities) camping is allowed along Forest Route 550 where tent signs are located. This area is heavily used for camping since it is so close to Denver (Heagley, 2014). Table 23 shows the number of campsites and amenities at the three campgrounds. All campgrounds are heavily used. Other private campgrounds are available on private and public properties along US 285 and other local roads in addition to the USFS campgrounds.

Table 23. Campgrounds near Project Area

Campground	Number of Sites	Amenities
Green Mountain	6 spaces. Green Mountain Campground is tents only. Campers must park and walk in to the campsite. There are a few bridges across the stream with steps.	The popular Buffalo Creek Recreation Area trail system is easily accessible from this area. Several trailheads are within a 1/2 mile radius of the campground. These trails are popular with hikers, bicyclists and horseback riders. Campground amenities include tent camping, picnic tables, toilets, drinking water, and parking. A fee is charged for some activities.
Buffalo	38 (24 reserveable, 14 first come)	Buffalo Campground is close to mountain bike trails and provides toilets, picnic tables etc. This campground does not have electricity or water hook-ups. There is no dump station available. Closest dump station is Chatfield Lake State Park in Littleton
Meadows	2 Group Sites - 25 vehicles per site	The popular Buffalo Creek Recreation Area trail system is easily accessible from this area. Several trailheads are within a 1/2 mile radius of the campground. These trails are popular with hikers, bicyclists and horseback riders. Camping includes sites for tent camping, accessible camping, and camping trailers, Campground amenities include picnic tables, toilets, drinking water and parking.

Trails

There are approximately 22.8 miles of recognized, National Forest System trails in the Project Area. These trails provide both motorized and non-motorized opportunities (USDA Forest Service, 2014). Table 24 shows the trail names and mileage within the Project Area.

Many of the trails listed in Table 24 extend beyond the Project Area boundary. Some of the trails including Buck Gulch and Strawberry Jack connect with Jefferson County Open Space trails in Pine Valley Ranch. This trail system is very popular and sees high use during the weekends from the local and regional population. The Buck and Miller Gulch Trails are particularly popular for mountain biking.

Table 24. Trail Mileage within the Project Area

Trail Name	Length of Trail in Project Area (miles)
Baldy	0.8
Buck Gulch	1.8
Charlie's Cutoff	1.3
Colorado Trail	3.3
Gashouse Gulch	1.6
Homestead	2.9
Miller Gulch	4.3
Narrow Gauge	0.2
Skipper	1.5
Strawberry Jack	1.9
Total	**19.7**

3.5.2 Recreation Environmental Consequences

Effects Common to All Alternatives

Some level of disturbance to recreation resources would likely occur under all alternatives. Wildfires pose a risk to recreation resources and all alternatives would have some risk of wildfire. The degree of disturbance would depend on the size and intensity of the fire. Alternative A would have the greatest risk of a large, intense fire. Should a fire occur, recreation would be impacted by views of smoke, areas with disturbed soil, burned trees, and areas of cut trees due to fire suppression efforts. Areas that experience wildfire could be closed to public access during and potentially after the fire suppression efforts would likely reduce access to other areas. Hazardous conditions following wildfire would be possible including unstable soils, hazard trees and damaged trails. Although the risk of disturbance from a large fire is less for Alternatives B and C, these alternatives would result in some disturbance to recreation resources during project implementation.

Alternative A - No Action

Direct and Indirect Effects

Alternative A (No Action) poses the greatest risk of a large, damaging wildfire to the extent that the fire would affect recreation. Direct effects would include visitors being restricted from using certain recreation areas during wildfire suppression or because the recreation area is located in the area of the fire. Should a fire occur, recreation would be directly impacted by views of smoke, areas with disturbed soil, burned trees, and areas of cut trees due to fire suppression efforts.

The effects of wildfire on recreational resources would depend on the type of fire that is experienced. Frequent, small fires would be unlikely to restrict public access for an extended period or create large areas of safety hazards. They also would not create significant visual alterations. However, a large and intense fire similar to what has occurred in surrounding areas in the recent past, could reduce or eliminate public access for an extended period for a variety of reasons including a need for watershed rehabilitation, continued safety hazards in areas of suppression activities, areas of burned hazards trees that pose a risk to recreationists, and hazardous conditions due to unstable soils and damaged trails.

Depending on the nature of the fire, the visual integrity of the area could be impacted, potentially changing the landscape character, scenic attractiveness and scenic integrity due to burned areas or areas with cut trees from suppression efforts. This could negatively affect the aesthetic experience of recreationists. The significance of these types of effects would be dependent on the size and intensity of any fires, should they occur. A large, intense fire could significantly alter the character of the area to the extent that recreationists may chose to go to other areas for their activities. But more typical, small and spotty fires scattered in the Project Area would be unlikely to have significant impacts.

There are three campgrounds, Green Mountain, Buffalo, and Meadows, that are located just outside the Project Area boundaries but that are used by visitors to the Project Area's trails and resources. These campgrounds would not be directly affected by any actions from Alternative A.

Cumulative Effects

There are no foreseeable projects affecting the Project Area, including any other fuel reduction projects. Past fire suppression and land management have created high fuels levels throughout much of the Project Area. It is likely that wildfire suppression would continue due to the history of large, destructive fires in the area combined with the proximity of residential areas. Therefore, cumulatively, this alternative would continue the trend of increasing forest density, reducing the resiliency of the forest to large disturbances. There would be a corresponding increase in the risk of large, intense wildfire that could damage recreational resources and use of the area. Past wildfires in the area have altered the character of the forest including a large portion of the Project Area. Should a large, intense fire occur in the unburned portions of the Project Area, the cumulative effect could significantly alter the character of the area to the extent that recreationists may chose to go to other areas for their activities. This would be most likely in the event of a large, intense fire that could leave large areas of burned trees that could potentially take decades to recover. Long-term, some burned areas may convert to meadows and open areas, which could increase attractiveness of some areas due to enhancement of views. This would depend on the size, location and intensity of any wildfire that were to affect the Project Area.

Alternative B

Alternative B proposes vegetation treatments including thinning, creating openings, prescribed burning, and removing trees on up to 10,000 acres within the Project Area. It is expected that the proposed treatments would take ten years to complete.

Direct and Indirect Effects

Alternative B has the potential to affect views from recreation areas and major travel ways. However, given the locations of priority treatment areas relative to the recreational activities available within the Project Area and surrounding areas, the recreational impacts due to affected views (see *3.4 Visual Resources)* would not be anticipated to be significant.

Table 25 presents the length of each trail that is located in treatment areas and could therefore be affected by treatment activities. A total of 13.7 miles, or 70 percent of the trail mileage in the Project Area, are located in treatment areas. In these trail segments trails and access may be temporarily closed for public safety. There would be short term impacts to visitors in specific areas. Potential impacts range from direct disturbance in the immediate area of the trail, trail closures and more indirect disturbances due to noise and visual impacts due to treatment activities in the vicinity. These indirect impacts could extend somewhat along the trails. However, there are other areas nearby with similar characteristics for recreation that could be used during the short-term treatment period. Therefore, although the short-term closures of trails and access to trails would somewhat limit use during treatment operations for visitors using these areas, these closures would be less than significant. Further, with implementation of the following design features, both short-term and long-term impacts to trails would be reduced:

Design Features

- Use appropriate signing, traffic control, and area closures, and provide advance information to user groups about closures to adequately protect public safety. Increase public education about road closures and appropriate uses.
- Meet all applicable laws regarding safety; follow Occupational Safety and Health Administration (OSHA) and State safe work practice guidelines.
- Restrict operations on weekends and holidays as needed to reduce user conflicts.
- Clear all slash or debris from the trail following treatment activities.
- Restore trail profile as necessary from potential impacts from harvesting equipment.

Alternative B treats the largest area of the alternatives and would therefore result in the lowest risk for a large, intense wildfire. The impacts from wildfire on recreation as discussed for Alternative A would still be possible, however, the fuel reduction treatments would reduce the risk of a large, intense wildfire and increase the possibility that fires, should they start would be more reflective of historic fire behavior and would be easier to control. This alternative has the lowest risk of loss of use of, or damage to, the recreational resources in the Project Area due to wildfire.

Table 25. Length of Trail in Treatment Areas - Alternative B

Trail Name	Length of Trail in Project Area (miles)	Length of Trail in Treatment Area (miles)	Percent of Trail in Treatment Area (%)
Baldy	0.8	0.6	77
Buck Gulch	1.8	1.4	76
Charlie's Cutoff	1.3	0.9	66
Colorado Trail	3.3	3.1	96
Gashouse Gulch	1.6	1.2	71
Homestead	2.9	1.8	62
Miller Gulch	4.3	3.0	68
Narrow Gauge	0.2	0.2	100
Skipper	1.5	0.4	29
Strawberry Jack	1.9	1.2	62
Total	**19.6**	**19.6**	70

Cumulative Effects

There are three campgrounds including Green Mountain, Buffalo, and Meadows, that are located just outside the Project Area boundaries but that are used by visitors to the Project Area's trails and resources. Alternative B would not directly affect these campgrounds. However, treatments in the Project Area would complement fuels treatment activities that are being completed near and around these campgrounds, cumulatively reducing the risk of damage due to wildfire. The fuel reduction proposed by this alternative reduces the risk of damage or loss of use to these three popular campgrounds.

There are no foreseeable projects affecting recreation in the Project Area, including any other fuel reduction projects. Therefore, there are no other activities that would cumulatively affect trail access, views, or recreational enjoyment due to project implementation type activities.

This alternative proposes treatments that would reduce forest fuels in proposed treatment areas throughout the Project Area. The risk of a large and severe wildfire that could damage recreational resources and use of the area would be reduced for this alternative. Past wildfires in the Project Area have created large openings, some of which have not successfully revegetated, and have converted large areas of forest to grassland and left other areas with dead burned standing trees. This alternative would treat areas in the vicinity of the previously burned areas, which will reduce the risk that additional adjacent areas would be subject to a severe wildfire which could expand the area with standing burned trees or that will take many decades to revegetate.

Alternative C

Alternative C proposes vegetation treatments including thinning, creating openings, prescribed burning, and removing trees on approximately 6,326 acres within the Project Area. Minimal temporary roads would be constructed to access treatment areas. It is expected that the proposed treatments would take ten years to complete.

Direct and Indirect Effects

Impacts from Alternative C would be similar to those described in Alternative B. Since the treatment area is about half as large as Alternative B and minimal temporary roads would be constructed, the short-term impacts to recreational activities in the Project Area would be of lesser extent and of shorter duration than for Alternative B. Certain recreation areas and trails around Miller and Buck Gulch would not be affected by the treatments because these areas are not accessible without the use of temporary roads. Impacts to recreational resources from implementation activities would be less than significant.

Table 26 presents the length of each trail that is located in treatment areas for Alternative C and could therefore be affected by treatment activities. A total of 10.9 miles, or 56 percent of the trail mileage in the Project Area, are located in treatment areas. This is less than the 70 percent of trail mileage that would be potentially affected by Alternative B. In these trail segments, the possibility of temporarily losing access would be considered high. Impacts for affected trail segments would be the same as discussed for Alternative B. Alternative C would require the same design features to lessen any impacts as discussed for Alternative B. For both alternatives, the impact to trails would be short-term and considered less than significant.

As discussed for Alternative B, this alternative would reduce the fuels in treated areas, lowering the risk of a large, intense wildfire in the Project Area. However, this alternative would treat only 63 percent of the area proposed for treatment by Alternative B. Some areas of high priority for fuels reduction would not be accessible because of this alternative's restriction to use only existing roads (no new roads including temporary roads). Therefore, although this alternative would reduce fuel loads and wildfire risk, and subsequently the risk to recreational resources, the reduction would be less than for Alternative B.

Cumulative Effects

The cumulative effects of Alternative C combined with other past, present and foreseeable actions are the same as discussed for Alternative B. Although the reduction of fire fuels, and therefore wildfire risk, would be less than Alternative C.

Table 26. Length of Trail in Treatment Areas - Alternative C

Trail Name	Length of Trail in Project Area (miles)	Length of Trail in Treatment Area (miles)	Percent of Trail in Treatment Area (%)
Baldy	0.8	0.6	77
Buck Gulch	1.8	0.5	30
Charlie's Cutoff	1.3	0.9	66
Colorado Trail	3.3	3.1	96
Gashouse Gulch	1.6	1.2	71
Homestead	2.9	1.2	41
Miller Gulch	4.3	3.0	68
Narrow Gauge	0.2	0.0	0
Skipper	1.5	0.4	29
Strawberry Jack	1.9	0.0	0
Total	**19.6**	**10.9**	**56**

3.5.3 Visuals Affected Environment

Analysis Area for Visual Resources

The analysis area for Visual Resources, including both the existing condition discussion and analysis of alternatives, includes the areas of proposed activities, major and secondary access roads, staging areas for proposed activities, adjacent recreational use areas, and surrounding viewsheds where the appearance of the proposed activities may alter landscape quality and sensitive views. Viewing locations within foreground (within 0.5 mile) and middleground (0.5 to 4.0 mile) distances have been assessed for representative residential, highway and roadway, and recreational land uses.

The Visual Resources Project Area is defined to include landscapes directly affected by the proposed activities and surrounding lands within three miles, which may be visually sensitive to changes in the seen environment. Beyond three miles, visual changes in the seen environment will be difficult to discern.

Visual Characterization of Project Area

The Project Area is characterized as mountainous terrain with an aspect-dependent dry continental forest. Precipitation is around 20 inches per year, with approximately 50 percent occurring in the form of snow. Elevations generally range from 6800 feet to 8000. The higher elevations are found in the western and central portion of the Project Area, while less dominant ridge and mountain features are found to the east, at elevations around 6800 feet. The mountainous terrain creates undulating lines on the landscape. Slopes are predominantly moderate to steep, with steeper terrain, jagged textures and patterns occurring on rocky peaks such as Raleigh Peak and Chair Rock. Other named mountains include Baldy Peak and Redskin Mountain. Some of these peaks are used for rock climbing, with their jagged rock faces soaring above the forest slopes.

Vegetation primarily consists of mixed conifers, including lodgepole pine and Ponderosa pine, with understories of aspens, native shrubs and grasses. Overall, the conifers create homogeneous, medium textures throughout much of this landscape. Increased vegetation diversity and patterns are created where deciduous aspen trees and grasslands occur in dispersed meadows. Overall, textures range from coarse textured escarpments on rocky mountain peaks to medium textures where conifers dominate.

In addition to the North Fork of the South Platte River, there are several intermittent streams and incised drainages including Buffalo Creek and Spring Creek, and Miller Gulch and Buck Gulch. Drainages typically create localized vegetation patterns, which contrast with adjacent grasses or conifers.

Cultural modifications primarily consist of rural residential subdivisions and second homes, historic structures, forest service facilities, and a network of unpaved roads and trails. No major federal or state highways are found within the Project Area. The county roads providing access through the Project Area include Park County Roads 68 and 70, Jefferson County Highway 126 and Jefferson County Road 96..

Overall, the scenic attractiveness of the mountains would be considered Class B, with some Class A scenery occurring where the landscape is viewed against more dominant peaks to the west. The predominant character of the Project Area, including most National Forest System lands, is a classic western landscape with ponderosa pine, aspen, meadows and rock outcrops. Existing scenic integrity ranges from moderate to low. Undeveloped landscapes generally are perceived to have high scenic integrity, while landscapes with utility corridors, other developments and dispersed residential uses contribute to low to moderate scenic integrity conditions.

Scenic Management System and Visual Resource Definitions

The Scenery Management System (SMS), adopted by the USFS in 1995 (USDA Forest Service, 1995), has been used to evaluate the quality of scenery for the Crossons-Longview Project. The SMS system employs a systematic approach for analyzing landscape character, including scenic attractiveness and scenic integrity, and landscape visibility associated with sensitive viewers. Several key terms from the USFS's SMS methodology are used in the Existing Condition and Analysis of Effects discussions to describe the visual resources of the Crossons-Longview Project Area and possible effects of the alternatives on those resources.

- **Landscape character** - consists of the physical, cultural, and biological attributes that make a landscape identifiable, unique, or give it a memorable sense of place.
- **Scenic attractiveness** - a measure of the visual appeal of a given landscape. Scenic attractiveness factors consist of landforms, vegetation, water, rock forms, adjacent scenery, cultural modifications and scarcity. The SMS system applies one of three ratings to NFS lands:
    - ***Class A*** – landscapes with distinctive or outstanding diversity or interest
    - ***Class B*** – landscapes with common or average diversity or interest
    - ***Class C*** – landscapes with minimal diversity or interest
- **Scenic integrity** - a measure of the intactness associated with the visual elements that define a landscape character unit and can range from Very High to Unacceptably Low. Scenic integrity is defined in the SMS system according to six levels, defined below.

- ***Very High*** – The valued landscape character 'is' intact with only minute, if any, deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- ***High*** – The valued landscape character 'appears' intact. Deviations may be present but must repeat form, line, color, texture and pattern common to the landscape character so completely and at such scale that they are not evident.
- ***Moderate*** – The valued landscape character 'appears slightly altered'. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- ***Low*** – The valued landscape character 'appears moderately altered'. Deviations begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect and pattern of natural openings, vegetation type changes, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but compatible or complementary to the character within.
- V***ery Low*** – The valued landscape character 'appears heavily altered'. Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural opening, vegetation type changes, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain (landforms) so elements such as unnatural edges, roads, landings, and structures do not dominate the composition.
- ***Unacceptably Low*** – The valued landscape being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern, or scale from the landscape character. Landscapes at this level of integrity need rehabilitation.

- **Landscape Visibility** - a measure of discernible detail in the landscape, relative to the viewer and their viewing conditions. Landscape visibility is a function of many, interconnected factors, including context of viewers, duration of view, degree of discernible detail, seasonal variations, and number of viewers. Landscape visibility is documented by assessing three elements: sensitive viewers, concern levels, and distance zones.
    - ***Sensitive Viewers*** - Constituents evaluated as 'sensitive viewers' depend on their viewing locations, visibility conditions, and activities and attitudes towards scenery and potential changes to landscape character. In the National Forests, Sensitive Viewers are typically found on travelways and use areas such as local roads, campgrounds, hiking trails, as well as lands generally used for dispersed activities such as hunting, photography, wildlife viewing and general solitude experiences. On private lands, sensitive viewers may be found where residents and visitors live and recreate.
    - ***Concern Levels*** - Concern levels are a measure of the degree of public importance placed on landscapes viewed from travelways and use areas. Three levels – 1, 2, and 3 are used to denote the intensity of viewer concern, based on type of use and volume of use. Input received from public scoping comments is an additional factor in determining concern levels.
    - ***Distance Zones*** - defined in the SMS system according to:

        Immediate Foreground – 0 to 300 feet
        Foreground – 300 feet to ½ mile
        Middleground – ½ mile to 4 miles
        Background – 4 miles to the horizon

3.5.4 Visuals Environmental Consequences

Analysis Methods

The analysis of visual resources involved examining the effects of treatment activities when viewed from foreground, middleground, and background distances from visually sensitive areas. For this project, rural travel routes and popular recreation areas were considered to be visually sensitive areas. Landscape visibility (Sensitivity) is defined as a measure of an area's potential sensitivity to visual change (USDA Forest Service 1996). Visual sensitivity considers viewer volumes, the purpose of their trip, and how long they visit an area. Areas considered to be potentially sensitive to visual changes include designated park and recreation areas, travel routes, and residential areas. Landscape visibility is important for its scenic quality, aesthetic values, and landscape merits.

The analysis is intended to analyze potential visual impacts at a landscape level, rather than in a particular location or locations. The exact locations of the treatments have not been determined at this time, so the analysis focuses on potential impacts to visual resources at the landscape level from foreground (0 to 0.5 miles), middleground (0.5 to 4 miles), and background (greater than 4 miles) distances.

Effects Common to All Alternatives

Some level of disturbance to visual resources would occur under all alternatives. Wildfires pose a risk to visual resources and all alternatives would have some risk of wildfire. Wildfires could impact the visual integrity of the area potentially leaving behind areas with burned trees, disturbed soils and signs of human disturbance such as areas of cut trees as a result of fire suppression efforts. At the time of the fire, smoke could impact views. The degree of disturbance would depend on the size and severity of the fire. Alternative A would have the greatest risk of a larger, more intense wildfire. Although the risk of disturbance from a large fire is less for Alternatives B and C, these alternatives would result in some disturbance to visual resources from forest treatments. Changes in the scenic environment, particularly from foreground viewing, would likely be evident with all alternatives.

Alternative A - No Action

Direct and Indirect Effects

Alternative A (No Action) poses the greatest risk of a large-scale, high intensity wildfire that could affect visual resources. The term intensity in fire science means how hot the fire burned. However, the impacts of the fire on the ground and to visual resources is called severity.

Wildfire could impact the visual character of the area and potentially change the landscape character, scenic attractiveness and scenic integrity, particularly in the short-term. The significance of the impacts to the visual resource would depend on the size and severity of the fire. Alternative A would have the greatest risk of a wildfire that could produce significant visual impacts. Should a fire occur, direct effects would include forest visitors viewing smoke and management actions taken to suppress fires such as cutting of some trees and disturbing soil to create fuel breaks. However, these effects would be short-term and, as a result, would be less than significant. Indirect effects would include changes in the visual landscape, such as charred soils, which

can also cause water repellency, burned understory vegetation, and scorched or completely burned trees. The duration of the visual effects would depend on the severity of the fire, which is related to fire intensity. Short-term impacts may last from two to five years post-fire, for many low severity fires. A low severity fire is characterized by minimal, short-term ecosystem effects. Soils are not heated, and overstory vegetation is rarely affected. The result of a low-severity fire is fuels reduction and topkill of understory vegetation. The existing scenic attractiveness of Class B and scenic integrity of moderate to low would not change due to the impacts of a low severity fire. These fires would have less than significant effects.

However, a large, high severity fire could change the visual landscape and potentially have both positive and negative effects. The scenic character of the forest could change from a forested landscape to a more open landscape with varying stands of trees (aspen and multistoried stands) and meadows. These changes would affect the scenic attractiveness by potentially opening up viewing areas in a previously dense forest. These effects could be considered positive. Both the Scenic Attractiveness (Class B) and Scenic Integrity (moderate to low) would be maintained. However a high severity fire could also have long-term potentially negative impacts as well. The 1996 Buffalo Creek Fire burned nearly 12,000 acres of trees and left an open forest mosaic, which changed the scenic character and scenic attractiveness of the area. A high-severity fire affects large acreages and is expressed by complete fuel consumption and extensive soil heating, and usually more than 70 percent top-kill of vegetation. In some areas the Buffalo Creek Fire would be considered a high severity and high intensity fire. In those areas, revegetation 18 years after the fire is still limited and trees are not successfully reestablishing. Stands of fire-killed trees are still visible. The visual changes from the Buffalo Creek fire are long-term and significant. A high severity fire in the Project Area could affect the scenic character, change the scenic attractiveness to a Class C, and affect the scenic integrity of the Project area a level lower to a landscape character of Low to Very Low.

Cumulative Effects

There are no foreseeable projects affecting visual resources in the Project Area, including any other fuel reduction projects which could help to restore more natural forest conditions that are resilient to fire, insects and diseases. Past fire suppression policies and implementation have created hazardous fire conditions throughout much of the Project Area. It is likely that wildfire suppression would continue due to the history of large, destructive fires in the area combined with the proximity of residential areas. Therefore, cumulatively, this alternative would continue the trend of increasing forest fuels and therefore a corresponding increase in insect and disease outbreaks, potential high severity fires, and other consequences of deferred forest management. However, past large wildfires in the area have altered the character of the forest including a large portion of the Project Area. Should a large, intense fire occur in the unburned portions of the Project Area, the cumulative effect could be a cumulative change in the Scenic Attractiveness Class and Scenic Integrity of the area.

Alternative B

Alternative B proposes vegetation treatments including thinning, creating openings, and prescribed burning (piling and burning and broadcast burning) on 9,574 acres within the Project Area. This alternative also proposes construction of temporary roads. It is expected that the proposed treatments would take ten years to complete.

Direct and Indirect Effects

Alternative B (Proposed Action) has the potential to affect views from popular recreation areas and travelways. The direct visual effects would include the presence of heavy equipment on sites to be treated, presence of slash, soil disturbance, fugitive dust and, when prescribed burning is being conducted, the presence of smoke. Effects such as fugitive dust and soil disturbance would only be visible within foreground distances. However, effects of thinning, piling and burning, broadcast burning, and temporary roads would be visible from middleground and background distances. These effects would be short-term; likely lasting for the period of time required to complete the treatments in a particular location as well as the time to complete revegetation of temporary roads. These effects would be less than significant. Overall, the scenic attractiveness would remain Class B, with some Class A scenery occurring where the landscape is viewed against more dominant peaks to the west. The scenic integrity would not change and would remain at moderate to low due to few changes in ongoing activities in the area and the type of treatments that would occur, which would maintain the integrity of the forest, but provide less dense canopies.

Indirect visual effects would include long-term changes in views of the forested landscapes. Figure 25 depicts two areas, one with and one without treatment, from a foreground distance. The left side of the photo shows treated conditions and allows the viewer to see to the forest floor. A decreased density of trees is also apparent. In terms of changes in lines, texture, form, and color the differences between treated and non-treated areas would not be apparent to most viewers.

Alternative B could also provide long-term beneficial impacts on visual resources in treated areas by increasing age class diversity, which is a factor in determining variety class (A, B, or C). The thinning would also provide better views for trail users through formerly dense forest trails. Tree species diversity would also be likely to increase including more aspen trees and greater variety of understory vegetation due to a more open canopy.

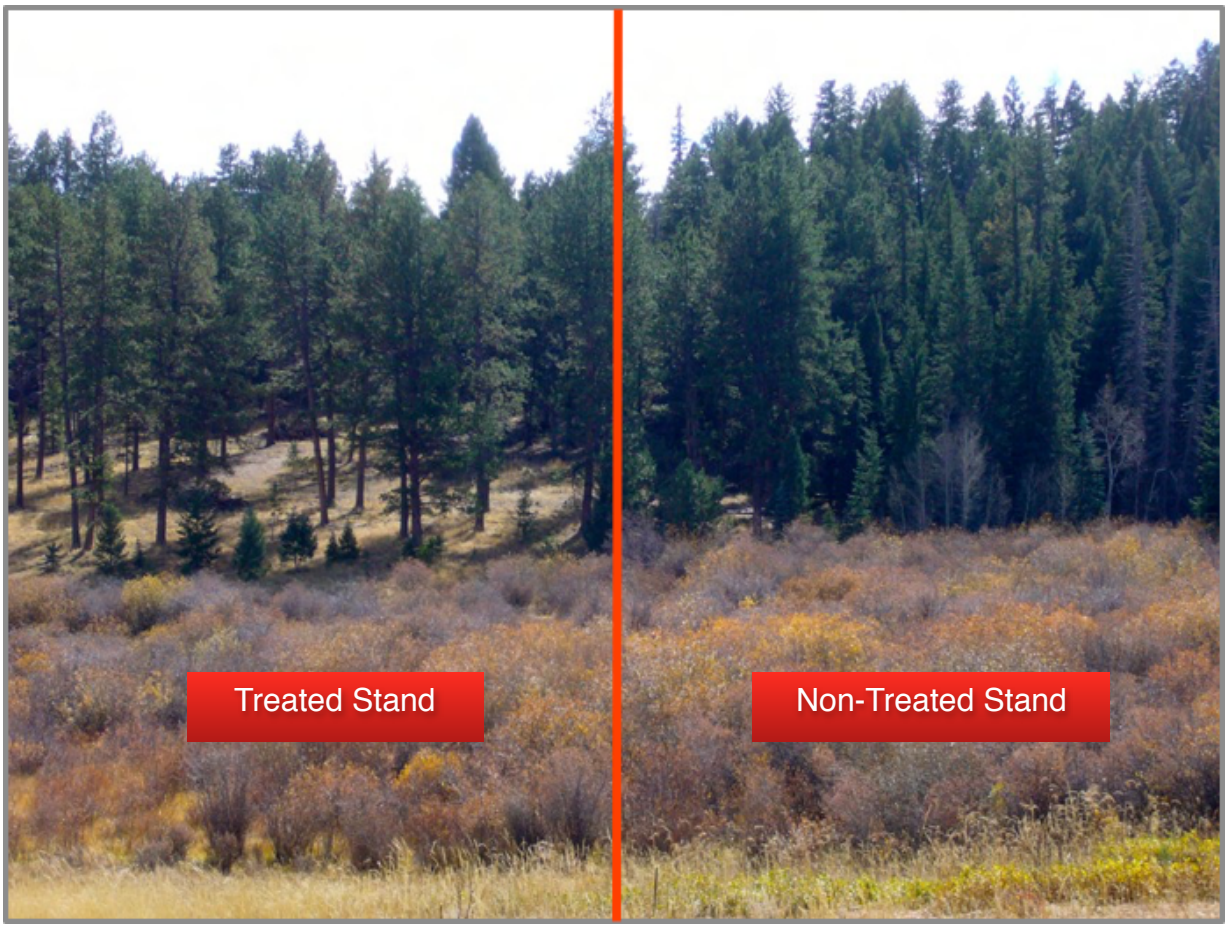

Figure 25. Comparison of Treated and Non-Treated Stands

Alternative B treats the largest area of the alternatives and would therefore result in the lowest risk for a large, intense wildfire. The impacts from wildfire on visual resources as discussed for Alternative A would still be possible, however, the fuels reduction treatments would reduce the long-term risk of a large, intense fire and increase the possibility that fires, should they start, would be limited in size and intensity and would be easier to control. Residents and other recreational users who are familiar with forest treatments are likely to prefer the visual impacts related to treatments compared to the visual consequences of a large scale, high severity and high intensity fire, where scenic character, attractiveness, and integrity could be altered (see description of effects of this type of wildfire in Alternative A). These visual effects would include openings in the forest mosaic, thinning of dense canopies, and less evidence of insects and disease due to increased resiliency,

Alternative B would have no significant adverse impacts on visuals, particularly if visual design criteria are met, because the treatments would not change the existing Class or Scenic Integrity of the area. Long-term, Alternative B could provide benefits to the visual environment by increasing the diversity of vegetation, opening the forest canopy, and creating a more historical landscape character in treated areas. Additionally, this alternative lessens the risk of unacceptable resource damage from high severity wildfire,,which could cause landscape scale visual impacts that lasts several decades.

Cumulative Effects

There are no foreseeable projects affecting visual resources in the Project Area, including any other fuel reduction projects. Therefore, there are no other vegetation treatments or road construction that would cumulatively impact scenic resources or change the existing Class or Scenic Integrity of the area. However, past fire suppression policies and implementation have created a high fuels level throughout much of the Project Area. This alternative proposes treatments that would reduce forest fuels in proposed treatment areas throughout the Project Area. The risk of large, intense wildfire that could combine with other, previous large fires to change the Scenic Attractiveness Class or Scenic Integrity of the area would be reduced for this alternative. Past wildfires in the area have altered the character of the forest including a large portion of the Project Area. This alternative would treat areas surrounding the previously burned areas, preserving their character.

Alternative C

Alternative C proposes vegetation treatments including thinning, creating openings, prescribed burning, and removing trees on 6,326 acres within the Project Area. Minimal temporary roads would be constructed to access treatment areas. It is expected that the proposed treatments would take ten years to complete.

Direct and Indirect Effects

Impacts from Alternative C would be similar to those described in Alternative B. Since the treatment area is about half as large as Alternative B and minimal temporary roads would be constructed, impacts to visual resources from the treatments would be less than significant, particularly with implementation of visuals treatment design features. As discussed for Alternative B, over the long-term, treatments would be considered beneficial due to more open viewing of the forest and surrounding areas due to thinning activities and the positive changes introduced with more aspen forests and meadows. Because minimal temporary roads would be constructed, the potential short-term visual impact from road construction activities and roads discussed for Alternative B would not occur.

As discussed for Alternative B, the treatments would lower the risk of a large, intense and visually damaging wildfire. However, given that this alternative treats roughly half of the area of Alternative B, the risk would not be lowered to the same extent as Alternative B. Additionally, because of the no new roads constraint, including temporary roads, this alternative may not be able to access some of the higher priority stands that can be treated by Alternative B.

Cumulative Effects

The cumulative effects of Alternative C combined with other past, present and foreseeable actions are the same as discussed for Alternative B. Although the creation of forest conditions that are resilient to fire, insects, and diseases, would be less than Alternative B, and therefore wildfire risk, would be greater than Alternative B.

3.6 Socio-Economics

3.6.1 Socio-Economics Affected Environment

The project area is located within unincorporated Jefferson and Park counties. Jefferson County is over 84 percent unincorporated and located within and west of the Denver metropolitan area. The incorporated portion of Jefferson County is represented by the western portion of the Denver metro area. Park County is located in the mountains, west of Jefferson County and is predominantly rural, unincorporated with few population centers. The project area is however in close proximity to the large Denver metropolitan area thus a popular attraction for recreational activities within easy driving distance.

Unincorporated Jefferson County contains approximately 260 square miles of parks, open space, and open lands. This is equivalent to about 40 percent of the total land area in unincorporated Jefferson County. These open areas include; Jefferson County Open Space Parks, Denver Mountain Parks, United States Forest Service land (Pike San Isabel Cimarron and Comanche National Forest-PSICC), Colorado State Parks, and parkland owned by a variety of Park and Recreation Districts.

Park County has a total of 2,194 square miles of land area, with a population density of only 7.33 per square mile. Unincorporated Park County also has a large number of parks, public lands, and open spaces. Most of the developed parks and open spaces are not in the vicinity of the project area. However, the Lost Creek Wilderness Area is located adjacent to the project area where there are trails and wilderness activities including the Colorado Trail, Brookside McCurdy Trail, and Craig Creek Trail. Most of the open space in Park County near the study area is federally owned.

Local and Regional Economy

The unincorporated communities and residential subdivisions near the Crossons-Longview project area include the following residential areas or residential units within Jefferson County (within the project area or just outside the project area): Longview, Dome Rock, Foxton, Ferndale, Riverview, Crossons in the project area, and South Platte, Cliffdale, Sphinx Park, Pine Grove, Buffalo Creek, Indian Springs Village, just outside the project area. In Park County the following residential areas are located within the project area: Estabrook, Insmont and Bailey. In addition there are homes along US 285 and County roads (64) , west of Bailey. These residential communities which also include some commercial and industrial uses from the wildland/urban interface along the project area boundaries, and are most likely to be affected by the proposed project.

Changes in flexible work place, transportation, and communications have allowed people to continue working for city-based companies while living in rural or mountain communities. Most of the full-time residents of these communities commute to jobs outside of the immediate area. Other residents depend on tourism-based and forest resource-related activities for their economic livelihood. These activities include collecting wood products, hunting, outfitters and guides, and ranching, however these uses do not represent a large percentage of residents or a large part of the study area economic base. Still others telecommute or work out of their homes as small entrepreneurial businesses. Many residents surrounding the project area consider forest resources and forest health an important part of their quality of life.

Population

Population growth near the project area has been high for the last decade. The high growth rate has occurred despite the large proportion of public land in the area, primarily because residences in the area are located near U.S. Highway 285 and within a 30- to 40-mile commute to jobs in the Front Range of Colorado. It is anticipated that this area will continue to grow at a higher rate than the average in Colorado for the foreseeable future. It is likely that the communities around the project area will continue to draw new residents. The growth trend for the area may be slower in future decades than it was between 2000 and 2010 because of the limited availability of land to develop for residential uses.

Jefferson County encompasses the far western portion of the Denver metropolitan area including parts of Westminster, Arvada, Wheatridge, Lakewood, Littleton, Morrison, and Golden, but also extends into the Front Range Mountains with smaller communities such as Conifer, Shaffers Crossing, Pine Junction, Evergreen, Aspen Park, many mountain parks and recreational areas and national forest lands. The population of Jefferson County is estimated at 551,798.

The population in Park County is estimated at 16,121. Only a small portion of Park County is within the project area, but includes the town of Bailey and the Pike National Forest. Park County extends across the mountains over Kenosha Pass into South Park with other small communities.

Census tracts 0809300200 Block Group 2 in Park County, 080590120.58 Block Groups 2, 3, and 4, and 080590120.36 Block Group 1 represent the population base within the project area and surrounding vicinity. Some surrounding census tracts within a two mile buffer radius include census tracts 08093000100 Block Group 3 and 0809300200 Block Group 1 in Park County, 08059012058 Block Group 1 in Jefferson County, and 08035014300 Block Group 1 in Douglas County.

From 2000 to 2010 the population of the entire census tract 080590120.58 only grew by 3 people. Within the two block groups represented in the project area, total population for both block groups (which extend far beyond the project boundary) is only 2,284. There are relatively few people living within the project area; however there are many rural residential developments within close proximity.

Population growth has many implications related to fire hazard and the need for fuel management. With more people comes greater hazard of human-caused wildland fire. Increased population also tends to increase property values and development, which increases potential losses from wildland fire.

Employment and Income

About 72 percent of Jefferson County resides in the foothills with the eastern portion located in the plains. Jefferson County has easy access to all major arterial highways and is close to downtown Denver. The County is considered a primary job creator in the State with over 62,250 firms. Employment in the county includes the aerospace industry, renewable energy, and research and development. The National Renewable Energy Laboratory, US Department of Energy's primary national laboratory for renewable energy and energy efficiency research and development is located in unincorporated Jefferson County. Many workers who live near the project area commute to jobs outside the area. For those workers who commute to work from near the project area, jobs are dominated by government, retail trade, health care and social services,

accommodations and food, and professional and technical services. Other industries such as manufacturing and construction are also well represented in the county.

According to the Colorado Department of Labor and Employment, 8,489 residents were employed in December 2013 in Park County. By comparison, 2,159 workers were employed within the county during 2012, which suggests that 75 percent of the adult workforce commutes to work outside the county due to relatively few employers in Park County and higher wages in neighboring counties. The largest employers in Park County include public administration (408 workers), education (399 workers), food and lodging (334 workers), construction trade (227 workers), retail trade (190 workers), and professional and technical services (122 workers). As in previous years, public administration and educational services employed the most workers within the county in 2012. Because the local economy is now largely driven by seasonal tourism and construction, employment data reflect fluctuations in these industries. In contrast, employment in manufacturing, communications, and health care remain fairly constant throughout the year.

The demand for second homes and new homes for an incoming population has stimulated the construction industry. The retail trade, and accommodation and food sector is also of relatively greater importance, as is typical of economies that depend on tourism and recreation. Wildland fires near the project area and in other parts of the state in 2002 and 2011 had a role in reduced tourist visits to Colorado, as media coverage of wildland fire incidents was extensive in the national press.

Housing

In 2012 the estimated number of housing units in the Census Tract Block groups represented in the project was 1,343 units. These census block groups extend well beyond the project area, however the number is representative of the number of units that may be affected by the proposed project activities if a high intensity fire would occur. The median housing value of an owner occupied home in census tract 120.58 was $333,100 in 2010 compared to $247,015 in all of Jefferson County in 2013. In Park County the median home value for an owner occupied unit in 2012 was $249,600. If a wildland fire were to occur in the vicinity some of these homes could be affected. A large-scale wildland fire has the potential to influence housing within two miles of the burned area (USDA Forest Service, 2002). Residential properties are most at risk for damage from wildland fire. Residential properties are most likely to be located next to forested areas, at greater distances from major access roads than other property types. Commercial and mixed use properties are generally located near U.S. Highway 285, and would have a smaller risk of damage from wildland fire because fire protection providers would have easier access to these properties since they are close to major thoroughfares. It is likely that many vacant properties would be developed with residential units to accommodate projected population growth in the near future and provide second homes in the area.

Community Services

The PSICC shares wildland fire suppression resources with other federal government agencies nationwide. Interagency wildland fire crews are dispatched where they are needed. Fire protection in the project area is provided by the PSICC, the Platte Canyon Fire Protection District (FPD), the North Fork FPD, and the Elk Creek FPD.

The Platte Canyon FPD serves the project area around Bailey in Park County with a wide range of emergency services. Demand for services increases by 45 percent due to tourists passing through the District (.http://www.plattecanyonfire.com/). Services include protection from fires; basic life support and medical assistance, chopper landings for emergency services, educational and training programs in fire and personal safety for firefighters and community (especially at public schools); CPR classes; wildland mitigation programs; swift water and ice rescue; mutual structural and wildland trainings between six surrounding fire departments. The district is a volunteer department with 65 volunteers, one paid fire fighter, and four stations. At all times there is adequate fire equipment spread between the four stations on the district to rapidly respond to all local fire calls and emergencies.

The Elk Creek FPD has 65 personnel in four fire stations in Richmond Hill, Pine Junction, Conifer Mountain Area, and Aspen Park. The district serves 98 square mile area in parts of western Jefferson County and eastern Park County and communities of Aspen Park-West, Bailey, Broken Arrow, Conifer, Cub Creek, Elk Falls, Evergreen Meadows, Evergreen South, Glen Elk, Hillview, Pine Valley, Pine Junction, Richmond Hill, Shaffers Crossing, Silver Springs and Wandcrest (http://www.elkcreekfire.org/ECFD/Welcome.html) . http://5280fire.com/?page_id=3011).The district population is an estimated 15,000 residents. Elk Creek Fire is a mostly volunteer combination Fire Department, staffed with 60 plus members, 8 career Fire Fighters / EMS providers, 3 Administration / Fleet, 12 plus Support Team and a full fleet of equipment for fire, wildfire and medical emergencies.

The North Fork Volunteer FPD provides structural and wildland fire suppression, emergency medical care and transport, rescue and fire prevention services to the mountain communities of Pine Grove, Buffalo Creek, Deckers, Trumbull, Oxyoke, Nighthawk and Scraggy View (http://www.northforkfire.org/). North Fork Volunteer Fire Department covers 306 square miles in southern Jefferson and northwest Douglas Counties in Colorado. Pike National Forest composes 80% of the District. While the number of residents in the District is approximately 1700, it is estimated that Pike National Forest has over one million people visit this division of the forest every year. North Fork utilizes three type I engines carrying 1000 gallons of water each, three tenders (or type III engines) carrying 2000 gallons of water each and one heavy rescue for structural operations. North Fork Volunteer Fire Department provides structural fire suppression services to over 500 residences and businesses.

There is a broad range of hospitals, clinics, and other medical services within a 1- to 2-hour driving distance in Front Range urban communities.

3.6.2 Socio-Economics Environmental Consequences

The analysis includes quantitative and qualitative components. The qualitative components generally support the social analysis and the quantitative components support the economics analysis. The economic analysis methods and assumptions are described below.

Financial Efficiency Analysis

Financial efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received on the project. The main criterion in assessing the financial efficiency of each alternative is Present Net Value (PNV), which is defined as the discounted value (at 4 percent) of agency revenue minus agency costs. When considering quantitative issues, financial efficiency analysis offers a consistent measure in dollars for comparison of alternatives. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important - but recognizes that non-market values are difficult to represent with appropriate dollar figures. The values not included in this part of the analysis are often at the center of disagreements and the interest people have in forest resource projects. Therefore, financial efficiency should not be viewed as a complete answer but as one tool the decision maker uses to gain information about resources, alternatives, and trade-offs between costs and benefits.

PNV is an economic measure that accounts for all current and future costs and benefits within the treated units in a single dollar figure. Future costs and benefits are estimated and discounted into today's dollars and added to the current project costs and benefits. The result is a figure that can be compared across alternatives representing the total financial impact over the life of the project. Because a dollar is worth more now than it would be in the future, discounted costs and benefits are smaller figures. For example, a benefit of $1,000,000 in 100 years is worth about $20,000 today using the standard government discount rate of four percent.

This economic analysis compares direct monetary costs and benefits associated with the Crossons-Longview Forest Restoration Project for each proposed alternative. It provides the decision maker with comparative information on the relative economic effects of the alternatives. This analysis does not evaluate the economic effects of indirect and/or unquantifiable costs and benefits that may be related to erosion control, prevention of widespread high intensity forest fire, potential economic loss of private property from high intensity fire, impacts to water supply systems and reservoirs downstream of the treatment areas, or any potential impacts both beneficial or adverse to wildlife species or recreational resources within the project area.

The EA evaluates three alternatives, Alternative A – No Action, Alternative B - Proposed Action, and Alternative C. This document describes the analysis conducted on the economic effects of implementing the forest restoration project for each alternative and estimates the NPV of vegetative treatments and associated costs and revenues generated from commercial harvesting of timber salvaged from the restoration project. An economic efficiency spreadsheet model was developed to complete the analysis, discounting current costs over the 10-year period using a US Forest Service standard discount rate of 4 percent (Appendix C). The NPVs to the Forest Service are calculated based on the direct costs and benefits per year for implementing and maintaining Alternative B - Proposed Action.

The quantifiable economic benefit for this project is the expected gross receipts to the Forest Service from the sale of commercial timber. In addition to the vegetative treatments of the proposed action, timber sale preparation and administration, road maintenance and temporary road construction, and completion of the environmental analysis (EA) are representative costs analyzed for the two action alternatives of the Crossons-Longview Reforestation Project EA.

Economic Assumptions Used in the Analysis

The following assumptions were used in this financial efficiency analysis:

1. Xeric ponderosa pine, mesic ponderosa pine and mixed conifer would yield similar timber volumes and income, estimated to be $100 per acre through timber sale contracts where traditional harvesting equipment and commercial product removal would occur. In xeric ponderosa pine, mesic ponderosa pine and mixed conifer on slopes greater than 35% and greater than 0.5 miles from roads, hand treatments would occur at a cost of $500 per acre.
2. Timber sale preparation costs average $40 per acre which is applied to xeric ponderosa pine, mesic ponderosa pine and mixed conifer.
3. Lodgepole pine, aspen and shrubland treatments would all be completed at a similar cost estimated to be $250 per acre. These treatments would likely be completed through a stewardship contract at cost.
4. Administration costs are $25 per acre and apply to all treated acres
5. Prescribed fire would be used in all treatments to reduce activity fuels. The cost for prescribed fire is $65 per acre.
6. Temporary roads would cost $500 per mile to construct and abandon.
7. Some existing roads would require maintenance, including resurfacing and drainage work. This maintenance would cost $250 per mile.
8. The analysis is in terms of 2014 dollars.
9. Both treatment costs and revenues from timber salvage are discounted over the 10 year project. Costs for road maintenance, temporary roads, and completion of the EA are anticipated to be expended in the first year.
10. It was assumed that total wood volume would be processed in each implementation year throughout the 10 year life of the project.
11. Above assumptions are based on past projects within the Upper South Platte and interviews with Arapaho-Roosevelt National Forest staff regarding costs of forest treatments completed by the Long-term Stewardship Contract.

Since both Alternatives B and C are similar except in scope of number of acres treated and the use of temporary roads, the socioeconomics impacts are anticipated to be similar over the 10 year life of the project. The addition of temporary roads in Alternative B would require some road building, but the overall employment and time frame effects of the road building and decommissioning through the 10 year period is considered to have a minimal effect on the overall socioeconomic impacts. The same crews would likely build the temporary roads. Population is not anticipated to grow significantly within the project area since much of the land is public land; however population will continue to grow in the broader study area to some degree.

Alternative A (No Action)

Alternative A (No Action) would have no direct effect on the socioeconomics of the Crossons-Longview Project Area. No vegetation treatments would be implemented under this alternative. The indirect effects are discussed below.

Implementation of this alternative could affect the local economy as well as state and federal budgets due to both the risk of fire and the resulting outcome if a large-scale, high-intensity fire would occur. This alternative, the no-action alternative, would not implement any vegetation treatments and therefore has a higher risk of wildland fire than the other two alternatives. Should a large-scale fire occur in the project area, there would be a broad range of possible outcomes on the social and economic resources of Jefferson and Park County. The total cost of the fires within the project study area such as the Buffalo Creek, Lime Gulch, High Meadows, and North Fork Fires would include costs associated with suppression, rehabilitation, insured property losses, uninsured property losses, timber destruction, and other resource losses including losses to the water storage system.

Population

Effects of wildland fire at the wildland-urban interface would likely cause a temporary decrease in the population of communities and subdivisions. If a fire occurred, the rate of residential development would decrease in the years following a wildland fire because the area may be considered less attractive due to the remnants of the burned trees and scorched land. This effect would continue until damages to local property owners and businesses are recovered, and the economy could once again provide the opportunities of the pre-fire economy.

Employment and Income

Likely impacts on employment and income from a high intensity fire would include decreases in tourism and visitation to natural areas within the project vicinity for the short term. A large-scale wildland fire that involves major fire damage to properties would have the greatest effects to the local economy, and would be felt through all businesses in the local economy for a long period. The direct effects to the local economy would continue until the scenic landscape has been re-established and property damages have been recovered. Indirect effects include the economic recovery of the area that would take place after the re-establishment and recovery of resources and properties.

Housing

Treatments in the project area directly and indirectly affect the safety and preservation of housing outside the project area. Low intensity fire within the project area may be easier to control and keep the fire from leaving the project area. Whereas high intensity fire may be more difficult to control within the project area and it may escape into buffer areas. Destruction of houses outside of the project area is also a function of hazardous fuels reduction immediately surrounding the houses. While any alternative, including a no-action alternative, within the project area, can have potential impacts on residences outside of the project area, the Forest Service does not have control over the actions of private landowners.

Hypothetically, assume a high intensity wildland fire destroyed an estimated 132 (10 percent) of the total 1,324 residences valued at $290,000 each, located in the major Census block groups within the project area. The value of those losses would be $38 million at full market value. If only a 60 percent loss occurred the estimated loss in value would be $23 million. In addition the loss of property taxes for the two counties would be substantial. In the future, the number of homes and the value of all properties are likely to increase. In the

short-term, a large-scale wildfire could cause substantially higher losses than those discussed above. However, if private land owners are diligent at creating defensible space on their properties less property damage may occur.

Community Services

If a wildland fire occurred, it is likely that all of the existing fire protection resources in the project area would be involved in any large-scale wildland fire suppression effort. Interagency wildland fire crews would be dispatched from other areas as needed. Many local firefighters are volunteers, and would incur lost income because they would not be working at their regular jobs for the duration of a wildland fire unless they become paid cooperators after the mutual aid time period or when a fire is determined to be a federal fire. Many provisions for pay are also in place for fire department personnel working on fires outside NFS lands by the state or other pay type arrangements are made with employers. In some cases, fire pay can be greater than what a minimum wage individual is making,

Local emergency care and ambulance service is provided by the North Fork FPD, Elk Creek FPD, and Platte Canyon FPD. In the event that a wildland fire caused numerous injuries, the local emergency care and ambulance services may find it difficult to provide adequate emergency care. There are injuries and potential loss of life for firefighters as well as residents and visitors. Health problems could appear or be exacerbated by the inhalation of smoke. Local emergency care would need to be supplemented by additional personnel from nearby agencies.

Alternatives B (Proposed Action) and C

Population

The project would not have noticeable direct or indirect effects on population. The skills and services required for the project would be provided by current US Forest Service personnel or by contractors or timber merchants. The long-term effect of vegetation treatment activities would be to decrease the potential for large-scale wildland fire and creating forest conditions that are resilient to fire, insects, and diseases.

This may contribute to the attractiveness of the region as a residential and recreational destination, supporting continued growth of the local economy and the permanent population.

One indirect effect of this alternative could be a perceived loss of privacy for homeowners adjacent to treated areas because the forest structure would be thinned and sight distances increased. However, this would only affect a small number of homeowners immediately adjacent to treated areas. This effect may be offset by the perception that future wildland fire hazard has been reduced, with evidence of this change available for viewing on adjacent forestlands. Because of the recent Buffalo Creek, Lime Gulch, Hi Meadows, and North Fork fires and associated property losses, it is likely that many residents would prefer the reduced fire hazard, even at the cost of reduced privacy. For example, surveys of residents in a nearby communities showed a strong preference for using various types of fire and fuels management tools, as opposed to taking no action at all (Kent et al., 2003).

Employment and Income

The primary goal for treatment is fuel reduction, which leaves most of the larger trees. However, the vegetation treatments would produce a variety of wood products ranging from saw timber, to post and poles, firewood, and chips for biomass projects. Timber harvest and other service contracting opportunities would be available to local wood products companies and some employment would be supported by thinning, harvesting, and other activities. If contractors from outside the community are selected for the project, a minor economic benefit may be realized by local stores, restaurants, and other businesses; however, this effect is expected to be relatively small compared to the effect of ongoing residential and recreational activities in and near the project area.

Employment and income from tourism activity is important in the local area. Much of this activity is based on recreational opportunities on NFS lands, including the project area. Treatment activities would temporarily displace some dispersed uses such as various motorized and non-motorized activities, wildlife viewing, hunting, and backcountry recreation, including guided activities by outfitter guides under Special Use permits. The restriction or displacement of recreational activities and any subsequent economic effects would be temporary. There are several substitute sites for any displaced activity. In addition, only a small percentage of the project area would undergo treatment at any one time. It is not likely that the overall number of persons engaging in these activities would change because of treatment; therefore, there would be no measurable economic effect from the displacement of recreational activities.

Housing

It is anticipated that the workforce to implement the proposed treatments would comprise a combination of current US Forest Service personnel and contractors. Contractors could be local or could come from outside the area. In the event that additional workforce from outside of the region is required for project activities, there would be a relatively small demand for temporary housing that could be accommodated by existing resources. Nearby communities provide a range of temporary and seasonal housing. In addition, outside contractors may use travel trailers during the time they are working on the project.

The intent of the project is to restore sustainable forest conditions that are resilient to fire, insects and diseases with an outcome of also reducing the hazard to private property from wildland fires. Many existing homes have been built near NFS lands in the project area. In addition, timber stands are interspersed among many homes on private lands adjacent to NFS lands. Within the two major census tract blocks located within the project boundary there are a total of 1,343 residential units, however it is not likely that all of these units are within the project boundary. The total number of residential units in the census tract blocks within the project area and two mile buffer zone is 8,032. Clearly all of these units are not located within the project area. Only a small number of residences are actually located within the project boundary perhaps less than 100. Nevertheless the proposed treatments could reduce the risk to private property. Based on the reduction in both predicted fire size and intensity, a large-scale fire in the project area and adjacent buffer could destroy hundreds of residences. The destruction of these houses could cause millions of dollars of losses. In addition to the loss of the property value, residential property tax revenues would be reduced.

Another housing-related concern is the potential inability of homeowners to secure insurance. There has been increasing discussion in recent years that insurance companies may deny policies to homeowners in fire-prone areas. As yet, there does not appear to be clear indication that this is happening. By reducing potential fire behavior and fire danger on adjacent forest lands, these alternatives may reduce the chance that residents would lose their homeowners insurance http://www.insurancejournal.com/news/national/2013/08/15/301833.htm.

Community Services

Existing fire protection resources may need to be improved in response to ongoing residential and commercial development on private lands near the project area. The proposed project would not affect this growth. Successful implementation of the proposed project may reduce the potential for extreme fire behavior and large-scale wildland fire. This may reduce the hazard of fighting a fire for local firefighting resources at the same time that the demand for protection of homes and other resources is increasing.

The proposed project may also help in protecting facility infrastructure such as power lines, substations, and other structural facilities within the project area and surrounding zone.

Watershed Protection

In the West, watershed protection and rehabilitation have become increasingly urgent. Experts predict that climate change and drought will exacerbate water shortages and cause larger, more intense wildfires that increase flooding and sedimentation that can have major impacts on watersheds and water supplies (High Country News, 2012). Thinning can help protect a watershed from intense wildfires and protect water that flows into creeks and reservoirs (High Country News, 2012)

The Front Range of Colorado experienced major impacts to municipal water supplies as a result of flooding, erosion and sediment deposition after the 1996 Buffalo Creek Fire, 2000 Bobcat Fire, and 2002 Hayman and Schoonover fires, and 2012 High Park and Waldo Canyon Fires. The Denver Water Department and City of Aurora will spend up to $40 million to mitigate the impacts of those fires on their water supply system, while the City of Fort Collins and Colorado Springs Utilities have yet to estimate the total costs of the 2012 fires.

Denver Water, the utility that supplies 1.3 million people in the metro area, spent more than $26 million dredging Strontia Springs Reservoir, treating the water and rehabilitating the watershed after the Buffalo Creek, Hayman, and Hi Meadow Fires.

This forest restoration project could benefit watersheds and help to avoid costs related to watershed rehabilitation triggered by wildland fires.

In addition to these benefits, benefits would be derived from restoring sustainable forest conditions that are resilient to insects and diseases while providing for diverse wildlife habitats, recreational opportunities and sustainable watershed conditions.

Economic Analysis

The economic analysis used the assumptions listed above in Section 4.2 Economic Assumptions Used in the Analysis, as well as acreage treated and harvested. These values were entered into the economic model to

calculate the economic indicators of effects from the proposed action. These results were discounted over the 10 year project period.

Additional modeling assumptions;

- Alternative A is the no action alternative, so there are no direct costs or benefits.
- Alternative B treats an estimated 5,409 acres of ponderosa pine and mixed conifer. Hand vegetative treatments totaled 3,459 acres of ponderosa pine and mixed conifer, vegetative treatment of lodgepole pine, aspen and shrublands totaled 706 acres. Five miles of roads would be maintained and 3 miles of temporary roads constructed (JW Associates, 2014).
- Alternative C treats an estimated 3,913 acres of ponderosa pine and mixed conifer. Hand vegetative treatments totaled 1,928 acres of ponderosa pine and mixed conifer, vegetative treatment of lodgepole pine, aspen and shrublands totaled 485 acres. Five miles of roads would be maintained. Minimal temporary roads would be constructed.

The analysis of Present Net Value by Alternative (Table 27), shows the financial efficiency analysis for quantifiable costs and benefits that change by alternative. This analysis is in compliance with FSM 1970.3, 1970.6 and the Region 2 Supplement. The analysis considered many costs and revenues, with timber revenues based on regional timber sale appraisal bulletin for ponderosa pine and mixed conifer. Forest Service implementation costs included vegetation treatment, sale preparation, sale administration, service contract, prescribed burn, handpiling, noxious weed surveys, temporary roads, road maintenance costs. Some treated acreage would not generate revenues. Alternative A (No Action) represents the baseline from which to compare the action alternatives and is valued at zero.

Table 27. Present Net Value for Alternatives (thousands of $).

Alternative	Discounted Total Costs	Discounted Total Benefits	Discounted Present Net Value	Benefit /Cost Ratio
A	0	0	0	0
B	$2,594	$439	-$2,156	0.17
C	$1,641	$318	-$1,324	0.19

Both action alternatives show a net loss through the analysis period (Table 28), which suggests, from a timber sale standpoint, the project is not economically feasible. Since the Crossons-Longview project is primarily forest restoration not a timber sale per se, the costs involved in calculating net present value include significant costs for fuels reduction, vegetation treatment, and forest restoration. These additional costs include prescribed burns, thinning, handpiling and other treatment of materials on site. Alternative C shows the lowest net loss of the two action alternatives analyzed since it does not include the cost of temporary road construction. The figures in Alternatives B and C reflect the discounted costs over the 10 year period and the discounted revenues generated from the improvement cuts or commercial harvesting. Additional details on the financial efficiency analysis are presented in Appendix C.

Table 28. Benefits, Costs and Revenues by Alternative.

	Alternative A	Alternative B	Alternative C
BENEFITS			
Vegetative Treatment			
Reduced risk of large high intensity fire and subsequent erosion	no	yes	yes
Reduced potential wildfire suppression and restoration costs	no	yes	yes
Reduced fire-related risk to human life and property	no	yes	yes
Increased water quality protection	no	yes	yes
Forest restoration and increased sustainability	no	yes	yes
Improved threatened prairie montane skipper habitat	no	yes	yes
Increased protection of recreation resources	no	yes	yes
Road Reclamation			
Reduced erosion and stream sediment loading	no	yes	yes
Increased long-term aquatic habitat productivity	no	yes	yes
COSTS			
Ponderosa Pine Mixed Conifer Veg. Treatment	$ -00	$ 2,224,926	$ 1,334,311
Lodgepole, Aspen, Shrublands Veg. Treatment	$ -00	$ 193,756	$ 132,581
Road Costs	$ -00	$ 2,644	$ 1,202
Total Cost for EA	$ -00	$ 173,077	$ 173,077
Total costs	$ -00	$ 2,594,402	$ 1,641,171
REVENUES			
Income from Commercial Harvesting	$ -00	$438,680	$317,480
Total revenues	$ -00	$438,680	$317,480
Present Net Value (Costs - Revenues)	$ -00	($2,155,722)	($1,323,691)

The loss reflected in this analysis is largely due to (1) meeting the objectives of a restoration project, which improves forest conditions and has extensive unquantifiable benefits, (2) the cost of restoration treatments that would not normally occur in a commercial sale, (3) some lower-value and volume product being removed, and (4) limited market conditions.

The unquantifiable benefits of the project for both alternatives include the following:

Vegetative Treatment

1. Reduced risk of intense fire either small or large-scale, high-intensity fire and subsequent erosion
2. Reduced potential wildfire suppression and restoration costs
3. Reduced fire-related risk to human life and property
4. Increased water quality protection
5. Forest restoration and increased sustainability
6. Improved threatened Pawnee montane skipper habitat
7. Increased protection of recreation resources

Road Reclamation and Improvement

1. Reduced erosion and stream sediment loading
2. Increased long-term aquatic habitat productivity

3.7 Cultural/Heritage Resources

3.7.1 Cultural/Heritage Resources Affected Environment

The Crossons-Longview Project Area includes both documented prehistoric and historic sites. The area was a transportation corridor used by prehistoric people for habitation and hunting. Historic use includes homesteading, lumbering, ranching, mining, settlement, transportation, communication, recreation, and tourism. A site's eligibility status is based on content in terms of documented archeological deposits and the potentially valuable information they contain, historic engineering attributes, and/or association with important historic events or persons.

Previous heritage resource investigations conducted in the Crossons-Longview Project Area between 1952 and 2014 have identified and recorded 162 historic and prehistoric sites (see detailed list of sites in administrative record). Table 29 summarizes the results of these surveys. The prior investigations and documentation include numerous surveys and reports that were completed for wildfire salvage, fuels management, timber sales, utilities and infrastructure projects, the proposed Two Forks Dam and other water supply projects, watershed improvements, etc. Numerous surveys were also conducted solely to survey for cultural resources of the area, in particular as surveys for inclusion to the North Fork and Estabrook Historic Districts. Other investigations were completed to further knowledge of known or suspected cultural properties. Many of the properties have been surveyed more than one time.

Table 29. Cultural Survey Results (1952 - 2014) in Crossons-Longview Project Area[11,12]

Survey Result	Prehistoric Sites	Historic Sites	Total
Listed on National Register of Historic Places	0	5	5
Listed on Colorado State Register of Historic Places	0	1	1
Officially Eligible for Listing on NRHP	1	8	9
Field Eligible for Listing on NRHP	3	1	4
Added to North Fork or Estabrook Historic Districts	0	17	17
Officially not eligible for listing	3	17	20
Within NR District/Field not eligible for listing	0	33	33
Field not eligible for listing	4	32	36
Isolated Find/Field not eligible for listing	3	11	14
No eligibility call/no assessment or needs data	3	22	25
Total	17	147	164

The records for these previously identified sites were reviewed during the current analytical process to determine the types and number of sites found in the area, the significance of these sites as indicated by recommendation for entry into the National Register of Historic Places (NRHP), location and potential impacts due to activities proposed in the Project Area. A summary of the results of this review are presented in Table 29. Cultural resource surveys have documented 17 prehistoric sites of which 4 are officially eligible or determined in the field to be likely eligible for listing on the NRHP. There are no prehistoric sites that have been listed on NRHP in the Project Area. Surveys have also documented 147 historic properties. Of these, five have been listed on the NRHP An additional 9 are either officially eligible or determined in the field to be likely eligible for listing. An additional site has been listed as a Local Landmark on the State of Colorado Register of Historic Places although it was determined to be not eligible for the NRHP. Properties listed in the NRHP are automatically placed in the Colorado State Register. Sites may also be nominated separately to the Colorado State Register without inclusion in the National Register.

It should be noted that surveys conducted prior to 1985, when field methods could be described as "reconnaissance" by one or two individuals, are not considered as adequate cultural resource surveys. Standards for survey coverage were upgraded according to new Colorado State Office of Archaeology and

[11] The total number of sites are 162. Two sites reported both a prehistoric and historic resource and therefore the total number of resources listed on this table are 164.

[12] Eight of the sites that did not have an eligibility call, assessment or needs data were last surveyed prior to 1985. Three of these are prehistoric sites and five are historic sites.

Historic Preservation (OAHP) in that year, and since 1985 all field surveys employ systematic and thorough pedestrian inspection of most, if not all, of individual project areas. Of the 164 sites surveyed between

1952 and 2014, 8 (5 percent) were surveyed prior to 1985 and would require additional surveys prior to project implementation. These sites include five historic and three pre-historic sites. Of these sites, one historic site was noted as "field not eligible" for listing. The remaining five sites did not have any assessment or eligibility determination or they are indicated as "needs data."

Prehistoric Evidence

The records for the Project Area document 17 prehistoric sites of which only three are considered "field eligible" for listing and one is listed as officially eligible for listing. Three of the 17 sites were surveyed prior to 1985 and would require additional surveys prior to project implementation. There are no prehistoric sites that are listed on NRHP. The sites eligible for listing include lithic scatter, flakes, chipped stone concentration as typically associated with trash scatter and camps.

"Prehistoric" properties refer to sites with materials and items common to Native American cultures of Colorado. The use of these sites usually date before AD 1860 and may be much earlier (even several thousand years). A site's eligibility status is based on content in terms of documented archeological deposits and the potentially valuable information they contain.

Prehistoric sites are characterized generally as surface areas of stone tools, stone tool manufacturing debris, and in some cases, fire-cracked rock and ground stone for processing plant material. Prehistoric sites may include concentrations of finished tools and manufacturing debris; representing the remnants of temporary dwellings or outdoor activity areas. Prehistoric sites with these manifestations are usually interpreted as camps, or as resource collecting and processing areas. Most of the prehistoric properties recorded during previous investigations represent locations where small prehistoric social groups resided for a short period while harvesting local resources, or some of the smaller sites may be areas where collected resources were processed or consumed. Processing sites either consist of formal shaped stone tools for processing meat or vegetable resources or ground stone for processing vegetable resources. It is not uncommon in the Pike National Forest for sites to have 50 to 100 or even more than one hundred 100 surface items.

In general, the prehistoric sites in the area appear to be surface in nature with shallow cultural deposit. It is thought that most of the prehistoric sites in the general area date to the late period (A.D. 1500-1870). However, items found in the Pike National Forest have been dated to much earlier periods, potentially as much as 2,000 years ago. It may be that some of the sites contain a mixture of deposits and materials representing the late period and an earlier use.

The prehistoric properties within the Crossons-Longview Project Area that are recommended eligible for inclusion and listing on the NRHP contain preserved archeological deposits that are storehouses of archeological and cultural information. The deposits are potential sources for addressing research problems in Colorado Mountain archaeology; for example, calculating the time span of prehistoric occupation in the southern Rocky Mountains, or reconstructing the subsistence patterns and other lifeways of indigenous social groups. Sites may be important as traditional cultural areas to the modern descendants of the Native

American peoples who previously inhabited the eastern part of the Colorado mountains area. Some tribes have indicated in previous consultations that peeled or scarred trees, medicine / directional trees, and overhangs / crevices and rock shelters used by historic indigenous tribes are important cultural resources; they are regarded as such by the US Forest Service and are protected.

Other Native American sites that could be found in the area include culturally modified trees. Native American groups harvested the cambium layer of ponderosa pine (and possibly other conifers) by removing a strip of bark from these trees for use as a food and medicine and for ceremonial purposes. Similar trees, in other locations within the Pike-San Isabel National Forest have been recorded and the peeling scars dated. The date range for the scars falls within the decades of the early 19th century (AD 1820-1860). Native American groups also created prayer and directional trees. These trees (conifers) would have been saplings when manipulated by bending the tree to the ground and tied into place with straps secured by stakes. Directional trees point toward a sacred mountain, landscape or place while the prayer tree may also point a cardinal direction. The prayer trees would then be adorned with offerings to invoke good tidings. Both of these types of culturally modified trees are considered prehistoric sites and, if found, would be considered for recommendation for eligibility as a site listed on the NRHP.

Rock shelters could also be found in the Project Area. Rock shelters are typically found in granite outcrops adjacent to stream courses. These overhangs are ideal campsites for mobile groups harvesting and consuming local resources during any season when the area was not impassible due to deep snow. Often, the depth of cultural deposits in these shelters is greater than one meter, suggesting a fairly lengthy period of use (perhaps several thousand years). Because the total volume of deposit for each shelter is substantial, these properties have the potential to contribute important data to our knowledge of prehistoric cultures in the eastern portion of montane Colorado.

Quarries are discrete areas where local bedrock outcrops provided raw materials suitable for the manufacture of flaked stone tools (the stone raw material must be suitable for creating sharp and durable edges or points). Quarry sites containing these outcrops plus evidence of prehistoric activity such as portable and usable fragments of the quarried raw material (“cores” or “blanks”) and waste material (“debitage”) remaining from on-site stone tool manufacture. Quarries are a site type that could be encountered within the Project Area.

Native American Consultation

Tribal governments and other officials of tribes, and cultural representatives with possible traditional ties to the area, or those tribes that have previously indicated interests, were contacted regarding the Crossons-Longview project by a scoping letter. No concerns about potential project effects have been raised from these groups regarding the proposed activities. The tribes that were contacted are;

- Apache Tribe of Oklahoma
- Eastern Shoshone Tribe (Wind River Reservation)
- Cheyenne and Arapaho Tribes of Oklahoma
- Comanche Nation of Oklahoma
- Jicarilla Apache Nation

- Kiowa Tribe of Oklahoma
- Northern Arapaho Tribe
- Northern Cheyenne Tribe
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe
- Ute Indian Tribe (Uintah & Ouray Reservation)

Historic Evidence

Historic properties refer to sites with materials and items common to European immigrant cultures of the Western Frontier. Generally, in the Pike National Forest, these properties date after 1860. The records for the Project Area document 147 historic sites. Five of the 147 sites were surveyed prior to 1985 and,would require additional surveys prior to project implementation.

Five of the surveyed sites are listed on the NRHP and one is listed as a Local Landmark on the State of Colorado Register of Historic Properties. Included in the five sites listed on the NRHP are two historic districts and one district expansion; the North Fork Historic District, the North Fork Historic District Expansion and the Estabrook Historic District. The other two listed sites include a single dwelling and a department store. The site listed on the State of Colorado Register of Historic Places is a single dwelling.

There are additionally eight sites considered officially eligible for listing and one considered field eligible for listing. Most of these sites are structures that contribute to the designated historic districts. Additional resources include a railroad grade and an historic bridge. Additionally, there are 17 structures that were included in the North Fork Historic District expansion.

North Fork Historic District (Site Number 74000586)[13,14]

The North Fork Historic District, listed on the National Register of Historic Places in 1974, runs through the Project Area Boundaries. This Historic District is located in south Jefferson County, southeast of Conifer. The two primary access routes into the district are Foxton Road from US 285, just west of Conifer, and County Road 126 from US 285 at Pine Junction. The historic district follows the North Fork of the South Platte River and is approximately 13 miles in length, from the North Fork's junction with the South Platte River to the town of Pine Grove. Field surveys conduction from 2004 to 2007 added 17 historic properties located in the Crossons-Longview Project Area to the Historic District.

The North Fork Historic District includes several communities associated with the development of the Denver, South Park and Pacific Railroad's route through Platte Canyon during the 1870s to serve the mining areas to the west. The District's past is similar to that of many communities in the mountains of Colorado and the American West from the 1870s to the middle of the 20th century. The district lies along a river corridor

[13] http://www.historycolorado.org/archaeologists/jefferson-county#platte

[14]National Park Service, United States Department of the Interior. National Register of Historic Places Continuation Sheet. North Fork Historic District, Jefferson County, Colorado. http://www.historycolorado.org/sites/default/files/files/OAHP/NRSR/5JF4449.pdf

flowing out of mountains that contain precious metals. As settlement spread along the corridor, so did the growth of other industries including ranching, agriculture, and tourism. By the 1890s, rail tourism boosted the local economies and the North Fork area became a popular summer resort. Structures that remain in the area include a mix of wood frame, log and masonry construction.

The original nomination document established 1878-1938 as the overall district period of significance. Areas of significance were indicated for agriculture, commerce, transportation and recreation/tourism. Additional documentation filed sometime later reiterated the importance of the areas of significance for agriculture, transportation and entertainment/recreation, but added industry for the the important extractive activities that occurred in the district. The beginning date for the period of significance was kept at 1878 but the end date was extended to 1957. The period of significance begins with the construction of the railroad through the Platte Canyon and ends at a somewhat arbitrary mid-50s date of 1957, through which the district was significant for entertainment/recreation.

Estabrook Historic District (Site Number 80000919)[15,16,17]

The Estabrook Historic District, listed on the National Register of Historic Places in 1980, runs through the Project Area Boundaries. It is located a few miles southeast of Bailey on the North Fork of the South Platte River. The boundaries are generally formed by high hills or rock walls, particularly to the east. The district follows the river from Insmont Hill to the central part of the district where it joins with Craig Creek coming up from the south. It continues to follow the river as it flows to the east into the narrow, high walled Waterton canyon.

The nomination document established 1873 to the present as the overall district period of significance. Areas of significance were indicated for architecture and commerce, although the statement of significance also discusses the importance of transportation and tourism.

The Estabrook Historic District is significant for its association with the Denver, South Park & Pacific Railway and the tourist industry that developed along the line. The District includes a rustic style complex with numerous buildings and structures including parts of an old roadbed that is believed to be the last of the Denver, South Park & Pacific Railroad. There is also a small railroad bridge that is possibly the only original bridge remaining from the line.

The district is also significant for its association with some of the State of Colorado's most important pioneers and its fine architectural features. Estabrook was a scenic valley with good fishing and a number of officers, directors and financiers of the railroad began buying land and establishing summer residences. It soon became a popular spot for tourists given its proximity to Denver and special trains run for tourists. The onset of the Great Depression caused a sharp loss in business and in 1937 the train tracks were removed.

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[15] http://www.nationalregisterofhistoricplaces.com/co/park/districts.html

[16] http://www.parkco.us/index.aspx?NID=386

[17] USDI National Park Service. 1980. National Register of Historic Places Inventory - Nomination Form. April 15, 1980. Accessed February 10, 2015. http://pdfhost.focus.nps.gov/docs/NRHP/Text/80000919.pdf

Architecturally, the structures in the District represent fine examples of the rustic style, an architectural style developed in the United States in the early 20th century as part of a "back to nature" movement. The rustic style is one of the few indigenous American architectural styles. The buildings of the district are especially notable for their fine craftsmanship, unusual decorative features and excellent condition.

3.7.2 Cultural/Heritage Resources Environmental Consequences

The identification process for cultural properties potentially affected by the Crossons-Longview Environmental Assessment included a file search to locate previously known properties and previously conducted field studies. No project specific field surveys have yet been conducted to identify all the potentially affected cultural resources because specific treatment areas would be identified during project implementation. At that time, surveys, site eligibilities, effects determinations and mitigation and protection measures would be undertaken. Mitigation and protection measures would be developed in consultation with the SHPO prior to implementation of any activities in any given treatment area.

Alternative A (No Action)

Only existing and planned activities, previously approved under other NEPA documents, would be implemented as a result of this alternative. These existing and planned activities would comply with federal law(s) and acts as applicable as well as follow the Forest Plan as they apply to Heritage Resources.

Direct and Indirect Effects

There would be no direct or indirect effects from this alternative because no additional disturbance would occur.

Cumulative Effects

Past forest management, particularly fire suppression, has created a forest that is more dense and with higher fuel loadings than would have existed historically. Because of this, there is a risk of the development of large-scale, high intensity wildfires, should a fire start in the area. Many of the identified historic sites are wooden structures that could be destroyed in the event of a fire in the Project Area. Both historic districts are at risk from damage or destruction from wildfire. This alternative has the highest risk of a large-scale, high intensity fire and therefore, the greatest risk of loss of or damage to cultural sites of the alternatives.

Alternative B (Proposed Action)

This alternative proposes vegetation treatments, prescribed burning and construction of temporary roads in order to reduce forest fuels and the corresponding risk of a large-scale, high intensity wildfire. These planned activities would comply with federal laws and acts as applicable as well as follow the Forest Plan as they apply to Heritage Resources.

All treatment areas would be required to be evaluated for the existence of prehistoric and historic sites that have been previously identified and recorded and recommended as eligible for, or listed on, the National Register of Historic Places (NRHP). Background research would also assist with developing heritage resource

inventory strategy and predict site density. Heritage resource staff would be required to be informed of the proposed action so as to ensure NHPA Section 106 Compliance. This would include possible additional surveys, consultation, project effects determination and protection and /or mitigation measures as determined in consultation with SHPO.

Mitigating the effects of projects on significant sites should be considered on a case-by-case basis and mitigation plans would be implemented, as needed. Decisions about significance and protection would be determined by the Heritage Resource Program Manager, in consultation with the appropriate line officer, interested parties, and the Colorado State OAHP / SHPO. Significant sites would be preserved for scientific investigation or interpretation, and traditional cultural sites or locations would be preserved and not publicized. Specific requirements regarding the presence of significant cultural sites include:

- Implementation may only occur in areas where cultural resources surveys and any necessary avoidance or mitigation measures have been developed in accordance with NHPA requirements.
- Avoid or mitigate known or discovered sites that are eligible for nomination or listed on the National Register of Historic Places.
- Proposed project activities would be required to comply with Federal law(s), the National Historic Preservation Act (NHPA), as amended, other Acts as applicable, and the Forest Plan.
- If a site is located, recorded and recommended eligible for listing or nomination to the NRHP, the impacts to the site would be required to be evaluated. If there could be adverse effects due to the proposed project activities, the site would be mitigated through avoidance or Memorandum Of Agreement (MOA) with the State Office of Archaeology and Historic Preservation (OAHP/SHPO) prior to any site activities.
- Damage to surface and subsurface deposits at significant archeological properties would be required to be negligible to non-existent. If located or identified, the boundaries of NRHP eligible or listed sites would be identified for protection from project activities.
- Standing buildings and other cultural properties, if identified, with structural components would be required to be protected from damage by proposed activities. Heavy equipment employed during project activities have the potential to directly or indirectly affect cultural resource. Sites within this category would be flagged prior to project implementation and monitored during and after proposed activities.
- The locations of sensitive archeological resources would be required to be considered when designing proposed vegetation management, prescribed burning and related activities. Activities that could impact archeological resources include support facilities needed for the implementation of the proposed vegetation treatments. These facilities may include heavy equipment staging areas, modification and reroute of existing access roads, temporary roads, and pre-operation activities. The planning process for developing treatment areas includes provisions for the identification and protection of significant heritage sites.
- Traditional cultural properties, including culturally peeled trees and directional trees and traditional areas are to be protected during planning, implementation, and related activities. In cases where the local scenery and setting is an integral contributor to the significance of a cultural property, the proposed activity should be designed so that the setting and scenery are preserved.
- Even with surveys of treatment areas prior to implementation of activities on each site, the inadvertent discovery of historic or prehistoric material is possible. If an archaeological discovery is made, all work must stop within 100 feet and the South Platte Ranger District Zone Archeologist and Forest Archeologist must be notified.

Direct and Indirect Effects

Implementation of the Crossons-Longview proposed activities have the potential to directly affect cultural resources. Impacts could include surface disturbance, inadvertent damage from heavy equipment, or disturbance from human activity. Both hand thinning and mechanical vegetation treatments could damage existing cultural resources.

Prescribed fire, including pre and post-fire activities, has the potential to affect cultural resources. Heavy equipment for the fire line and hand-constructed lines have the potential to disturb cultural material by affecting the sub-surface stratigraphy and removal or disturbance of surface constituents. Fire, when it is introduced, has the potential to affect historic and prehistoric organic surface material. Fire disturbance is based on fire intensity and duration.

Indirect effects associated with the implementation of Alternative B could include disturbance of archeological sites located just outside of the proposed treatment areas or temporary roads. These effects could be due to activity surrounding staging areas, and access points (roads, temp roads, skid trails) as well as erosion (slope wash, slope destabilization). Therefore a buffer of 50 m (164 ft) outside of the proposed project boundary would need to be inventoried. Staging areas and access for a proposed treatment area is part of the area of potential effects and would require a Heritage Resource inventory.

The proposed project activities have the potential to directly or indirectly affect cultural resources. However, through compliance through Section 106 of the NHPA, the project would avoid or mitigate adverse effects to cultural resources listed or eligible for listing in the NRHP.

Cumulative Effects

The implementation of Alternative B should result in only negligible loss of archeological soils and the artifacts contained therein. As long as cultural resource surveys have taken place and OAHP/SHPO has been allowed to comment on any related or future resources management projects in the area associated with this EA, this alternative would have minimal cumulative effect to unknown heritage resources and no cumulative effect to known heritage resources due to proposed activities.

Past forest management, particularly fire suppression, has created a forest that is more dense and with higher fuel loadings than would have existed historically. Because of this, there is a risk of the development of large-scale, high intensity wildfires, should a fire start in the area. Many of the identified historic sites are wooden structures that could be destroyed in the event of a fire in the Project Area. Both historic districts are at risk from damage or destruction from fire. This alternative has the highest amount of fuels reduction and therefore the lowest risk of a large, intense wildfire and therefore, the lowest risk of loss of cultural sites due to wildfire of the alternatives.

Alternative C

This alternative proposes vegetation treatments, and prescribed burning in order to reduce forest fuels and the corresponding risk of a large-scale, high intensity wildfire. This alternative does not allow the

construction of temporary roads. These planned activities would comply with federal laws and acts as applicable as well as follow the Forest Plan as they apply to Heritage Resources.

The direct effects of Alternative C would be similar to Alternative B but would have a slightly lower potential to have inadvertent impacts to unknown cultural resources. The lower potential effects are due to minimal temporary roads and a smaller area of vegetation treatments.

The proposed project activities have the potential to directly or indirectly affect cultural resources. However, through compliance through Section 106 of the NHPA, the project would avoid or mitigate adverse effects to cultural resources listed or eligible for listing in the NRHP.

The cumulative effects of Alternative C would be similar to Alternative B, except that due to the lower amount of fuels reduction proposed, this alternative would have a higher risk of loss of cultural sites due to wildfire. However, this risk would be lower than that of Alternative A, the No Action Alternative.

3.8 Consistency with the Forest Plan

3.8.1 Vegetation

The 1976 National Forest Management Act (NFMA) requires that site-specific projects must be consistent with the Forest Plan. Forest Plan goals and objectives guide the identification and selection of potential agency projects. The determination of whether or not an individual project is consistent with the Forest Plan is based on whether or not the project adheres to forest-wide and management area goals and standards. For analysis of the Catamount project applicable management direction is provided in the 1984 Land and Resource Management Plan for the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (Forest Plan). Forest Plan goals that are relevant to the forest vegetation assessment include:

- Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool (III-4).
- Provide for increased production and productive use of wood fiber while maintaining or improving other resource values (III-4).
- Improve age class and species distribution of tree stands forest-wide (III-4).
- Perpetuate the aspen type (III-4).
- Improve the health and vigor of all vegetation types (III-4).

The Forest-wide management requirements set the baseline conditions that must be maintained in order to implement the Forest Plan as it was intended. They establish the environmental quality and natural resource requirements that apply to all areas of the Forest(s).

Alternative A, the no action alternative would not help foster any of the Forest plan goals stated above.

Alternative B (Proposed Action) and Alternative C are consistent with these broad Forest wide goals and the goals and direction for the Management Areas 2B, 5A and 7A, that comprise the Project Area. Many of the vegetation treatments employed would not be commercial operations. Although some commercial timber

may be harvested, the most likely products from these treatments would be the sale of some of the cut trees as firewood and woody biomass.

3.8.2 Fire-Fuels/Air Quality

Alternative B (Proposed Action) and Alternative C would follow applicable Federal and State laws and related regulations that govern the management of the Land and Resource Management Plan for the Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands; subsequent Amendments to the Forest Plan of which there are 34 dating from September 1985 to the most current of January 2009. This includes but is not limited to the National Fire Plan, Forest Land and Resource Management Plans, Resource Management Area Plans, Manual Direction, Standards and Guides. Smoke Management Plans and Prescribed Fire Plans for site-specific projects would include federal and state regulatory direction of the federal Clean Air Act of 1990, and the Colorado Air Resources Board. Compliance with these plans would occur at the time on-site projects are executed.

Alternative A, the no action alternative, would not make progress towards the objectives of the National Fire Plan.

3.8.3 Watershed/Soils

Alternative B (Proposed Action) and Alternative C would be consistent with all Forest Plan Goals, and General direction, standards and guidelines. Alternative A (No Action) would be consistent with all Forest Plan Goals, and general direction, standards and guidelines, except for the goals pertaining to increasing water yield.

3.8.4 Wildlife

The Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands Forest Plan (USDA Forest Service 1984) identified many goals for fish and wildlife (III-3 to III-6), including:

- Increase diversity for wildlife and habitat improvement;
- Improve fish habitat on suitable streams and low elevation ponds and lakes; and
- Protect riparian areas and wetlands from degradation.

The Forest Plan provides general direction, standards, and guidelines regarding vegetation diversity, snags, logs, and riparian areas in all vegetation types (e.g., III-12 to III-14, III-50 to III-52, and III-203 to III-215). Other Forest Plan details are associated with Management Areas 2B and 7A, and specifically for Management Area 5B, which is to be managed primarily for big game winter range. The Forest Plan provides specific guidelines in this management area to maintain thermal cover and forage.

The Forest Plan also established general management direction for fish and wildlife (III-28 to III-34), including:

1. Manage and provide habitat for recovery of endangered and threatened species;

2. Maintain habitat for viable populations of all existing vertebrate wildlife species; and

3. Use both commercial and non-commercial silvicultural practices to accomplish wildlife habitat objectives

Specific Standards and Guidelines in the Forest Plan for protection of Management Indicator Species include the following (III-29 and Amendment 30):
Provide for the habitat needs of Management Indicator Species on the National Forest

a. Elk - Protect calving concentration areas from habitat modification and disturbance from May 15 - June 30.

b. Abert's Squirrel- Protect or provide for one Abert's squirrel nest tree clump (0.1 acres of 9 to 22" DBH ponderosa pine with a basal area of 180 to 220 and an interlocking canopy) per six acres on ponderosa pine sale areas.

Alternative B (Proposed Action) and Alternative C would make progress towards the above-stated goals and are consistent with objectives, standards, and guidelines provided in the Forest Plan and subsequent amendments. All Alternatives are consistent with the Forest Plan.

Conservation Measures and monitoring requirements are incorporated into the action alternatives, to ensure compliance with the Forest Plan to avoid, minimize, rectify, reduce, eliminate, and/or compensate for adverse impacts of the proposed activity. This includes specific monitoring requirements for the avoidance of unexpected resource effects and the completion of project design and implementation as planned.

3.8.5 Recreation/Visuals

The actions and effects considered in this analysis are consistent with the Land and Resource Management Plan direction for the Pike and San Isabel National Forests.

The Project Area includes three Management Areas where treatments could occur including:

- MA 2B - Rural and Roaded Natural Recreation Opportunities
- MA 5B - Big Game Winter Range
- MA 7A - Wood Fiber Production and Utilization (sawlogs)

Management Area 2B

Management Area 2B is the only MA in the Project Area that is to be managed specifically for recreation opportunities. This MA is found on the east and southwest and central west portions of the Project Area. Parts of the Colorado Trail that go through the Project Area cross through this MA. The prescription for Management Area 2B includes general guidance for Recreation:

> "Management emphasis is for rural and roaded-natural recreation opportunities. Motorized and non-motorized recreation activities such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling, and cross-country skiing are possible. Conventional use of highway-type vehicles is provided for in design and construction of facilities. Motorized travel may be

> prohibited or restricted to designated routes, to protect physical and biological resources (USDA Forest Service 1984)."

For Visual Resource Management, the general direction from the Forest Plan says:

> "Design and implement management activities to provide a visually appealing landscape. Enhance or provide more view opportunities and increase vegetation diversity in selected areas (USDA Forest Service 1984)."

Management Area 5B

Management Area 5B is to be managed primarily for big game winter range. Recreation management would be considered subordinate to the needs of big game winter range and primarily for summer use. Winter recreation is to be managed for very low or low densities. Some areas may be closed to winter use if necessary to prevent disturbance of wildlife (USDA 1984). This MA is found in the northwest portion of the Project Area. None of the identified trails travel through this MA.

The Management Prescription for MA 5B includes this general direction for recreation:

> "Existing local roads are closed and new motorized recreation use is managed to prevent unacceptable stress on big game animals during the primary big game use season (USDA 1984)."

For Visual Resource Management, the Forest Plan says:

> "Management activities are not evident, remain visually subordinate or dominate in the foreground and middleground but harmonize and blend with the natural setting. (USDA 1984)."

Management Area 7A

Management Area 7A is to be managed primarily for wood-fiber production and utilization. This MA is found in the central portion of the Project Area. Most of the trails in the Project Area are located in this Management Area. The Management Prescription for MA 7A includes this direction for recreation:

> "Roaded-natural recreation opportunities are provided along Forest arterial and collector roads. Semiprimitive motorized recreation opportunities are provided on those local roads and trails that remain open, semiprimitive non motorized opportunities are provided on those that are closed (USDA 1984)."

For Visual Resource Management, the Forest Plan says:

> "Management activities are not evident or remain visually subordinate along Forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middleground, but harmonize and blend with the natural setting (USDA 1984)."

All Alternatives, including Alternative B (Proposed Action) and Alternative C would be consistent with all Forest Plan direction for recreation and visuals, including the direction for the Management Areas that comprise the Project Area.

3.8.6 Cultural/Heritage

All Alternatives including Alternative A (No Action), Alternative B (Proposed Action) and Alternative C are consistent with the Forest Plan.

3.9 Irreversible and Irretrievable Commitments of Resources

The proposed vegetation treatments would not critically imperil any special status plant species.

There would be no irreversible or irretrievable commitments of resources related to fish and wildlife species or their habitats. Loss of old growth could represent an irretrievable loss of habitat, although no known old growth stands would be lost.

There would be no irreversible or irretrievable commitments of recreation resources due to the implementation of the proposed treatments. The effects of these treatments on safety and access to popular recreation areas would be temporary, lasting from a couple days to a couple of weeks in any given area. Implementation of the above referenced design guidelines would ensure no permanent impacts to safety or access.

For all alternatives, there would be some irreversible or irretrievable commitment of resources to cultural resources that are not NRHP eligible.

3.10 Short-term Uses and Long-term Productivity

Special status plants could be damaged in the short-term but long-term productivity of these species should be minimal if guidelines are employed.

The fuels management activities, as described under the proposed alternative, would create some short-term disturbances but in the long-term, productivity would be enhanced. The proposed treatments would change the structural stages and related crown fire hazard ratings for forested stands. Potential short-term impacts could occur through disturbance of wildlife and plant habitat, soil disturbance, and stream sedimentation, but the changes in stand composition would reduce the long-term potential for crown fire propagation. Overall, a lower crown fire hazard would result in a more sustainable forest and less environmental damage to wildlife, water, range, recreation, and private lands.

The short-term changes caused by the proposed treatments would not impact the ability to provide a range of recreation opportunities in the Project Area. There would be no permanent changes in recreation settings. No campgrounds, day use areas, or trails would be permanently altered by the proposed treatments. Therefore, the long-term ability to provide recreation opportunities would not be negatively affected.

The short-term uses associated with each alternative would not result in a loss of long-term cultural resources. Mitigation measures would protect significant cultural resources. Alternatives B and C would provide a long-term beneficial effect of reducing the risk of loss of cultural resources to wildfire.

3.11 Unavoidable Adverse Impacts

Some potential habitat for sensitive plant species might be disturbed during vegetation treatment activities.

Some minor, short-duration impacts are expected from conducting prescribed burning. Potential impacts would include short-term displacement of the public for public safety during burning and decreases in air quality due to smoke. These issues will be addressed during the preparation of prescribed fire burning and smoke management plans. Mitigation measures would be developed and implemented as needed.

Under Alternative B - Proposed Action wildlife habitat for certain species would be adversely affected to varying levels. During implementation of the treatments, noise, soil compaction, fire, and vegetation removal would reduce the amount of available habitat. Likewise, there may be a direct take in some species. Over the long-term, the diversity and functionality of the habitat would increase.

During implementation of proposed treatments (Alternatives B and C) or in the event of wildfire (highest risk of occurrence in Alternative A) there may be times when particular areas are closed to public access. During these times short-term, unavoidable adverse effects could occur to some recreationists.

Cultural sites that are not eligible to the NRHP would not be protected from project activities. Therefore, for all alternatives, there could be some unavoidable effects such as degradation or destruction to cultural resources that are not NRHP eligible.

3.12 Other Required Disclosures

On August 26th, 2014 a species list was collected from the USDI Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC). This list was then used to determine whether any threatened and endangered species, designated critical habitat, proposed critical habitat, Migratory Birds of Conservation Concern, or other natural resources of concern may be affected by the Crossons-Longview project. Review of this list was completed and species with no potential or suitable habitat as well as species outside of their distributional range and/or elevation range were excluded from further review. The USFWS has identified three federally listed species as having part of their range on the Pike and San Isabel National Forest. These species are the threatened Colorado butterfly plant (*Gaura neomexicana* var. *coloradoensis*), the threatened Ute ladies' tresses (*Spiranthes diluvialis*) and the threatened Western prairie fringed orchid (*Platanthera praeclara*). There is no potential for Colorado butterfly plant in the Pike-San Isabel National Forest and western prairie fringed orchid would not be effected as there would be no water depletions associated with this project (Steve Olsen, personal communication 2/21/2014).

Consultation with the USFWS would be required for the Ute ladies' tresses orchid because the project would occur within the range of this plant (on elevations below 6'500 feet).

No waters would be impounded or diverted as part of Alternative B - Proposed Action, so coordination with USFWS under the Fish and Wildlife Coordination Act is not required.

Prior to ground-disturbing activities, all appropriate consultation and any site-specific surveys deemed necessary would occur in compliance with the National Historic Preservation Act.

Additional regulatory direction relevant to recreation in the Crossons-Longview Project Area is found in Executive Order 12962. This Executive Order concerns Recreational Fisheries, dated June 7, 1995, and directs federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. The effects of the alternatives would not impact recreational fishing opportunities.

3.13 Environmental Justice

Under Executive Order 12898 (Federal Register 1994), federal agencies are required to identify and address disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice. As required by law and Title VI, all federal actions will consider potentially disproportionate negative impacts on minority or low-income communities. Minimal minority or low income populations would be affected within the Proposed Project area.

As shown in Table 30, the population that lives within the project area is predominantly white, with a low percentage of poverty, and higher per capita and median incomes than the average for the State of Colorado. Income levels throughout the project area are diverse. The most recent estimate of median household income was in 2013, and shows an estimate of $58,433 for Colorado compared to $68,984 for Jefferson County, and $61,570 for Park County (U.S. Bureau of Census, 2014). Both Park and Jefferson counties have higher median household incomes since these two counties represent rural mountain suburbs for the city of Denver. The population have somewhat higher incomes due to a higher percentage of professional occupations, wealthier homeowners who may live in more desirable properties in these mountain locations and choose to commute, and second home owners who typically have higher income. This higher income is reflective of the components of rural living near a large metropolitan area with some individuals working in management, sales or professional employment or who are possibly considered lone-eagles or self-employed.

The most recent poverty status statistics are from the 2013 Census Bureau data. These data showed poverty status for 13.2 percent of the total Colorado population compared to 8.6 percent in Jefferson County, and 9.1 percent in Park County. Again these statistics show a middle to upper middle class population base within the region, with a below poverty population well below the state average. People within the poverty status may reside within the project area, but not in disproportionate numbers. Table 30 shows some basic demographic statistics for identifying potential areas of concern.

Table 30. 2013 Census Community Statistics for Environmental Justice Analysis[18]

Population	Colorado	Jefferson	Park
Total Population	5,268,367	551,798	16,121
Percent Below Poverty	13.2	18.6	9.1
Percent White	88.0	92.4	95.2
Percent Black	4.4	1.3	0.5
Percent American Indian	1.6	1.2	1.2
Percent Asian	3.0	2.8	0.7
Percent Native Hawaiian or Pacific Islander	0.2	0.1	-
2 or more Races	2.8	2.3	2.2
White Alone	69.4	79.1	90.5
Percent Hispanic Origin	21.0	15.0	5.7
Per Capita Income	$31,109	$36,087	$31,504
Median Household Income	$58,433	$68,984	$61,570

[18] 2009 to 2013

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Chapter 5.
Glossary and List of Acronyms

A

Affected Environment - The physical, and human-related environment that is sensitive to changes resulting from the proposed actions.

Air Quality - Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206:Jan., 1988.

Airshed - A geographic area that, due to topography, meteorology, and climate, shares the same air.

Alternative - A mix of management prescriptions applied to specific land areas to achieve a set of goals and objectives. The alternative provides management direction for the proposed project which reflects identified public and management concerns for the Decision Area.

Analysis Area - The Analysis Area is the area that bounds the analysis for a particular resource and/or issue. It may be confused with the Project Area which is the area within which the proposed activities are limited to.

B

Background - That part of a scene, landscape, etc., which is furthest from the viewer, usually from three miles to infinity from the observer.

Basal Area - The area of the cross section of a tree stem near the base, generally at breast height and inclusive of bark.

Best Management Practices (BMPs) - Practices determined by the State to be the most effective and practical means of preventing or reducing the amount of water pollution generated by non-point sources, to meet water quality goals.

Big Game - Those species of large mammals normally managed as a sport hunting resource.

Big Game Winter Range - A range, usually at lower elevation, used by migratory deer and elk during the winter months; more clearly defined and smaller than summer ranges.

Biological Evaluation - A documented Forest Service review of activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed or sensitive species.

Board Foot (bf) - The amount of wood equivalent to one foot by one inch thick.

Broadcast Burn - Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of a fuel hazard or as a silvicultural treatment , or both.

Browse - Twigs, leaves, and young shoots of trees and shrubs on which animals feed.

C

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees.

Cavity - The excavated hollow in trees by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals.

CDOW - Colorado Division of Wildlife

CFR - Code of Federal Regulations

Classified Road – A road that is constructed or maintained for long-term highway vehicle use. Classified roads may be public, private, or forest development.

Condition Class - A grouping of timber stands into size-age-stocking classes for Forest planning.

Conifer - Any of a group of needle and cone-bearing evergreen trees.

Cover - Vegetation used by wildlife for protection from predators or to escape the adverse effects of weather.

Cultural Resources - The remains of sites, structures, or objects used by humans in the past-historic or prehistoric.

Cumulative Effect - The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative Effects Area (CEA) - The area that is used for assessing cumulative impacts (see above).

CWPP - Community Wildfire Protection Plan

D

DBH - Diameter Breast Height

Developed Recreation - Recreation dependent on facilities provided to enhance recreation opportunities in concentrated use areas. Examples are ski areas, resorts and campgrounds.

Diameter at Breast Height - The diameter of a tree measured four feet, six inches above the ground.

Dispersed Recreation - Recreation that occurs outside of developed recreation sites requiring few, if any, facilities or other improvements and includes such activities as hunting, hiking, viewing scenery and cross-country skiing.

Displacement of Soil - The movement of the forest floor (litter, duff, and humus layers) and surface soils from one place to another by mechanical forces such as a blade used in piling and windrowing. Mixing of surface soil layers by disking, chopping, or bedding operation, is not considered displacement.

Duff - An organic surface soil layer below the litter layer in which the original form of plant and animal matter cannot be identified with the unaided eye.

E

EA - Environmental Assessment

Ecosystem - Any community of organisms along with its environment, forming an interacting system.

Ecotone - The boundary or transition zone between adjacent plant communities.

Edge - Where plant communities meet or where successional stage or vegetation conditions within the plant community come together.

Effects (or impacts) - Environmental consequences (the scientific and analytical basis for comparison of alternatives) as a result of a proposed action. Effects may be either direct, which are caused by the action and occur at the same time and place, indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative.

EIS - Environmental Impact Statement

Endangered Species - Any plant or animal species which is in danger of extinction throughout all, or a significant portion of its range (Endangered Species Act of 1973).

Endemic- The population of potentially injurious plants, animals or diseases that are at their normal balances level, in contrast to epidemic.

Environment - The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental Assessment - A concise public document which serves to: a. briefly provide sufficient evidence and analysis for determining whether to prepare an EIS, or a finding of No Significant Impact; b. Aid an agency's compliance with NEPA when no EIS is necessary; c. facilitate preparation of an EIS when necessary.

Environmental Impact Statement - A detailed summary prepared by the responsible official in which a major Federal action which significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and the effects analyzed.

Ephemeral Streams - Streams that flow only as a direct response to rainfall or snowmelt events. They have no baseflow.

Epidemic - The populations of plants, animals and diseases that build-up, often rapidly, to highly abnormal and generally injurious levels.

Erosion - The detachment and transport of individual soil particles by wind, water, or gravity.

ESA - Endangered Species Act of 1973

F

Floodplain - The lowland and relatively flat areas adjoining inland and coastal waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Forage - All browse and non-woody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

Foreground - That part of a scene, landscape, etc., which is nearest to the viewer, and in which detail is evident, usually one quarter to one-half mile from the observer.

FSH - Forest Service Handbook

FSM - Forest Service Manual

Fuels Treatment - Manipulation or reduction of natural or activity fuels (generated by a management activity such as slash left from logging) to reduce fire hazard.

Fuels - Combustible materials present in the forest which potentially contribute a significant fire hazard.

G

GIS - Geographic Information System

H

Habitat - The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Type - An aggregation of all land areas potentially capable of producing similar plant communities at climax stage.

HFRA - Healthy Forests Restoration Act

HUC - Hydrologic Unit Code

I

Indicator Species - See Management Indicator Species.

Indirect Effects - Secondary effects which occur in locations other than the initial action or significantly later in time.

Interdisciplinary (ID) Team - A group of professional specialists with expertise in different resources that collaborate to develop and evaluate management alternatives.

Interdisciplinary Approach - Utilization of one or more individuals representing areas of knowledge and skills focusing on the same task, problem, or subject. Team member interaction provides needed insight to all stages of the process.

Invertebrates - Animals having no backbone such as earthworms, insects and lesser animals.

Irretrievable - Applies to losses of production, harvest, or a commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievable lost during the time an area is used as a winter sports (recreation) site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals, or cultural resources, or to those factors that are renewable only over long-time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue - A subject or question of public discussion or interest to be addressed or discussed in the planning process.

L

Landtype - A unit of land with similar designated soil, vegetation, geology, topography, climate, and drainage. The basis for mapping units in the land systems inventory.

Linkage - A belt or band of cover or habitat which allows animals to move from one location to another.

Litter - An organic surface soil layer usually composed of identifiable leaves, branches or other vegetative material, and animal remains.

Lodgepole Pine - See Timber types.

Lop and Scatter - Fuel treatment where, following tree felling, limbs and branches are cut off and scattered in the unit.

M

MA - Management Area

Management Area (MA) - Geographic areas, not necessarily contiguous, which have common management direction, consistent with the Forest Plan allocations.

Management Direction - A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management Indicator Species (MIS) - A species selected because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements. A species of fish, wildlife, or plants which reflect ecological changes caused by land management activities.

Middleground - That part of a scene or landscape which hits between the foreground and background zones.

MIS - Management Indicator Species

Mitigation - Actions to avoid, minimize, reduce eliminate, replace, or rectify the impacts of a management practice.

Mixed Conifer - See Timber Types

Monitoring and Evaluation - The evaluation, on a sample basis, of Forest Plan management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Mortality - In forestry, trees in a stand that die of natural causes.

N

National Environmental Policy Act - An interdisciplinary process, which concentrates decisionmaking around issues, concerns, alternatives, and the effects of alternatives on the environment.

National Forest Management Act - Law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Regional Guides and Forest Plans, and the preparation of regulations to guide that development.

Natural Regeneration - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

NEPA - National Environmental Policy Act

NFMA - National Forest Management Act

NFS - National Forest System

NHPA - National Historic Preservation Act

NRHP - National Register of Historic Places

No Action Alternative - The No Action Alternative is required by regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives. When a project activity is being evaluated, the No Action Alternative is defined as one where current management direction would continue unchanged.

Noxious Weed - A plant species that is highly injurious or destructive and has a great potential for economic impact. A plant species that is listed as noxious by the State of Idaho.

O

OHV - Off-Highway Vehicle

Overstory - The portion of trees in a forest which form the uppermost layer of foliage.

P

Peak Flow - The greatest flow attained during the melting of the winter snowpack.

Perennial Streams - Streams that flow continuously throughout the year.

Pioneer Species - A plant capable of invading a bare site (newly exposed soil surface) and persisting there until replaced by another species or community as succession progresses.

Plant Community - An assembly of plants living together.

Precommercial Thinning - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster.

Preferred Alternative - The alternative recommended for implementation in the EIS (40 CFR 1502.14).

Prescribed Burning - The application of fire to fuels in either a natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e. silviculture, wildlife management, reduction of fuel hazard, etc.).

Prescription - Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.

Private Road – A road under private ownership authorized by an easement to a private to a private party, or a road which provides access pursuant to a reserved or private right.

Project Area - The Project Area is the area within which the proposed activities are limited to. It may be confused with the Analysis Area which is the area that bounds the analysis for a particular resource and/or issue.

PSICC - Pike and San Isabel National Forests, and Cimarron and Comanche National Grasslands

Public Road – A road open to public travel that is under the jurisdiction of and maintained by a public authority such as States, counties and local communities.

R

Range of Alternatives - An alternative is one way of managing the National Forest, expressed as management emphasis leading to a unique set of goods and services being available to the public. A range of alternatives is several different ways of managing the Forest, offering different levels of goods and services.

Recreation Opportunity Spectrum - A system for defining the types of outdoor recreation opportunities the public might desire and identifies that portion of the spectrum a given area might be able to provide. It is used for planning and managing the recreation resource and recognizes recreation activity, setting, and experience opportunities.

Reforestation - The natural or artificial restocking of an area with forest trees.

Regeneration - The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop itself (i.e. seedlings or saplings).

Regeneration Harvest - Used in reference to harvest methods which remove an existing stand to prepare the site for regeneration.

Release - Freeing trees from competition for light, water and nutrients by removing or reducing the vegetation growth that is overtopping or closely surrounding them.

Riparian - Pertaining to areas of land directly influence by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas. Vegetation bordering watercourses, lakes or swamps; it requires a high water table.

Road – A vehicle travel way of over 50 inches wide.

Road Maintenance - The upkeep of the entire Forest Development Transportation Facility including surface and shoulders, parking and side areas, structures and such traffic control devices as are necessary for its safe and efficient utilization.

Roadless Area - A National Forest-system area which is larger than 5,000 acres or, if smaller than 5,000 acres, is contiguous to a designated Wilderness or primitive area; contains no roads, and has been inventoried by the Forest Service for possible inclusion into the wilderness preservation system.

ROS - Recreation Opportunity Spectrum

S

Salvage Harvest - Intermediate harvests made to remove trees that are dead or in imminent danger of being killed by injurious agents such as insects.

Sanitation Harvest - Intermediate harvests made to remove dead, damaged or susceptible trees to prevent the spread of pests or pathogens.

Scoping - The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action, i.e. the range of actions, alternatives, and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignment.

Sediment - Any material carried in suspension by water, which will ultimately settle to the bottom. Sediment has two main sources; from the channel itself, and from upslope areas.

Seedlings and Saplings - Non-commercial size young trees.

Sensitive Species - Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or habitat capability that would reduce a species' existing distribution.

Seral - A biotic community which is a development, transitory stage in ecological succession.

SHPO - State Historic Preservation Office

Silviculture - The art and science of growing and tending forest vegetation, i.e. controlling the establishment, composition, and growth of forests, for specific management goals.

Site Preparation - A general term for a variety of activities that remove or treat competing vegetation, slash and other debris that may inhibit the establishment of regeneration.

Slash - The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.

Snag - A standing dead tree usually without merchantable value for timbre products, but may have characteristics of benefit to some cavity nesting wildlife species.

Special Use Permit - A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.

Stand - A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from other adjacent communities.

Stand Replacing Fire - A fire that consumes an entire stand of trees. These fires are generally quite hot and can burn hundreds of acres.

Succession - The progressive changes in plant communities toward climax habitat.

Successional Stage - A stage or recognizable condition of a plant community which occurs during its development from the bare ground to climax habitat.

T

Thinning - Cutting in evenaged stands to redistribute growth potential or benefit the quality of the residual stand.

Threatened Species - Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tiering - Refers to the coverage of general matters in broader Environmental Impact Statements or Environmental Assessments with subsequent other related statements in Environmental Assessments incorporated, by reference, the discussions contained in the previous document, solely on the issues specific to the statement subsequently prepared.

Timber Types - A descriptive classification of forest land based on present occupancy of an area by tree species (i.e. lodgepole, mixed conifer). More appropriately called cover types, this category is further defined by the composition of its vegetation and/or environmental factors that influence its locality.

U

Understory - Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Unevenaged Management - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover. Harvest systems that develop or maintain unevenaged stands are individual tree and group selection.

Ungulate - A mammal having hoofs, i.e. deer, elk, and moose.

USDA - United States Department of Agriculture

USDI - United States Department of the Interior

USFWS - United States Fish and Wildlife Service

V

VCC - Visual Condition Class

Vertebrates - Animals having a backbone, or a spinal column, including mammals, fishes, birds, reptiles, and amphibians.

Viable Population - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Viewshed - Subunits of the landscape where the scene is contained by topography similar to a watershed.

Visual Condition Class - A measure of the level of disturbance to the visual resource, expressed in acres. The visual condition classes are used as indicators to measure the existing conditions and effects of alternatives.

Visual Quality Objective - A system of indicating the potential expectations of the visual resource by considering the frequency an area is viewed and the type of landscape. Specific VQOs are in Chapter 3 - Visual Quality.

Visual Resource - The composite of landforms, water features, vegetative patterns, and cultural features which create the visual environment.

VQO - Visual Quality Objective

W

Water Yield - The measured output of the Forest's streams.

Watershed - Entire area that contributes water to a drainage system or stream.

Wetlands - Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Wilderness - All lands included in the National Wilderness Preservation System by public law; generally defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation.

Wildfire - Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Wildlife Diversity - The relative degree of abundance of wildlife species, plant species, communities, habitats, or habitat features.

Windrowing - Slash or debris piled in a row along the contour of the slope.

WUI - Wildland-Urban Interface

Y

Yarding - A method of bringing logs into a roadside area or landing, for truck transport. Methods may include forms of skyline cable logging systems, ground-based skidding, balloon, helicopter, etc.

Chapter 6.
List of Preparers

Name	Education/Experience	Role
Brian Banks Pike National Forest	B.S. Physical Geography, Geology Minor, University of Colorado at Boulder 16 Years Experience	District Ranger
Sage Finn Pike National Forest	B.S. Natural Resource Management 32 Years Experience	Vegetation Manager
Zoe Ghali EMPS Inc.	M.S. Environmental Physiology, University of Colorado B.S. Biology, University of California 12 Years Experience	Wildlife Author
Lisa Heagley Pike National Forest	B.S. Natural Resources, Recreation and Tourism, Colorado State University 20 Years Experience	Recreation/Lands/ Wilderness Staff Officer
Kris Heiny Pike National Forest	BS in Forestry, Colorado State University MBA, Colorado State University 31 Years Experience	Project Lead, Assistant Fire Management Officer - Fuels
Kimberly Karish Blue Mountain Environmental	Ph.D. in Landscape Ecology and Environmental Planning, Harvard University M.S. in Fisheries and Wildlife Ecology, Utah State University B.S. in Ecology, Behavior and Evolution, University of California, San Diego 12 Years Experience	GIS Lead
Jennifer Kathol Kathol & Company	B.S. Natural Resource Economics, Colorado State University 33 Years Experience	Recreation, Visuals & Economics
Steve Olson Pike National Forest	B.A. Zoology, Southern Illinois University - Carbondale 29 Years Experience	Botany
Mikele Painter Pike National Forest	B.S. Wildlife Biology with a concentration in Conservation Biology M.S. Forestry	Wildlife Biologist
Brad Piehl, JW Associates	M.S. Forest Engineering/Hydrology, Oregon State University B.S. Forest Resources, University of Minnesota 28 Years Experience	Project Manager, Hydrology and Soils Author
Priscilla M. Riefkohl Guzmán Pike National Forest	BA in Anthropology, MA in Archaeology 17 Years Experience	Pike National Forest Zone Archaeologist
Steve Sanchez Pike National Forest	B.S. Biology, Math Minor, University of Southern Colorado, Master of Applied Natural Science, University of Southern Colorado 30 Years Experience	Soil/Water/Air Program Lead
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Appendix A
Biological Assessment

Crossons-Longview Forest Restoration Project
Environmental Assessment

Biological Assessment V3

South Platte Ranger District
Pike National Forest
September 2015

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ACRONYMS/ABBREVIATIONS

BA Biological Assessment

CFR Code of Federal Regulations

dbh diameter at breast height

EA environmental assessment

EMU Ecological Management Unit

ERT Environmental Research and Technology

ESA Endangered Species Act

FSM Forest Service Manual

GIS Geographic Information Systems

MIS Management Indicator Species

MSO Mexican spotted owl

NEPA National Environmental Policy Act

PAC protected activity centers

PCE primary constituent elements

PMJM Preble's meadow jumping mouse

Skipper Pawnee montane skipper

SRM Southern Rocky Mountains

TES threatened or endangered species

USFS U.S. Forest Service South Platte Ranger District of the Pike and San Isabel National Forests Comanche and Cimarron National Grasslands

USFWS U.S. Fish and Wildlife Service

1. INTRODUCTION

The U.S. Forest Service South Platte Ranger District of the Pike and San Isabel National Forests Comanche and Cimarron National Grasslands (USFS) has prepared this biological assessment (BA) for the Crossons-Longview Forest Restoration Project. An environmental assessment (EA) is being written for this project, addressing its implementation. Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened, endangered, or proposed species, or cause the destruction or adverse modification of their critical habitats. In addition, the USFS has established direction in Forest Service Manual (FSM) 2670 to guide habitat management for threatened, endangered, proposed, and sensitive species. This document is prepared in accordance with legal requirements set forth under section 7 of the ESA and follows standards established in FSM direction (2672.42) and the Code of Federal Regulations (50 CFR 402).

A Biological Assessment must be prepared for federal actions that are "major construction activities" (a project significantly affecting the quality of the human environment) to evaluate the potential effects of the proposal on listed or proposed species. The Forest Service has established direction in Forest Service Manual 2672.4 and Region 2 Supplement Number 2600-94-2 to guide habitat management for proposed, endangered, and threatened species. Preparation of a Biological Evaluation as part of the National Environmental Policy Act (NEPA) process ensures that these species receive full consideration in the decision-making process. Analysis of Forest Service Region 2 sensitive status species and Management Indicator Species (MIS) is discussed in a separate Wildlife Report/Biological Evaluation (BE).

This report is intended to evaluate whether implementation of the selected action may affect any plant, wildlife or fish species listed under the ESA, their proposed or designated critical habitats, or any species proposed for listing. To achieve this objective, this report reviews the ongoing action in sufficient detail to identify the level of effect that will occur to each species, based on the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the biologists and ecologists who completed the evaluation.

For listed species and designated critical habitat, one of three possible determinations (U.S. Fish and Wildlife Service [USFWS] and National Marine Fisheries Service 1998) is chosen:

- "No effect" – where no effect is expected;
- "May affect, not likely to adversely affect" – where effects are expected to be beneficial, insignificant (immeasurable), or discountable (extremely unlikely); and
- "May affect, likely to adversely affect" – where effects are expected to be adverse or detrimental.

2. Federally Threatened, Endangered and Candidate Species

Of the species that currently may be affected by projects in Jefferson or Park counties (Table 1), the least tern, pallid sturgeon, piping plover, western prairie fringed orchid, and whooping crane are not addressed further because the project area lacks suitable habitat for these species and no water depletions would result from the activities; therefore, there would be no effect to these species. Suitable habitat is also lacking for the black-footed ferret, Colorado butterfly plant, greenback cutthroat trout, North American wolverine, Penland alpine fen mustard, and Uncompahgre fritillary butterfly; therefore, there would be no effects to these species and they likewise will not be addressed further. Potentially suitable habitat for the Mexican spotted owl (MSO), Pawnee montane skipper (skipper), Preble's meadow jumping mouse (PMJM), and Ute ladies'-tresses orchid does exist in and near the project area. No evidence exists that any other listed or proposed species may occur on the project area.

3. Designated Critical Habitat

Areas designated as critical habitat are areas that may require special management considerations and are essential for the conservation of the species. The project area does not contain any current designed critical habitat. Revisions to critical habitat would be monitored and management adjusted as appropriate should new designation occur.

4. Consultation History

Federal actions that affect listed species must undergo consultation or conference with the USFWS. Definitions related to consultation and conference is given in the Endangered Species Act Consultation Handbook, Procedures for Conducting Section 7 Consultation and Conferences (USFWS 1998a).

Consultation is underway with the USFWS regarding threatened, endangered and candidate species for federal listing with the potential to occur in the Crossons-Longview Project Area.

Table 1. Federally threatened, endangered, proposed, and candidate species that may be affected by activities in Jefferson or Park counties, Colorado[1]

Common Name	Scientific Name	Status	Notes
Canada lynx	*Lynx canadensis*	Threatened	The project area is lacking in suitable habitat does not contain a Lynx analysis Unit.
Colorado butterfly plant	*Gaura neomexicana spp. coloradensis*	Threatened	The Forest lies outside the known range of the species. Forest activities will not affect Colorado butterfly plant.
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	Threatened	Restricted to only a few small drainages on the Pike and San Isabel National Forests per recent genetic studies; the species in not present in the planning area.
Gunnison's prairie dog	*Cynomys gunnisoni*	Candidate	Primary habitat, consisting of high mountain valleys and plateaus at elevations from 6,000 to 12,000 ft; open or slightly brushy country, scattered junipers, and pines (Wrigley at al 2012). Planning area does not contain suitable habitat.
Least tern (interior population)▲	*Sternula antillarum*	Endangered	No water depletions in the South Platte River would occur as a result of this project, therefore there would be no impact on downstream reaches.
Mexican spotted owl	***Strix occidentalis lucida***	**Threatened**	**Potential habitat in the planning area, included in analysis**
North American wolverine	*Gulo gulo*	Proposed Threatened	Habitat preference for high-elevation sites that maintain deep snow depths into late winter/early spring. Project area elevation not likely to include wolverine habitat.
Pallid sturgeon▲	*Scaphirhynchus albus*	Endangered	No water depletions in the South Platte River would occur as a result of this project, therefore there would be no impact on downstream reaches.
Pawnee montane skipper	***Hesperia leonardus montana***	**Threatened**	**Potential habitat in the planning area, included in analysis**
Piping plover▲	*Charadrius melodus*	Threatened	No water depletions in the South Platte River would occur as a result of this project, therefore there would be no impact on downstream reaches.
Preble's meadow jumping mouse	***Zapus hudsonius preblei***	**Threatened**	**Potential habitat in the planning area, included in analysis**
Uncompahgre fritillary butterfly	*Boloria acrocnema*	Endangered	Known to only occur above timberline on Mt. Uncompahgre. No occurrence in project area counties.
Ute ladies'-tresses orchid	***Spiranthes diluvialis***	**Threatened**	**Potential occurrence in the project area, included in analysis**
Western prairie fringed orchid▲	*Platanthera praeclara*	Threatened	No water depletions in the South Platte River would occur as a result of this project, therefore there would be no impact on downstream reaches.
Whooping crane▲	*Grus americana*	Endangered	No water depletions in the South Platte River would occur as a result of this project, therefore there would be no impact on downstream reaches.

[1] Source: USFWS November 12, 2013
▲- Water depletions in the South Platte River system may affect this species.
Species in bold font have analysis carried forward.

5. Description of Proposed Action

The South Platte Ranger District of the Pike and San Isabel National Forest proposes to treat approximately 11,700 acres within the 22,729 acre Crossons-Longview Project Area to move the montane forest ecosystem towards historic conditions. The Proposed Action would reduce the potential for catastrophic wildfires and improve the resiliency of the ponderosa pine and Douglas-fir dominated forests of the Front Range montane ecosystem. The Proposed Action would also protect water supplies and enhance wildlife habitat. To accomplish these goals, the US Forest Service proposes vegetation treatments to alter forest stand and understory conditions within the 22,729 acre Crossons-Longview Project Area.

The target vegetation types are identified on Table 2 below. Areas within 0.5 miles of existing and temporary roads would be the focus of the proposed treatments. These areas were estimated by identifying target vegetation types within one mile of existing roads and on slopes less than 60 percent.

Table 2. Crossons-Longview Vegetation Types Targeted for Treatments

Vegetation Type	Area (acres)	Percentage
Xeric Ponderosa pine	4,581	49%
Mesic Ponderosa pine	3,684	38%
Mixed Conifer	603	6%
Lodgepole pine	557	6%
Aspen	121	1%
Shrubs	28	<1%
Total	9,574	100%

The treatments would be accomplished by a combination of mechanical harvesting equipment and hand treatment. Specific actions would be dependent on site-specific conditions and the vegetation type; however, actions would include thinning, created openings, and prescribed burning. Professional judgment will be used, given the guidelines identified in the Environmental Assessment and taking into consideration the terrain and vegetative type, to determine which one or combination of treatments are most appropriate for individual treatment sites. Approximately 55 percent of the treatment areas are located within 0.5 miles of existing roads, with 33 percent of those areas treated by hand due to slopes between 35-60 percent. Approximately 61 percent of the treatment areas lie on slopes of 0-35 percent and would be considered appropriate for treatment with traditional harvesting equipment and commercial product removal. The treatments on slopes between 35-60 percent would likely be hand treatments.

Where possible, vegetation treatments would take into consideration previously treated areas and/or past burned areas in order to increase the overall landscape benefit. The proposed action does not include the establishment of any new system roads, however, some temporary roads would be needed to accomplish the project's goals. It is expected that project activities will take approximately 10 years to treat the entire targeted area.

Alternative C was developed in response to a concern that increasing access through the use of temporary roads would cause some negative effects. There are a variety of advantages and concerns about using temporary roads to complete the goals of the purpose and need. Even if gated or closed to motorized use, roads increase access into areas being treated. This can be an advantage for recreational uses but can create concerns to private property owners who are concerned about vandalism or unauthorized use of private property. The increased access can help with fire fighting efforts but also increase the possibility of dispersed camping and unattended campfires. Alternative C proposes that no temporary roads will be built to accomplish the project's purpose and need. Although relying solely on the existing road network will lessen the ability to remove fuels and will reduce the area that can be treated, there are still many roads in the project area and a large area of forest that is available for treatment off these existing roads. This alternative seeks to balance forest restoration with concerns about expanding the existing road network. Like the Proposed Action, Alternative C would reduce the potential for catastrophic wildfires and improve the resilience of the ponderosa pine and Douglas-fir dominated forests of the Front Range Montane ecosystem. Alternative C would also protect water supplies and enhance wildlife habitat. Areas considered available for treatment are a subset of Alternative B. Because no temporary roads will be constructed, all treatment must occur off of existing roads, limiting the area that can be treated. It is assumed that all treatment will occur within 0.5 miles of existing roads, reducing the available treatment area to 6,326 acres. Table 3 presents the total treatment area by vegetation type for Alternative C.

Table 3. Crossons-Longview Alternative C Vegetation Types Targeted for Treatments

Vegetation Type	Area (acres)	Percentage
Xeric Ponderosa pine	2,919	45%
Mesic Ponderosa pine	2,500	40%
Mixed Conifer	422	7%
Lodgepole pine	354	6%
Aspen	115	2%
Shrubs	16	< 1%
Total	6,326	100%

6. Analysis Methods and Assumptions

Information on species occurrence in the Crossons-Longview Project Area and suitable habitat features was collected from Pike and San Isabel National Forests, USFWS, Colorado Natural Heritage Program, and other sources to aid in the analysis of this project.

The indicators listed below are used to measure impacts of the project on wildlife and fish habitat:

- Pine structural stage diversity (estimated resulting structural stage distributions);
- Snag retention (estimated number of snags per acre); and
- Aspen communities (estimated acres enhanced).

Specific assumptions for project activities include the following:

- Slopes of 0-35 percent would be considered appropriate for treatment with traditional harvesting. Slopes of 35-60 percent would be appropriate for hand-treatment only, while those over 60 percent would not be suitable for treatment.
- Understory cover is anticipated to recover within 3 years of mechanical treatment or less than 2 years after hand thinning and prescribed burning

6.1 Conservation Measures

To be applied to all project activities as follows:

- Leave-tree spacing will be variable and retain the natural clumpy characteristics in the treated stand.
- Larger trees will generally be retained; trees identified as older than 150 years are to be retained.
- Existing snags will be retained where they are not a hazard.
- Resources will be monitored to ensure management objectives are achieved.
- All unclassified access routes and paths used to remove logs will be obliterated and rehabilitated within two years of treatment.
- Best management practices will be followed to limit the spread of noxious weeds in the treatment areas.
- Best management practices will be followed to limit soil erosion and maintain water quality.
- USFS will coordinate annually with USFWS to discuss and track treatment progress in habitat for the Mexican spotted owl, Pawnee montane skipper, and Preble's meadow jumping mouse.

Conservation Measures have also been developed to be applied in relevant habitat for specific species. These measures are included under Conservation Measures, below.

7. EXISTING CONDITION

This section describes the regulatory framework and environmental baseline for each species assessed in the BA. For each species, the potential for the selected action to cause direct, indirect, or cumulative effects is analyzed and a determination is made. For detailed species descriptions and documentation see "Threatened, endangered, and Forest Service Sensitive Species of the Pike and San Isabel National Forests" (updated June 2012), on file at the South Platte district office (Wrigley et al. 2012). All acre estimates are based on Geographic Information Systems (GIS) models of species' habitats; these areas are presumed suitable unless field verification indicates otherwise. Alternatively, if suitable but unmapped habitat is discovered during field visits those sites must be considered occupied and the appropriate conservation measures applied.

This environmental analysis is tiered to the 1984 Forest Plan, as amended (USDA Forest Service 1984).

Other regulation and policy measures relevant to actions in the Project Area include the following:

- The ESA of 1973 as amended (16 USC 1531, et seq.) directs federal agencies to ensure that their actions do not jeopardize threatened and endangered species, and that through their authority they help to bring about the recovery of such species.
- The Region 2 Watershed Conservation Practices Handbook (Forest Service Handbook R2 Supplement 2509.25), which contains proven watershed conservation practices to protect soil, aquatic, and riparian systems. If used properly, the watershed conservation practices meet applicable federal and state laws and regulations, including state best management practices. Forest Supervisors and District Rangers are responsible for implementing the applicable management measures and design criteria from this handbook, or acceptable alternatives that meet applicable legal and regulatory requirements, in all projects.

7.1 MEXICAN SPOTTED OWL

Regulatory Framework

The Mexican spotted owl is a threatened species, listed on March 16, 1993 (58 FR 14248). A final rule designating critical habitat for the owl was published on June 6, 1995; this designation was successfully challenged in court (60 FR 29914). On August 31, 2004, the USFWS published a new final rule designating critical habitat for the owl. Over 8.6 million acres of critical habitat is designated in Arizona, Colorado, New Mexico, and Utah (69 FR 53182).

A final recovery plan was published in September 2012 (USFWS 2012) and replaces the previous plan dated October 16, 1995. The 1995 recovery plan subdivided the owl's range into 11 recovery units, six in the United States and five in Mexico. These were renamed in the September 2012 Final Recovery Plan as ecological management units, in accordance with current USFWS guidelines. The project area is within the Southern

Rocky Mountains Ecological Management Unit (SRM EMU; formerly called the SRM-Colorado and SRM-New Mexico Recovery Units).

The Mexican spotted owl occurs in forested mountains and rocky canyonlands in the southwest United States and south into several states of Mexico (Gutierrez et al. 1995; Ward et al. 1995). The species' core range occurs in central Arizona and New Mexico. In Colorado, it occurs in lower-elevation forests, usually in deeply incised, rocky canyons in southern Colorado and along the Front Range. When the species was listed as threatened in 1993, there were twenty historic records for Colorado, with occurrences ranging from the San Juan Mountains in southwestern Colorado and from the Front Range as far north as the vicinity of Denver (USFWS 1993). The primary constituent elements (PCEs) of critical habitat are described in Table 4, Primary Constituent Elements of Mexican Spotted Owl Critical Habitat. The planning area contains no critical habitat. Critical habitat is found adjacent to eastern boundary of the planning area as well as approximately X miles to the south in Jefferson County.

Table 4. Primary Constituent Elements of Mexican Spotted Owl Habitat Critical Habitat.[2]

Features	Description
Forest structure	• A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground • A shade canopy created by the tree branches covering 40 percent or more of the ground • Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 4.5 feet (1.4 meters) from the ground
Maintenance of adequate prey species	• High volumes of fallen trees and other woody debris • A wide range of tree and plant species, including hardwoods • Adequate levels of residual plant cover to maintain fruits and seeds and to allow plant regeneration
Canyon habitats	• Presence of water (often providing cooler temperature and higher humidity than the surrounding areas) • Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, or riparian vegetation • Canyon wall containing crevices, ledges, or caves • High percent of ground litter and woody debris

[2] Source: USFWS 2004

On the Pike and San Isabel National Forests, protected activity centers (PACs) were established at current and historic sites where owls were known or suspected to nest or roost. Using Rocky Mountain Region spatial vegetation and topography data, the two forests also created a conservative model of forested stands that meet the general description of recovery habitat, which has been updated in accordance with the 2012 MSO Recovery Plan habitat definitions. Because the model was designed to be conservative, some identified stands may not actually be capable of providing habitat for owls (e.g., inadequate tree size and/or density). Therefore, stands must be field-verified to determine if they do not have the capacity to provide suitable owl habitat.

Within mixed-conifer forested recovery habitat in the SRM EMU 25 percent of a planning area (e.g., Pike and San Isabel National Forests) must be managed for recovery nesting/roosting habitat (see USFWS 2012, Table C-3). The remainder is to be managed to provide foraging, dispersal, wintering, or other habitat needs. Recommended management for these foraging and non-breeding areas includes retaining PCEs and minimizing tree removal, however no specific numbers are provided.

Environmental Baseline

The proposed Project Area is generally lacking cool, moist canyons with large diameter trees that meet the species Primary Constituent Elements (PCEs). On the Pike and San Isabel National Forests, protected activity centers (PACs) were established at current and historic sites where owls were known or suspected to nest or roost. The closest PACs are located more than 10 miles south of the Project Area. Between 1993 and 2005 the USFS conducted extensive surveys for owls across the district. No MSO were detected within the Project Area. Furthermore, no reproduction was documented in the nearby PACs, so given the survey results on the district the likelihood of owls occurring in the Project Area is considered low. Habitat in the planning area may be utilized for foraging and can be considered dispersal habitat. Habitat modeling indicates that the Project Area contains an estimated 3,960 total acres of potentially suitable recovery owl habitat. Approximately 2,600 acres of the potentially suitable recovery owl habitat is located within proposed treatment areas.

In addition to stand replacing wildland fire, the MSO is threatened by the following:

- Noise and habitat disturbance from commercial, recreational, scientific, or educational activities
- Incompatible silviculture treatments
- Over-grazing
- Climate change
- Land and road development

Conservation Measures

The project area does not contain critical habitat core areas or PACs. Therefore conservation measures presented here are limited to recovery habitat as defined in the 2012 MSO recovery Plan (USFWS 2012).

For this analysis, all potentially suitable habitat as identified in the MSO habitat model (i.e., forested foraging/ non-breeding habitat, forested nest/roost habitat, riparian recovery habitat and rocky canyon habitat) is considered occupied. All potential habitat will require field verification to determine if appropriate habitat type is actually present prior to implementation. Conservation Measures are presented below for each habitat type.

There is a maximum of 2,600 acres of MSO recovery habitat in the proposed treatment areas. During consultation with US Fish and Wildlife Service an annual maximum treatment area within the 2,600 acres of recovery habitat will be determined.

Forested Nest/Roosting Habitat (including Rocky Canyon Habitat)

1. Treatments are permitted long as stand conditions remain at or above the values given in Table C.3 of the 2012 MSO Recovery Plan. No stand that meets Table C.3 conditions should be treated in such a way as to lower that stand below those conditions until ecosystem assessments can document that a surplus of these stands exist at larger landscape levels (e.g., no less than the size of a FS District). The following criteria will also be followed:
    - Retain trees ≥46- cm (18 inches) diameter at breast height dbh unless there are compelling safety reasons to do so or if it can be demonstrated that removal of those trees will not be detrimental to owl habitat.
    - Manage for nest/roost replacement habitat and emphasize attainment of nest/roost conditions as quickly as reasonably possible.
    - Mimic natural disturbance patterns, provide a mosaic of treated and untreated areas, and strive for species diversity.
    - Retain key owl habitat elements including most hardwoods, large snags (>46 cm [18 in] dbh), large downed logs (>46 cm [18 in] diameter at any point), trees (>46 cm [18 in] dbh.

Forested Foraging/Non-Breeding Habitat

- Retain key owl habitat including most hardwoods, large snags (>46 cm [18 in] dbh), large downed logs (>46 cm [18 in] diameter at any point), trees (>46 cm [18 in] dbh), unless this conflicts with forest restoration and/or owl habitat enhancement goals.
- Minimize tree removal.

Riparian Recovery Habitat

- Manage for Proper Functioning Condition, manage for species diversity, manage for grazing effects, and minimize construction activities.
- Maintain key habitat components (e.g., large trees, large snags, large logs, hardwoods, etc.).
- Minimize tree removal.

7.2 Pawnee Montane Skipper

Regulatory Framework

The skipper is listed as threatened (USFWS 1987) and a recovery plan exists (USFWS 1998b), but no critical habitat has been designated. Skippers occur only on the Pike Peak Granite Formation in the South Platte drainage system in Colorado, involving portions of Jefferson, Douglas, Park, and Teller counties. The species typically occurs at an elevation range of 6,000 to 7,500 feet, though there are records as high as 8,000 feet (Wrigley et al 2012). Potentially suitable skipper habitat was first mapped in the 1980's (ERT 1988). There are three populations of the skipper distinguished in the butterfly's Recovery Plan that occupy approximately 25,044 acres of ponderosa pine forests between 6,000 and 8,000 feet in the South Platte River Valley (ENSR 2003).

Environmental Baseline

Based on field studies by Environmental Research and Technology (ERT) (1988) the general characteristics of skipper habitat include tree canopy cover of 30 percent; ponderosa pine crown cover of 25 percent, Douglas-fir crown cover of 5 percent; tree density of less than 120 trees per acre in the smallest size class; overall tree density of less than 200 trees per acre; shrub and grass cover generally less than 10 percent; prairie gayfeather (*Liatris punctata*) flower stem density ranging from 50 to 500 per acre; and blue grama (*Bouteloua gracilis*) cover 5 percent or less, but present nearly everywhere. Skippers are dependent upon prairie gayfeather and blue grama for nectar and reproduction, respectively. Adult females deposit their eggs singly on leaves of blue grama in late summer. After hatching, larvae feed on blue grama until they pupate. From late July to October adult skippers emerge and forage for nectar on prairie gayfeather flowers, as well as a variety of other plants including hairy golden-aster (Wrigley et al 2012).

Between 1996 and 2002, four separate fires burned approximately 48 percent (12,026 acres) of the habitat in the Project Area. There is evidence that high-severity burns may decrease habitat suitability. On-going monitoring of skippers in the 2002 Hayman Fire area has documented that areas of moderate-to-high burn severity still represent marginal habitat for the skipper even in 2012, 11 years after the Hayman fire. Burn areas also appear to be dependent upon a source population of butterflies from unburned habitats (Sovell, 2013).

Based on the current map of suitable habitat, approximately 540 acres of potentially suitable habitat is present in the planning area. Habitat mapping is general, and non-mapped area may be suitable while some portions of mapped habitat may be considered suboptimal because forest canopy cover has become too dense or ground cover is sparse.

Threats to the species in addition to high severity wildland fire include the following:

- Invasive weeds which may outcompete host plants
- Climate change and drought
- Habitat loss from natural and human causes (ie. conifer encroachment)
- Inadequacy of existing regulatory mechanisms
- Recreational use of habitat
- Land and road development

Conservation Measures

For this analysis, all suitable skipper habitat is considered occupied. All potential habitat will require field verification to determine if appropriate habitat type is actually present prior to implementation.

1. There is a maximum of 415 acres of skipper habitat in the proposed treatment area. During consultation with US Fish and Wildlife Service an annual maximum treatment area within the 415 acres of skipper habitat will be determined.
2. The disturbance from mechanized thinning operations in skipper habitat will be minimized by the use of pre-treatment surveys to determine the best skid trails and forwarder routes. Routes will be designated to avoid blue grama and Liatris areas, and trees will be felled so as to avoid areas of blue grama and prairie gayfeather, where possible.
3. Thinning and burning activities will take place outside of the skipper flight season (August 1 to October 1).
4. The size and shape of created forest openings within skipper habitat will be based on the concept of a maximum distance to forest edge requirement in skipper habitat. The maximum distance would be 265 feet, based on the radius of a 5-acre circle, such that any point within the opening will be within 265 feet of a forest edge. A forest edge would be defined as the outer margin of a forested area with 11 percent or greater canopy coverage of overstory trees, and which extends for at least 100 feet on the axis perpendicular to the edge. A minimum of 100 feet of forest will remain between created openings. A few live ponderosa pine trees shall remain scattered throughout the opening.
5. Small forest openings (1/10-ac to 1/2-ac) with blue grama and prairie gayfeather are important components of skipper habitat, therefore, slash treatments will minimize or avoid piling or scattering slash in these forest openings. Slash deposition will not exceed an average depth of 12 inches in skipper habitat.
6. Blading of existing roads or access routes that are vegetated and within skipper habitat will be limited to a project maximum total of 4 acres (approximately 3 miles of road). Bladed areas will be reclaimed immediately after treatments are completed.
7. Prescribed burning in skipper habitat will be limited to 1,000 acres per year with no more than 500 acres of contiguous habitat burned in any given year. Burns in adjacent areas shall be staggered by a minimum of 2 years to allow for recover of skipper populations.
8. In as much as possible, thinning activities in suitable habitat shall be staggered over space and time (i.e., years) to avoid treating large contiguous blocks of suitable habitat all at once.

7.3 Preble's Meadow Jumping Mouse

Regulatory Framework

PMJM was listed as threatened in 1998 (63 FR 26517), primarily due to human development of its limited habitat along the Front Range of the Rocky Mountains (USFWS 1998c). A draft recovery plan has been written but not finalized (USFWS 2003). Critical habitat was initially designated in 2003 (USFWS 2003) and revised in Colorado in 2010 (USFWS 2010). Sections of the South Platte River (unit 10) and Arkansas River drainages in Colorado are within designated critical habitat (USFWS 2010). No critical habitat is found within the project area.

Environmental Baseline

In general, typical habitat for PMJM is comprised of well-developed riparian vegetation with adjacent, upland habitat found at elevations between 4,650 feet and 7,600 feet, although elevations may vary across the range of the subspecies (USFWS 2003). Suitable riparian vegetation includes a dense combination of grass, forb, and low shrub cover, and taller shrubs and trees may be present. Adjacent uplands used by PMJM are variable and can include range from open grasslands to ponderosa pine woodlands. The montane woodlands where PMJM has been found are dominated by ponderosa pine, Douglas-fir, spruce, and occasionally aspen, with understories of shrubs and forbs. The active period for PMJM is estimated to be May 1 through October 31; they hibernate in underground burrows during the remaining time (USFWS 2003).

All riparian habitat in the project area and adjacent upland habitat (within 300 feet of 100 year flood plain) below 7,600 feet elevation is considered potentially suitable occupied habitat. The project area contains approximately 3,700 acres of potential habitat based on these criteria. Habitat mapping on the Pike and San Isabel National Forests appears to over-estimate the extent of potentially suitable PMJM habitat. During ground-truthing, some drainages initially mapped as potential habitat have been found to lack any riparian vegetation or surface water and should not be considered as potential habitat. In many areas, the mapped potential habitat is of marginal quality, with poorly developed or intermittent riparian vegetation. Upland vegetation is sparse in many mature mixed-conifer stands and grasses or shrubs that may provide forage or cover are absent. In these areas individual PMJM may occur; however, the likelihood of occurrence or persistent populations is considered to be much lower than in high-quality habitats. Other areas contain well-developed riparian and upland habitat that hold a high potential for supporting persistent populations of PMJM. It is likely that mapped potential habitat is more comprehensive than actual suitable or occupied habitat. Field verification surveys prior to implementation of project activities could confirm the suitability of habitat.

Threats to the species include the following:

- Invasive weeds
- Recreation
- Climate change and drought
- Inadequacy of existing regulatory mechanisms
- Modification of riparian areas vegetation or systems (i.e. through stream stabilization)
- Hydrology impairments
- Loss and fragmentation of riparian habitat from urbanization

Conservation Measures

For this analysis, all Preble's critical habitat, as well as all suitable riparian and adjacent (within 300 feet) upland habitat below 7,600 feet elevation is considered occupied. Vegetation treatment restrictions apply the same to critical habitat and potential habitat if it is suitable. All potential habitats will require field verification to determine if appropriate habitat type is actually present prior to implementation. Mapped habitat is considered suitable until field verification is completed.

For upland habitat within the floodplain and designated buffer:

1. There is a maximum of 2,100 acres of PMJM habitat in the proposed treatment areas. During consultation with US Fish and Wildlife Service an annual maximum treatment area within the 2,100 acres of PMJM habitat will be determined.
2. Product removal, mastication, slash treatments with heavy equipment, and prescribed burning within Preble's upland habitat will occur during the hibernation period (November 1 through April 30), but hand thinning treatments (including hand slash treatments) in upland habitat may occur at any time of the year.
3. Vehicles will not enter riparian areas, regardless of time of year, with the exception of identified drainage crossings, as described below.
4. Felling of trees in the water influence zone (WIZ; vegetation within 100 feet of perennial and intermittent streams) will occur in a way that protects vegetation in the WIZ from damage. Log landings and skid trails will be kept out of the WIZ, including swales. Removal of logs from the WIZ will include at least one-end log suspension.
5. Impacts to shrubs in upland areas by vehicles and associated logging equipment will be minimized. No shrubs or trees will be uprooted.
6. In as much as possible, treatments in suitable upland habitat shall be staggered over space and time (i.e., years) to avoid treating large contiguous blocks of suitable habitat all at once.

Riparian Habitat

1. No riparian vegetation will be removed.
2. Select conifer trees in riparian areas may be removed by hand equipment or by mechanical equipment if the vehicle can stop outside the riparian area and remove conifers inside the riparian area without damaging riparian vegetation. Such conifers may be targeted for removal only after discussion between the USFS and USFWS
3. Prescribed burns will not be ignited in Preble's riparian habitat, although backing fires and light understory burns may enter riparian area vegetation and will be limited to X acres over the life of the project. [Need to determine appropriate limit for prescribed burns for this project based on a maximum of X aces of habitat in the proposed treatment area- may need to check with USFWS]
4. Heavy equipment will be kept out of riparian areas around streams, swales, and lakes, except to cross at designated points, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil. Heavy equipment will be kept out of streams during fish spawning, incubation, and emergence periods.
5. Drainage crossings by vehicles and heavy equipment are allowed for the purposes of providing access across small drainages to treatment areas that would otherwise be inaccessible.
6. Drainage crossings will involve only overland travel by vehicles and drainage crossings will not be bladed.
7. Drainage crossings will avoid riparian shrub habitat if possible. If it is not possible to avoid riparian shrub habitat, efforts will be made to minimize disturbances of these areas.
8. Disturbances from drainage crossings in suitable Preble's riparian habitat shall not exceed 1 acre for the life of the project. No more than 0.5 acres of riparian grass and shrub habitats shall be impacted at any given time.
9. During the annual meeting, or prior to impact, the USFS and USFWS will review any proposed drainage crossing that would cause a disturbance or removal of suitable riparian habitat.
10. Once the drainage crossing is no longer needed to complete forest treatments, the crossing will be allowed to reclaim itself. If reestablishment of the riparian vegetation on the drainage crossing is not achieved within 3 years, further work may be needed and will be mutually coordinated at the annual meeting

7.4 UTE LADIES'-TRESSES

Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial herb in the orchid family (*Orchidaceae*). It flowers from July through August. It occurs at elevations of 4,200 to 6,000 feet in early- to mid-seral, moist to wet conditions, where competition for light, space, water, and other resources is normally kept low by periodic or recent disturbance events, such as alluvial banks, river floodplain habitats, shores of lakes and reservoirs, in mesic meadow-type vegetation maintained by lake level fluctuations or seasonal flooding of gravel bars, and human-developed dams, reservoirs, and irrigation ditches (NatureServe, 2014). It is found in Colorado in Boulder, El Paso, Jefferson, Larimer, Moffat and Weld counties (Colorado National Heritage Program, 2014). Habitat may be threatened by grazing or haying after flower production and invasion of sites by non-native plants.

8. Analysis of Effects

8.1 Direct and Indirect Effects- No action alternative

Mexican Spotted Owl

Under Alternative A, vegetation on the forest would follow natural succession, disturbance, and recovery processes. Long term, the tree cover and density would continue to increase and late successional pine forest would likely increase; some additional portions of the planning area may therefore become suitable for MSO. However, the risk of high severity wild-fire, with the potential to burn MSO recovery habitat would increase. The 2012 Recovery Plan identifies stand-replacing wildfire as the primary threat to MSO persistence. Dense late-successional stands would lead to an increased risk of insect infestation and wildfire.

Pawnee Montane Skipper

Under Alternative A, vegetation on the forest would follow natural succession, disturbance and recovery processes. A small potential for disturbance of Skipper from ongoing forest uses would remain. Long-term, the tree cover and density would continue to increase. Areas that currently represent xeric ponderosa pine with suitable patchy openings supporting prairie gayfeather and blue grama may become unsuitable for Skipper habitat as forest succession continues. In addition, the risk of high severity wild-fire, with the potential to burn upland and adjacent riparian habitat would remain and increase with forest succession. As indicated with studies in the Hayman burn area, high-severity fire may alter habitat conditions such that recovery of the species into the habitat is delayed 10 years or more.

Preble's Meadow Jumping Mouse

Under Alternative A, vegetation on the forest would follow natural succession, disturbance, and recovery processes. A small potential for disturbance of PMJM from ongoing recreational activities in riparian areas or other current forest uses would remain. Long-term, the tree cover and density would continue to increase in upland habitat, resulting in decreased grass and forb cover and reduction of suitable habitat for the species. In addition, the risk of high severity wild-fire with the potential to burn upland and adjacent riparian habitat would remain. Should high-severity wildfire occur, impacted areas could become unsuitable for PMJM for many years due to changes to structure and composition of vegetation components and changes to soil including increased risk of erosion. Telemetry data indicated that PMJMs did not enter burned habitats for at least 3 years after the Hayman Fire (Hansen, 2006). If left untreated, nonnative, invasive plants may alter the post-fire dynamics of riparian areas 50 to 100 years after a wildfire (Graham, 2003).

Ute Ladies Tresses

Alternative A (No Action) would have no direct effects on the sensitive plants in the Crossons-Longview Project Area because no vegetation treatments would be implemented. However, Alternative A (No Action) could have indirect effects on sensitive plants and habitats over time. Without treatment, conifers would continue to encroach into the open areas where these sensitive plants could occur. This could eventually lead to a decline in habitat quality and loss of individuals as shading changes growing conditions on the site.

Loss of tree canopy cover would continue in some areas due to the effects of insects and disease. This could improve conditions for sensitive plants. Habitat conditions for sensitive plants could decline with increased competition from other plants which also favor open canopied conditions, including several species of noxious weeds. The lack of fire would have a negligible effect on sensitive plants. They could benefit from the nutrient release from fire.

8.2 Direct and Indirect Effects- Proposed Action

Mexican Spotted Owl

MSO are not known to occur in the Project Area, although non-breeding individuals may occur but are likely to be limited. Should any owls be present in roost stands adjacent to treatment stands, they may be slightly temporarily disturbed by machinery and human noise. This level of disturbance is not expected to impact the fitness level of affected owls, since the species is relatively tolerant of humans and machinery (Delaney et al., 1999; Johnson and Reynolds, 2002; Swarthout and Steidl, 2003). Additionally, much of the MSO recovery habitat in the planning area is excluded from mechanical thinning and harvest treatments that use heavy equipment or machinery because of slope constraints of prohibiting harvesting equipment on slopes greater than 35 percent.

Approximately 2,600 acres potentially suitable foraging habitat (i.e. recovery habitat) could be temporarily disturbed in the Project Area (Figure 1). Of this area, based on slope constraints, approximately 1,216 acres would be treated with mechanical treatment and 1,390 with hand treatment only. Understory vegetation and existing coarse woody debris would be crushed by heavy machinery or consumed by prescribed fire, which could have a slight temporary negative effect on owl prey. However, both of these habitat components would recover and likely increase shortly after treatments are complete.

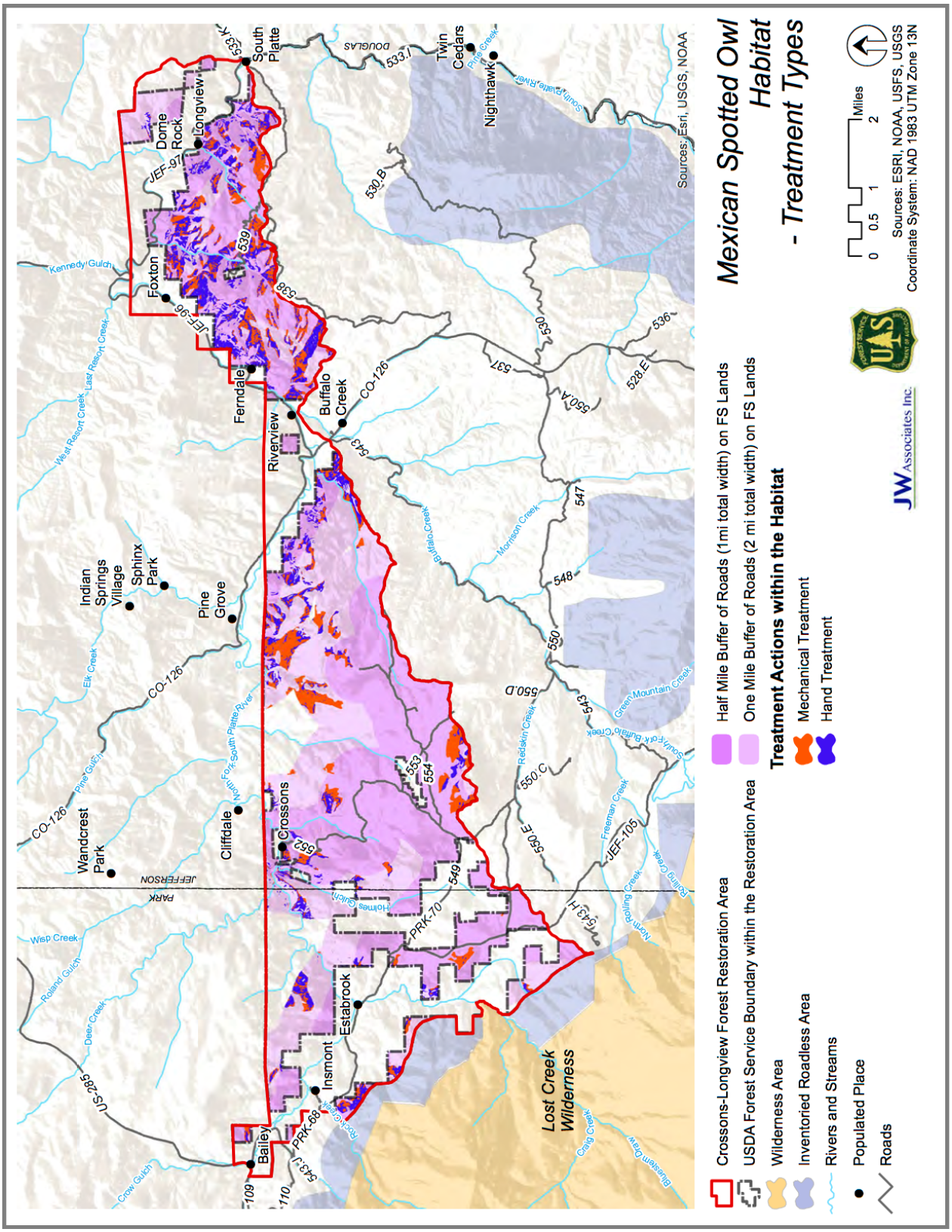

Figure 1. Crossons-Longview Treatment Types in Mexican Spotted Owl Habitat

Long-term, Alternative B (Proposed Action) would address the primary threat to the MSO: high-intensity wildfire. Fuel reduction and prescribed burn treatments in recovery habitat would reduce the hazardous fuel loads and the likelihood of high-intensity wildfire in these areas. Thinning treatments and prescribed burns would create small openings and thinned stands that increase horizontal diversity and create snags, canopy gaps, and large logs, as well as perpetuate understory shrubs, grasses, and forbs, which are important habitat components to the owl, its prey, and other wildlife (USFWS, 1995). The treatments proposed are consistent with the 2012 Recovery Plan guidelines for fuels and forest management practices in MSO habitat; the overall result would aim to mimic natural processes and would introduce additional diversity into the forest structure. In addition, owl habitat would benefit from the reduced risk of stand-replacing fire. Stands that are potentially capable of producing suitable breeding and non-breeding owl habitat would therefore be encouraged to develop, and would be more protected from loss due to fire.

Pawnee Montane Skipper

Alternative B would treat approximately 415 acres of potentially suitable Skipper habitat, including 240 acres of hand treatment and 175 acres of mechanical treatment (Figure 2). Within this habitat, thinning and burning activities may directly affect skipper eggs, larvae, or pupae through dislodging or crushing from vehicles and equipment and foot traffic or burned during prescribed fire activities. No direct effects to adult skippers are expected because under project conservation measures, all activities will avoid skipper habitat during the active flight season. Habitat in treatment areas, particularly in mechanical treatment areas, would be affected by crushing of vegetation and disturbance of soil from heavy machinery. In all treatment areas, coarse woody debris may be altered as much content may be added, removed, or changed in size. Understory cover is anticipated to recover within 3 years of mechanical treatment or less than 2 years after hand thinning and prescribed burning. Conservation measures would stagger treatments throughout the Project Area in space and time. As a result, skippers will have local refuges of undisturbed habitat adjacent to sites undergoing treatment, and can then repopulate treatment units when the understory vegetation has recovered (Sovell, 2013).

Project activities will be implemented so that disturbance to skippers will be minimized, however some individuals may be harmed, harassed, or killed. Given the conservation measures and naturally patchy distribution of the species these risks are expected to be acceptably low and of short duration in any one location. The long-term effect is expected to be positive for skippers because the amount and distribution of host plants is expected to increase with an appropriate reduction in tree cover, improving habitat conditions over a large area. Alternative B includes specific language to allow for thinning activities to improve skipper habitat by reducing density.

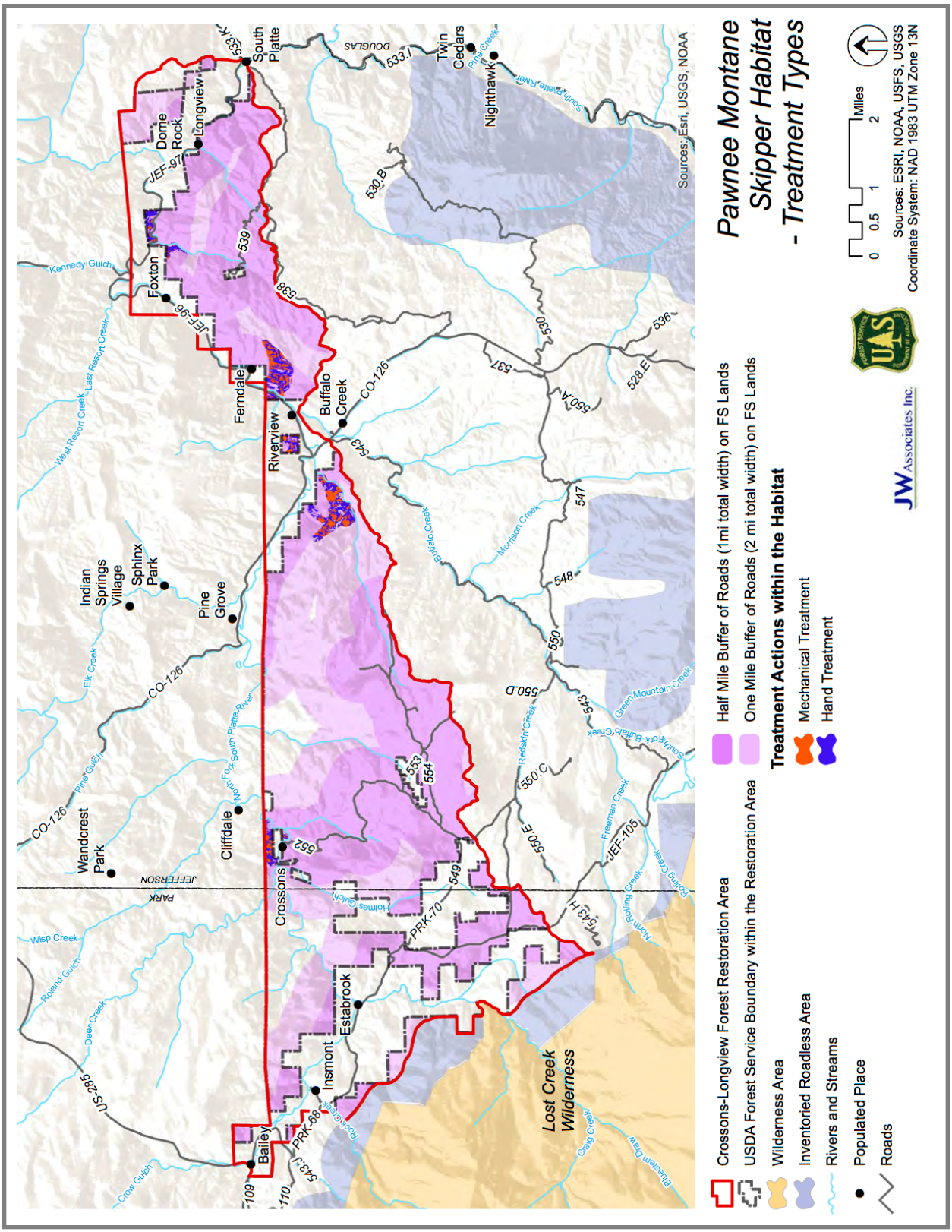

Figure 2. Crossons-Longview Treatment Types in Pawnee Montane Skipper Habitat

Preble's Meadow Jumping Mouse

Approximately 2,100 acres of potential PMJM habitat falls within the potential treatment area, 1,000 acres with potential mechanical treatment, and 1,100 acre with potential hand treatment (Figure 3). This represents approximately 57 percent of the total potential PMJM habitat within the Project Area. Individual PMJM may be disturbed, injured, or killed by project activities in upland habitat adjacent to riparian areas. Currently, suitable upland habitat would be affected by heavy machinery in areas proposed for mechanical treatment; existing herbaceous vegetation and small shrubs would be crushed, the soil surface would be disturbed, and coarse woody debris would be altered. During project operations upland habitat would be temporarily unsuitable or of reduced quality. Disturbed areas are expected to recover in 3 years of mechanical treatment, and 2 years or less after hand thinning and prescribed burning. No mechanical treatments are proposed for riparian areas.

The effects of management activities on upland habitat would be mitigated through the use of project specific conservation measures. However, the chance that individuals may be harmed, harassed, or killed is still present. But given the rare occurrence of the species these risks are expected to be acceptably low and of short duration in any one location. The long-term effect is expected to be positive for PMJM because the amount of grass, forb, and shrub cover would increase with the reduced tree cover, subsequently improving habitat conditions over a large area. The risk of losing suitable habitat and subpopulations of PMJM to widespread stand-replacing fire would also be moderated in comparison to pre-treatment conditions.

Ute Ladies Tresses

The Crossons-LongView Project Area includes approximately 1,100 acres below 6,500 feet in elevation. The proposed treatment area for Alternative B (Proposed Action) includes approximately 150 acres of treatment in xeric ponderosa pine. Surveys for Ute Ladies Tresses within the 150 acres of potential vegetation treatment would be required before any ground disturbing activities. Any identified plants would be documented and avoided by creating a no treatment buffer of 50 feet. These activities would result in no direct or indirect effects on Ute Ladies Tresses from Alternative B (Proposed Action).

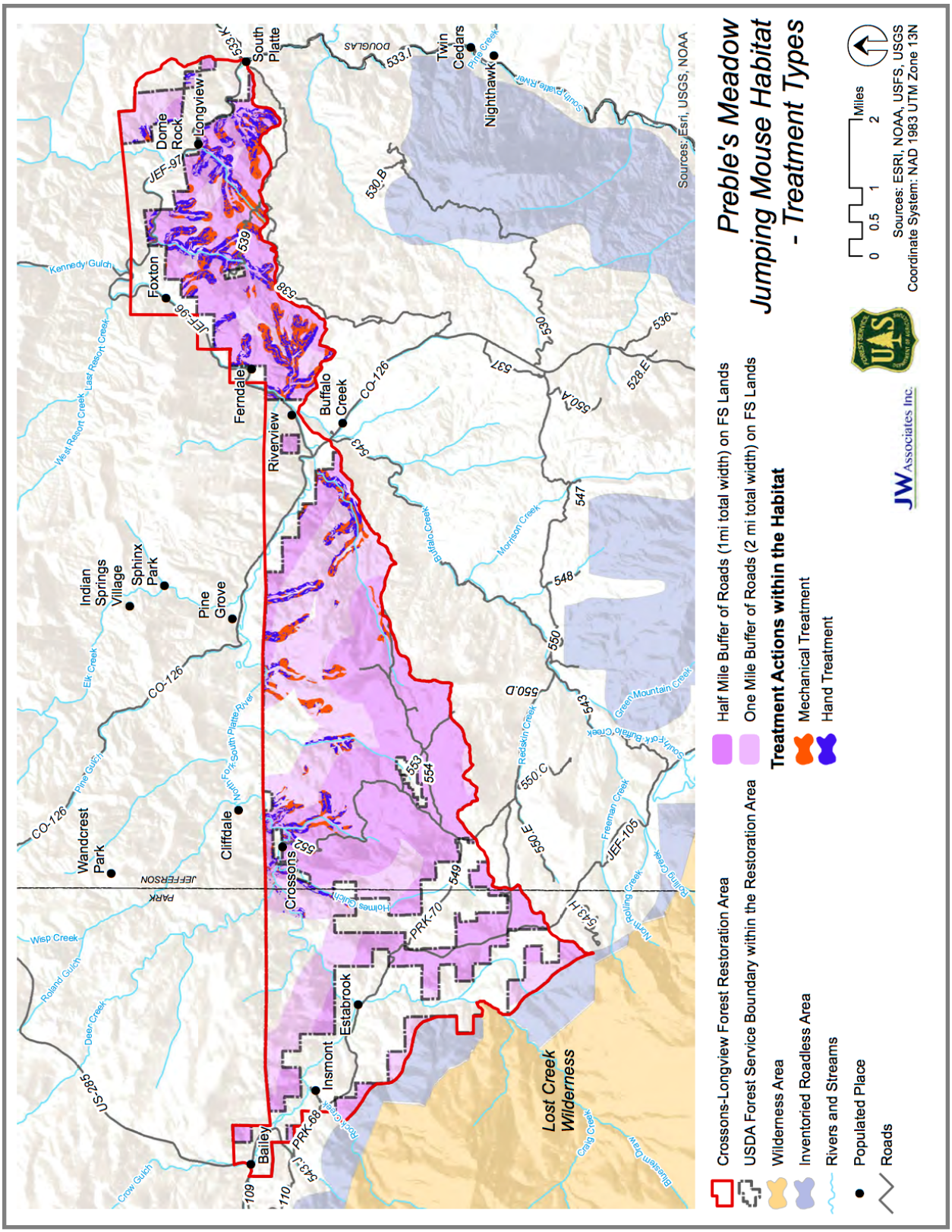

Figure 3. Crossons-Longview Treatment Types in Preble's Meadow Jumping Mouse Habitat

8.3 Direct and Indirect Effects- Alternative C

Mexican Spotted Owl

Impacts under Alternative C would be similar in nature to the proposed action. However because no temporary roads will be constructed, all treatment would occur using existing roads. Total area MSO recovery habitat within the proposed treatment area is 1,630 acres. Area of potential treatment under Alternative C is comprised of 917 acres with potential mechanical treatment and 716 acres with potential hand treatment. Due to the reduction in potential treatment area, short term impacts on MSO recovery habitat including disturbance from treatment activities and loss of downed woody debris that supports owl prey would be reduced. Due to the less treatment area, risk of high-severity wildfire and associated loss of MSO habitat would remain higher.

Pawnee Montane Skipper

Under Alternative C, impacts would be similar to those described under Alternative B. However because no temporary roads will be constructed, all treatment would occur using existing roads. As a result, acres of habitat that may be treated would be decreased to approximately 300 acres, including 177 acres with hand treatment and 123 acres with mechanical treatment proposed. Area of potential treatment under Alternative C is comprised of 600 acres with potential mechanical treatment and 700 acres with potential hand treatment. Due to the reduction in potential treatment area, short term impacts including crushing of eggs, larvae, or pupae and disturbance of host plants would be decreased. However, long-term improvement of habitat conditions due to the reduction of tree cover and increase in small patchy openings would also be reduced. Risk of high-severity wildfire and associated loss of skipper habitat would remain for the portions of the planning area outside of the treatment area.

Preble's Meadow Jumping Mouse

Impacts under Alternative C would be similar to those described under Alternative B. However because no temporary roads will be constructed, all treatment would use existing roads. As a result, acres of PMJM habitat that may be treated would decrease by 62 percent, from 2,100 to 1,300 acres. Area of potential treatment under Alternative C is comprised of 600 acres with potential mechanical treatment and 700 acres with potential hand treatment. Due to the reduction in potential treatment area, short-term impacts on PMJM, including temporary unsuitability of habitat from treatment activities, would be reduced. However, long-term improvement of habitat conditions due to the reduction of tree cover would also be reduced. Due to the reduction in potential treatment area, risk of high-severity wildfire and associated loss of PMJM habitat would remain for the portions of the planning area outside of the treatment area.

Ute Ladies Tresses

The direct and indirect effects of Alternative C would be the same as Alternative B (Proposed Action). Alternative C includes approximately 148 acres of potentially suitable Ute ladies tresses habitat. Protection measures would be the same as this described in Alternative B (Proposed Action). Therefore, there wold be no direct or indirect effects to Ute Ladies Tresses from Alternative C.

8.4 Cumulative Effects- No action alternative

This section presents the potential cumulative effects of the past, present, and reasonably foreseeable future actions in and adjacent to the Project Area. The cumulative effects analysis is bound by a period of 20 years and the South Platte Ranger District. Past and present activities in the Project Area are incorporated into the affected environment discussion. Cumulative impacts under NEPA are distinct from the cumulative effects required by Section 7 of the ESA, which are limited to non-federal activities reasonably likely to occur.

The existing non-federal activities in the planning area consist of the general public accessing the forest for recreational activities, and the regular actions of private landowners. These actions are expected to remain consistent with historic use. No other non-federal activities are expected to occur.

No other federal projects have occurred recently in the project area or are expected to occur. Other federal projects that are proposed for the district include communications maintenance and recreation planning. These projects would occur outside of the planning area and are not likely to impact threatened or endangered species (TES) populations.

In the absence of treatment, no directly cumulative effects to TES species would occur, however, forest succession would continue with increases in forest density, leading to an increased likelihood of wildfire, potentially resulting in loss of threatened or endangered species or habitat. Vegetation treatments may occur on private lands within the Project Area which could help to reduce stand densities and create a more diverse landscape, however, without treatment on Forest Service lands dense stands of ponderosa pine and mixed conifer would continue to develop. As a result, MSO habitat would not move towards target conditions, and conifer encroachment would continue to pose a risk for meadow and riparian habitat, impacting Skipper and PMJM respectively. The cumulative effect of the past, present, and reasonably foreseeable future actions on the condition of the forest vegetation under Alternative A (No Action) would be an area dominated by forest stands that are generally healthy but relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

8.5 Cumulative Effects- Proposed Action

No other hazardous fuels reduction treatments have been recently completed or area planned on other public lands in the Project Area.

The existing non-federal activities in the planning area consist of the general public accessing the forest for recreational activities and the regular actions of private landowners. These actions are expected to remain consistent with historic use. No other non-federal activities are expected to occur.

No other federal projects have occurred recently in the project area or are expected to occur. Other federal projects that are proposed for the district include communications maintenance and recreation planning. These projects would occur outside of the planning area and are not likely to impact TES species populations.

The overall cumulative effect of the Proposed Action would be to reduce the extent and intensity of catastrophic fire and its impact on threatened and endangered species and their habitat in the Project Area. These treatments would have a long-term positive cumulative effect on the habitat for the threatened, endangered, and proposed species likely to occur in the Project Area by: 1) reducing the extent and intensity of a wildfire or beetle infestation developing in adjacent areas; and 2) reducing stand density in the area to return to historical conditions. Potential benefits would vary from minor to moderate for the MSO, skipper, and PMJM depending on the specific occurrences of the species in or near the exact treatment areas during implementation.

8.6 Cumulative Effects- Alternative C

The existing non-federal activities in the planning area consist of the general public accessing the forest for recreational activities and the regular actions of private landowners. These actions are expected to remain consistent with historic use. No other non-federal activities are expected to occur.

No other federal projects have occurred recently in the project area or are expected to occur. Other federal projects that are proposed for the district include communications maintenance and recreation planning. These projects would occur outside of the planning area and are not likely to impact TES species populations.

The overall cumulative effect of Alternative C would be reduce the extent and intensity of catastrophic fire, however, due to the smaller area of treatment, threats to species outside of these areas would remain and the overall benefits could be limited. Potential benefits would vary from minor to moderate for the MSO, skipper, and PMJM depending on the specific occurrences of the species in or near the exact treatment areas during implementation.

8.7 EFFECTS DETERMINATIONS

Mexican Spotted Owl

Determination

Based on the effects analysis and the management actions, stipulations, and conservation measures described above, implementation of the proposed Crossons-Longview project may affect, is not likely to adversely affect the threatened Mexican spotted owl. The proposed project would have no effect on critical habitat because none has been designated in the project area.

Rationale

No individuals are known to occur in the planning area.

The EA contains conservation measures to reduce the risk of impacting MSO habitat.

Pawnee Montane Skipper

Determination

Based on the effects analysis and the management actions, stipulations, and conservation measures described above, implementation of the proposed Crossons-Longview project may affect, is not likely to adversely affect the Pawnee Montane Skipper.

Rationale

Potentially suitable habitat impacted by proposed project activities is likely to be minimal (less than 450 acres total).

The EA contains conservation measures to reduce the risk of impacting skipper and skipper habitat.

Preble's Meadow Jumping Mouse

Determination

Based on the effects analysis and the management actions, stipulations, and conservation measures described above, implementation of the proposed Crossons-Longview project may affect, is not likely to adversely affect the Preble's Meadow Jumping Mouse. The proposed project would have no effect on critical habitat because none has been designated in the project area.

Rationale

Treatments are not proposed for riparian areas.

The EA contains conservation measures to reduce the risk of impacting PMJM habitat in adjacent uplands.

Ute Ladies Tresses

Determination

Based on the effects analysis and the management actions, stipulations, and protection measures described above, implementation of the proposed Crossons-Longview project may affect, is not likely to adversely affect the Ute ladies tresses orchid.

Rationale

Suitable habitat would be surveyed prior to site actives; any identified plants would be avoided.

9. Short-term Uses and Long-Term productivity

The 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 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 (NEPA Section 101).

As provided for by the amended Forest Plan (USFS 1984), specific standards, objectives, and guidelines would be applied during implementation of the Proposed Action through the use of conservation measures. Adherence to these requirements would ensure that long-term productivity of the land is not impaired by short-term uses. There would be short-term impacts to vegetation, habitat, and wildlife species during vegetation treatments. However, the project goals are to increase ecological productivity in the long-term. Monitoring conducted at the Forest level would be applied to allow for adaptive management of the resources to protect long-term productivity.

10. Unavoidable Adverse Effects

Under Alternative A (No Action), there would be no action; therefore, there would be no direct effects under this alternative.

Under the Proposed Action wildlife habitat for certain species would be adversely affected to varying levels. During implementation of the treatments, noise, soil compaction, fire, and vegetation removal would reduce the amount of available habitat. Likewise, there may be a direct take in some species. Over the long-term, the diversity and functionality of the habitat would increase.

11. Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or road.

There would be no irreversible or irretrievable commitments of resources related to fish and wildlife species or their habitats. Loss of old growth could represent an irretrievable loss of habitat, although no known old growth stands would be lost.

12. Other Required Disclosures

The NEPA (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."

No waters would be impounded or diverted as part of the Proposed Action, so coordination with USFWS under the Fish and Wildlife Coordination Act is not required. Prior to ground-disturbing activities, all appropriate consultation and any site-specific surveys deemed necessary would occur in compliance with the National Historic Preservation Act. Coordination with USFWS, as required under the ESA, has been initiated as detailed in Consultation History, above.

13. Consistency with Forest Plan

The Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands Forest Plan (USDA Forest Service 1984) identified many goals for fish and wildlife (III-3 to III-6), including:

- Increase diversity for wildlife and habitat improvement;
- Improve fish habitat on suitable streams and low elevation ponds and lakes; and
- Protect riparian areas and wetlands from degradation.

The Forest Plan provides general direction, standards, and guidelines regarding vegetation diversity, snags, logs, and riparian areas in all vegetation types (e.g., III-12 to III-14, III-50 to III-52, and III-203 to III-215). Other Forest Plan details are associated with Management Areas 2B and 7A, and specifically for Management Area 5B, which is to be managed primarily for big game winter range. The Forest Plan provides specific guidelines in this management area to maintain thermal cover and forage.

The Forest Plan also established general management direction for fish and wildlife (III-28 to III-34), including:

1. Manage and provide habitat for recovery of endangered and threatened species;
2. Maintain habitat for viable populations of all existing vertebrate wildlife species; and
3. Use both commercial and non-commercial silvicultural practices to accomplish wildlife habitat objectives

Specific Standards and Guidelines in the Forest Plan for protection of Management Indicator Species include the following (III-29 and Amendment 30):

Provide for the habitat needs of Management Indicator Species on the National Forest

a. Elk - Protect calving concentration areas from habitat modification and disturbance from May 15 - June 30.
b. Abert's Squirrel- Protect or provide for one Abert's squirrel nest tree clump (0.1 acres of 9 to 22" DBH ponderosa pine with a basal area of 180 to 220 and an interlocking canopy) per six acres on ponderosa pine sale areas.

Alternative B (Proposed Action) and Alternative C would make progress towards the above-stated goals and are consistent with objectives, standards, and guidelines provided in the Forest Plan and subsequent amendments. All Alternatives are consistent with the Forest Plan.

Conservation Measures and monitoring requirements are incorporated into the action alternatives, to ensure compliance with the Forest Plan to avoid, minimize, rectify, reduce, eliminate, and/or compensate for adverse impacts of the proposed activity. This includes specific monitoring requirements for the avoidance of unexpected resource effects and the completion of project design and implementation as planned.

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8. List of Preparers

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Appendix B.
Colorado State Forest Service Defensible Space Guidelines

QUICK GUIDE SERIES FIRE 2012-1

Protecting Your Home from Wildfire:

Creating Wildfire-Defensible Zones

Formerly CSU Extension Factsheet 6.302

If your home is located in the natural vegetation of Colorado's grasslands, shrublands, foothills or mountains, you live in the **wildland-urban interface** (WUI) and are inherently at risk from a wildfire. The WUI is any area where structures and other human developments meet or intermingle with wildland vegetative fuels. In many vegetation types, it is not a matter of ***if*** a wildfire will impact your home, but ***when***.

Figure 1: ***Firefighters will do their best to protect homes, but ultimately it is the homeowner's responsibility to plan ahead and take actions to reduce fire hazards around structures. Photo: National Interagency Fire Center***

Wildfires are a natural part of Colorado's varied forest ecosystems. Many rural communities are located in areas historically prone to frequent natural wildfires. Living in the wildland requires more self-reliance than living in urban areas. It may take longer for a fire engine to reach your area, and a small fire department can easily become overwhelmed during an escalating wildfire. Planning ahead and taking actions to reduce fire hazards can increase your safety and help protect your property. As more people choose to live in areas prone to wildfire, additional homes and lives are potentially threatened every year. Firefighters always do their best to protect rural residents, but ultimately, **it is YOUR responsibility to protect your life, family, animals and property from wildfire.**

The information contained in this document is for use by individual landowners to help reduce wildfire risk on their property. In order to effectively protect subdivisions and communities, all landowners must work together to reduce fire hazards within and adjacent to communities. This includes treating individual home sites and common areas within communities, and creating fuelbreaks within and adjoining the community where feasible. This document will focus on actions individual landowners can take to reduce wildfire hazards on their property. For additional information on broader community protection, go to www.csfs.colostate.edu.

Figure 2: *Colorado's grasslands, shrublands, foothills and mountains all have areas in the wildland-urban interface where human development meets wildland vegetative fuels. Photo: CSFS*

In this guide, you'll read about steps you can take to protect your property from wildfire. These steps focus on beginning work closest to your house and moving outward. Also, remember that keeping your home safe is not a one-time effort – it requires ongoing maintenance. It may be necessary to perform some actions, such as removing pine needles from gutters and mowing grasses and weeds several times a year, while other actions may only need to be addressed once a year. While

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you may not be able to accomplish ALL of the actions described in this document to prepare your home for wildfire, each completed activity will increase the safety of your home, and possibly your family, during a wildfire.

Figure 3: ***Burning embers can be carried long distances by wind. Embers ignite structures when they land in gaps, crevices and other combustible places around the home. Photo: CSFS***

(Note: These guidelines are adapted for ponderosa pine, Douglas-fir and mixed-conifer ecosystems below 9,500 feet. *See page 9 for guidelines adapted to other forest ecosystems.)*

This guide primarily will help design your defensible space. **Defensible space** is the natural and landscaped area around a home or other structure that has been modified to reduce fire hazard. Defensible space gives your home a fighting chance against an approaching wildfire. Creating defensible space also reduces the chance of a structure fire spreading to the surrounding forest and other homes.

Three factors determine wildfire behavior: **fuels, weather** and **topography**. We cannot alter weather or topography, so we must concentrate on altering fuels. Fuels include vegetation, such as trees, brush and grass; near homes, fuels also include such things as propane tanks, wood piles, sheds and even homes themselves. Some plant species are more flammable than others, and the flammability of vegetative fuels changes depending on the season, recent weather events, and other factors such as drought. Fuel continuity and density also play an important role in wildfire.

Wildfire often creates its own weather conditions. Hot rising air and associated winds can carry embers and other burning materials into the atmosphere for long distances, where they can ignite vegetation and structures up to several miles away. Embers have caused the loss of many homes during wildfires.

As you think about protecting your home and property from wildfire, consider how you can manage fuels on your property to prevent fire from spreading to your home and other structures.

For more information on wildfire behavior, please see *FireWise Construction: Site Design and Building Materials* at www.csfs.colostate.edu.

Remember...

- ***Reducing fuels around a home will increase the chances for survival in a wildfire, but there is no guarantee.***
- ***This quick guide provides minimum guidelines. The more fuels you remove, the greater the chance your home will survive.***
- ***Working with your neighbors and community will increase the effectiveness of your home's defensible space.***

Fuel Arrangement and Types

When fuels are abundant, a fire can be uncontrollable and destructive. But when fuels are scarce, a fire cannot build momentum and intensity, which makes it much easier to control and is more likely to be beneficial to the land.

The more dense and continuous the fuels, the bigger the threat they pose to your home. The measure of fuel hazard refers to its continuity, both horizontal and vertical. Horizontal continuity refers to fuels across the ground, while vertical continuity refers to fuels extending from the ground up into the crowns of trees and shrubs. Fuels with a high degree of both vertical and horizontal continuity are the most hazardous, particularly when they occur on slopes. Mitigation of wildfire hazards focuses on breaking up the continuity of horizontal and vertical fuels.

Heavier fuels, such as brush and trees, produce a more intense fire than light fuels, such as grass. However, grass-fueled fires travel much faster than heavy-fueled fires. Some heavier surface fuels, such as logs and wood chips, are potentially hazardous heavy fuels and also should be addressed.

Vertical/Ladder Fuels

Ladder fuels are defined as smaller trees and brush that provide vertical continuity, which allows a fire to burn from the ground level up into the branches and crowns of larger trees. Lower branches on large trees also can act as ladder fuels. These fuels are potentially very hazardous, but are easy to mitigate. The hazards from ladder fuels near homes are especially important to address. Prune all tree branches from ground level up to a height of 10 feet above ground or up to 1/3 the height of the tree, whichever is less. Do not prune further up because it could jeopardize the health of the tree. Shrubs should be pruned based on specifications recommended for the species. Dead branches should be removed whenever possible.

Figure 4: *Ladder fuels are shrubs and low branches that allow a wildfire to climb from the ground into the tree canopy. Photo: CSFS*

Surface Fuels

Logs/Branches/Slash/Wood Chips

Naturally occurring woody material on the ground and debris from cutting down trees (also known as slash) may increase the intensity of fires. Increased fire intensity makes a fire harder to control and increases the likelihood of surface fires transitioning to crown fires. Dispose of any heavy accumulation of logs, branches and slash by chipping, hauling to a disposal site or piling for burning later. Always contact your county sheriff's office or local fire department first for information about burning slash piles. Another alternative is to lop and scatter slash by cutting it into very small pieces and distributing it widely over the ground. If chipping logs and/or slash, it's essential to avoid creating continuous areas of wood chips on the ground. Break up the layer of wood chips by adding nonflammable material, or allow for wide gaps (at least 3 feet) between chip accumulations. Also, avoid heavy accumulation of slash by spreading it closer to the ground to speed decomposition. If desired, two or three small, widely spaced brush piles may be left for wildlife habitat. Locate these well away from your home (NOT in Zones 1 or 2; see page 5-8 for zone descriptions).

Figure 5: *Surface fuels include logs, branches, wood chips, pine needles, duff and grasses. Photo: CSFS*

Pine Needles/Duff Layers

Due to decades of fire suppression, decomposing layers of pine needles, twigs and other organic debris–called duff – is deeper under many large trees today than it would have been a century ago. This is especially true in ponderosa pine forests where frequent and naturally occurring fires have been absent. These large trees often are lost when fires occur, because flames burning in the duff layer can pre-heat live vegetation and ignite the trees, or the tree's roots can be damaged from the intense heat of the smoldering duff, killing the tree. It is important to rake needle or duff layers deeper than 2 inches at least 3 feet away from the base of large trees. This should be done annually, and the additional duff also should be removed from the area.

Grasses

Grasses are perhaps the most pervasive and abundant surface fuel in Colorado. Mow grasses and weeds as often as needed throughout the growing season to keep them shorter than 6 inches. This applies to irrigated lawns and wild or native grasses. This is critical in the fall, when grasses dry out, and in the spring, after the snow is gone but before plants green-up.

Be especially careful when mowing in areas with rocks. Mower blades can hit rocks and create sparks, causing fires in dry grass. Consider mowing only on days with high humidity or after recent moisture to reduce the risk of starting an unwanted fire.

Figure 6: *Tree canopies offer fuel for intense crown fires. Photo: Paul Mintier*

When mowing around trees, be sure to avoid damaging the root system and tree trunk by using a higher blade setting on the mower and trimming grass that grows against the trunk only by hand.

Crown Fuels

An intense fire burning in surface fuels can transition into the upper portion of the tree canopies and become a crown fire. Crown fires are dangerous because they are very intense and can burn large areas. Crown fire hazard can be reduced by thinning trees to decrease crown fuels, reducing surface fuels under the remaining trees, and eliminating vertical fuel continuity from the surface into the crowns. Specific recommendations are provided in the Defensible Space Management Zones, pages 5-8.

The Home Ignition Zone

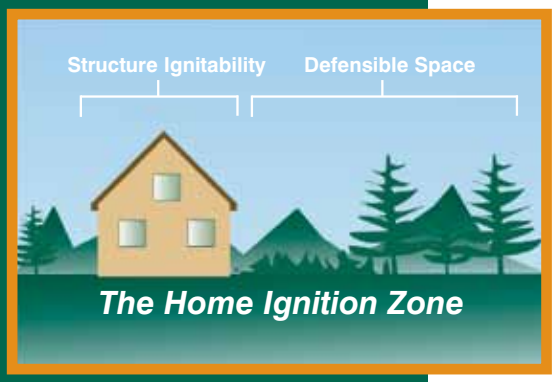

Figure 7: ***Addressing both components of the Home Ignition Zone will provide the best protection for your home. Credit: CSFS***

Two factors have emerged as the primary determinants of a home's ability to survive a wildfire – the quality of the defensible space and a structure's ignitability. Together, these two factors create a concept called the **Home Ignition Zone** (HIZ), which includes the structure and the space immediately surrounding the structure. To protect a home from wildfire, the primary goal is to reduce or eliminate fuels and ignition sources within the HIZ.

Structural Ignitability

The ideal time to address home ignition risk is when the structure is in the design phase. However, you can still take steps to reduce ignitability to an existing home.

The **roof** has a significant impact on a structure's ignitability because of its extensive surface area. When your roof needs significant repairs or replacement, use only fire-resistant roofing materials. Also, check with your county building department – some counties now have restrictions against using wood shingles for roof replacement or require specific classifications of roofing material. Wood and shake-shingle roofs are discouraged because they are highly flammable, and are prohibited in some areas of the state. Asphalt shingles, metal sheets and shingles, tile, clay tile, concrete and slate shingles are all recommended roofing materials.

Figure 8: ***(above) Wood shingle roofs are highly flammable and not recommended. Photo: CSFS***

Figure 9: ***(above right) Class A roofing materials including tile, clay, concrete, slate and asphalt shingles are fire-resistant options. Photo: CSFS***

The extension of the roof beyond the exterior structure wall is the eave. This architectural feature is particularly prone to ignition. As fire approaches the building, the exterior wall deflects hot air and gasses up into the eave. If the exterior wall isn't ignition-resistant, this effect is amplified.

Most **decks** are highly combustible. Their shape traps hot gasses, making them the ultimate heat traps. Conventional wooden decks are so combustible that when a wildfire approaches, the deck often ignites before the fire reaches the house.

The **exterior walls** of a home or other structure are affected most by radiant heat from the fire and, if defensible space is not adequate, by direct contact with flames from the fire.

Figure 10: ***Decks, exterior walls and windows are important areas to examine when addressing structure ignitability. Photo: CSFS***

Windows are one of the weakest parts of a building with regard to wildfire. They usually fail before the building ignites, providing a direct path for flames and airborne embers to reach the building's interior.

Burning embers are produced when trees and structures are consumed by wildfire. These embers sometimes can travel more than a mile. Flammable horizontal or nearly horizontal surfaces, such as wooden decks or shake-shingle roofs, are especially at risk for ignition from burning embers. Since airborne embers have caused the loss of many homes in the WUI, addressing structural ignitability is critical, even if the area surrounding a home is not conducive to fire spread.

This guide provides only basic information about structural ignitability. For more information on fire-resistant building designs and materials, refer to the CSFS *FireWise Construction: Site Design and Building Materials* publication at www.csfs.colostate.edu.

Defensible Space

Defensible space is the area around a home or other structure that has been modified to reduce fire hazard. In this area, natural and manmade fuels are treated, cleared or reduced to slow the spread of wildfire. Creating defensible space also works in the reverse, and reduces the chance of a structure fire spreading to neighboring homes or the surrounding forest. Defensible space gives your home a fighting chance against an approaching wildfire.

Figure 11: ***Homesite before defensible space. Photo: CSFS***

Creating an effective defensible space involves a series of management zones in which different treatment techniques are used. Develop these zones around each building on your property, including detached garages, storage buildings, barns and other structures.

The actual design and development of your defensible space depends on several factors: size and shape of building(s), construction materials, slope of the ground, surrounding topography, and sizes and types of vegetation on your property. You may want to request additional guidance from your local Colorado State Forest Service forester, fire department or a consulting forester as you plan a defensible space for your property.

Figure 12: ***Homesite after creating a defensible space. Photo: CSFS***

Defensible space provides another important advantage during a fire: increased firefighter safety. Firefighters are trained to protect structures only when the situation is relatively safe for them to do so. They use a process called "structural triage" to determine if it is safe to defend a home from an approaching wildfire. The presence or absence of defensible space around a structure is a significant determining factor used in the structural triage process, as defensible space gives firefighters an opportunity to do their job more safely. In turn, this increases their ability to protect your home.

If firefighters are unable to directly protect your home during a wildfire, having an effective defensible space will still increase your home's chance of survival. It is important to remember that with wildfire, there are no guarantees. Creating a proper defensible space does not mean that your home is guaranteed to survive a wildfire, but it does significantly improve the odds.

Defensible Space Management Zones

Three zones need to be addressed when creating defensible space:

Zone 1 is the area nearest the home and other structures. This zone requires maximum hazard reduction.

Zone 2 is a transitional area of fuels reduction between Zones 1 and 3.

Zone 3 is the area farthest from the home. It extends from the edge of Zone 2 to your property boundaries.

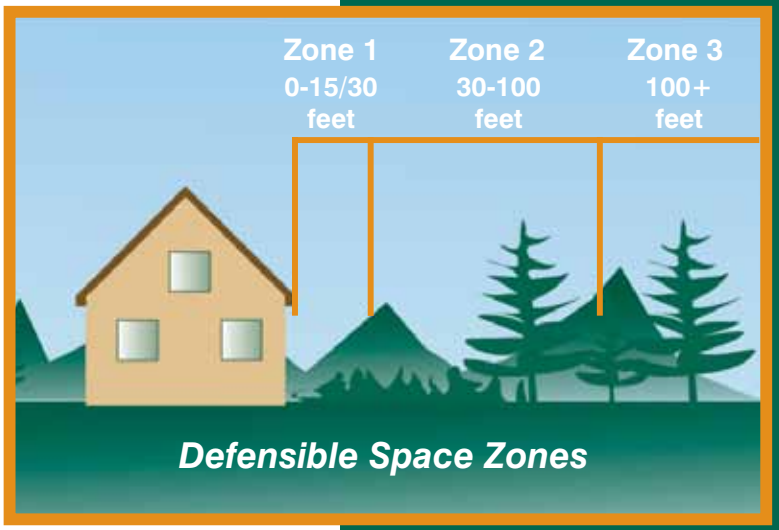

Figure 13: ***Defensible space management zones. Credit: CSFS***

Figure 14: ***This homeowner worked hard to create a defensible space around the home. Notice that all fuel has been removed within the first 5 feet of the home, which survived the Waldo Canyon Fire in the summer of 2012. Photo: Christina Randall, Colorado Springs Fire Department***

Figure 15: ***Clearing pine needles and other debris from the roof and gutters is an easy task that should be done at least once a year. Photo: CSFS***

Figure 16: ***Enclosing decks with metal screens can prevent embers from igniting a house. Photo: Marilyn Brown, La Plata County***

Zone 1

The width of Zone 1 extends a minimum distance of 15-30 feet outward from a structure, depending on property size. Most flammable vegetation is removed in this zone, with the possible exception of a few low-growing shrubs or fire-resistant plants. Avoid landscaping with common ground junipers, which are highly flammable.

Increasing the width of Zone 1 will increase the structure's survivability. This distance should be increased 5 feet or more in areas downhill from a structure. The distance should be measured from the outside edge of the home's eaves and any attached structures, such as decks. Several specific treatments are recommended within this zone:

- Install nonflammable ground cover and plant nothing within the first 5 feet of the house and deck. This critical step will help prevent flames from coming into direct contact with the structure. This is particularly important if a building is sided with wood, logs or other flammable materials. Decorative rock creates an attractive, easily maintained, nonflammable ground cover.
- If a structure has noncombustible siding (i.e., stucco, synthetic stucco, concrete, stone or brick), widely spaced foundation plantings of low-growing shrubs or other fire-resistant plant materials are acceptable. However, do not plant directly under windows or next to foundation vents, and be sure areas of continuous grass are not adjacent to plantings. Information on fire-resistant plants is available on the CSFS website at www.csfs.colostate.edu.
- Prune and maintain any plants in Zone 1 to prevent excessive growth. Also, remove all dead branches, stems and leaves within and below the plant.
- Irrigate grass and other vegetation during the growing season. Also, keep wild grasses mowed to a height of 6 inches or less.
- Do not store firewood or other combustible materials anywhere in this zone. Keep firewood at least 30 feet away from structures, and uphill if possible.
- Enclose or screen decks with $^1/_8$-inch or smaller metal mesh screening ($^1/_{16}$-inch mesh is preferable). Do not use areas under decks for storage.
- Ideally, remove all trees from Zone 1 to reduce fire hazards. The more trees you remove, the safer your home will be.
- If you do keep any trees in this zone, consider them part of the structure and extend the distance of the entire defensible space accordingly.
- Remove any branches that overhang or touch the roof, and remove all fuels within 10 feet of the chimney.
- Remove all pine needles and other debris from the roof, deck and gutters.
- Rake pine needles and other organic debris at least 10 feet away from all decks and structures.
- Remove slash, wood chips and other woody debris from Zone 1.

Zone 2

Zone 2 is an area of fuels reduction designed to diminish the intensity of a fire approaching your home. The width of Zone 2 depends on the slope of the ground where the structure is built. Typically, the defensible space in Zone 2 should extend at least 100 feet from all structures. If this distance stretches beyond your property lines, try to work with the adjoining property owners to complete an appropriate defensible space.

The following actions help reduce continuous fuels surrounding a structure, while enhancing home safety and the aesthetics of the property. They also will provide a safer environment for firefighters to protect your home.

Tree Thinning and Pruning

- Remove stressed, diseased, dead or dying trees and shrubs. This reduces the amount of vegetation available to burn, and makes the forest healthier.
- Remove enough trees and large shrubs to create at least 10 feet between crowns. Crown separation is measured from the outermost branch of one tree to the nearest branch on the next tree. On steep slopes, increase the distance between tree crowns even more.
- Remove all ladder fuels from under remaining trees. Prune tree branches off the trunk to a height of 10 feet from the ground or 1/3 the height of the tree, whichever is less.

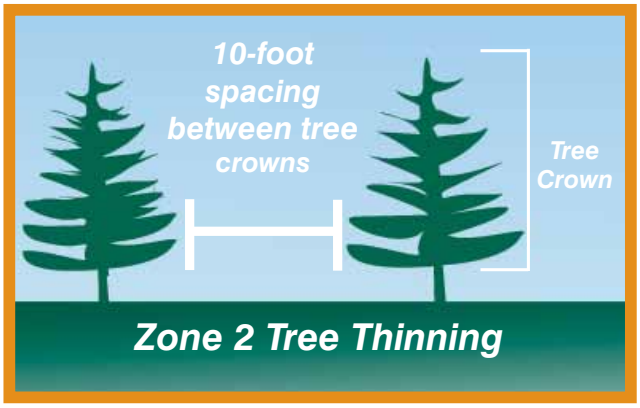

Figure 17: *In Zone 2, make sure there is at least a 10-foot spacing between tree crowns. Credit: CSFS*

- If your driveway extends more than 100 feet from your home, thin out trees within a 30 foot buffer along both sides of your driveway, all the way to the main access road. Again, thin all trees to create 10-foot spacing between tree crowns.
- Small groups of two or three trees may be left in some areas of Zone 2, but leave a minimum of 30 feet between the crowns of these clumps and surrounding trees.
- Because Zone 2 forms an aesthetic buffer and provides a transition between zones, it is necessary to blend the requirements for Zones 1 and 3. For example, if you have a tree in Zone 2 with branches extending into Zone 1, the tree can be retained if there is proper crown spacing.
- Limit the number of dead trees (snags) to one or two per acre. Be sure snags cannot fall onto the house, power lines, roads or driveways.
- As in Zone 1, the more trees and shrubs removed, the more likely your house will survive a wildfire.

Shrub Thinning/Pruning and Surface Fuels

- Isolated shrubs may be retained in Zone 2, provided they are not growing under trees.
- Keep shrubs at least 10 feet away from the edge of tree branches. This will prevent the shrubs from becoming ladder fuels.
- Minimum spacing recommendations between clumps of shrubs is 2 1/2 times the mature height of the vegetation. The maximum diameter of the clumps themselves should be twice the mature height of the vegetation. As with tree-crown spacing, all measurements are made from the edge of vegetation crowns.

Figure 18: *Pruning trees will help prevent a wildfire from climbing from the ground to the tree crowns. Credit: CSFS*

- Example – For shrubs 6 feet high, spacing between shrub clumps should be 15 feet or more (measured from the edge of the crowns of vegetation clumps). The diameter of these shrub clumps should not exceed 12 feet.
- Periodically prune and maintain shrubs to prevent excessive growth, and remove dead stems from shrubs annually. Common ground junipers should be removed whenever possible because they are highly flammable and tend to hold a layer of duff beneath them.
- Mow or trim wild grasses to a maximum height of 6 inches. This is especially critical in the fall, when grasses dry out.
- Avoid accumulations of surface fuels, such as logs, branches, slash and wood chips greater than 4 inches deep.

Firewood

- Stack firewood uphill from or on the same elevation as any structures, and at least 30 feet away.
- Clear all flammable vegetation within 10 feet of woodpiles.
- Do not stack wood against your home or on/under your deck, even in the winter. Many homes have burned as a result of a woodpile that ignited first.

Figure 19: *Keep firewood, propane tanks and natural gas meters at least 30 feet away from structures. Photo: CSFS*

Propane Tanks and Natural Gas Meters

- Locate propane tanks and natural gas meters at least 30 feet from any structures, preferably on the same elevation as the house.
- The tank should not be located below your house because if it ignites, the fire would tend to burn uphill. Conversely, if the tank or meter is located above your house and it develops a leak, gas will flow downhill into your home.
- Clear all flammable vegetation within 10 feet of all tanks and meters.
- Do not visibly screen propane tanks or natural gas meters with shrubs, vegetation or flammable fencing. Instead, install 5 feet of nonflammable ground cover around the tank or meter.

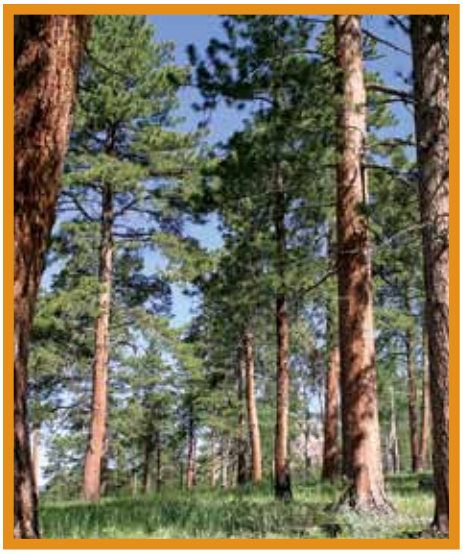

Figure 20: *This ponderosa pine forest has been thinned, which will not only help reduce the wildfire hazard, but also increase tree health and vigor. Photo: CSFS*

Zone 3

Zone 3 has no specified width. It should provide a gradual transition from Zone 2 to areas farther from the home that have other forest management objectives. Your local Colorado State Forest Service forester can help you with this zone.

This zone provides an opportunity for you to improve the health of the forest through proper management. With an assortment of stewardship options, you can proactively manage your forest to reduce wildfire intensity, protect water quality, improve wildlife habitat, boost the health and growth rate of your trees, and increase tree survivability during a wildfire.

In addition, properly managed forests can provide income, help protect trees against insects and diseases, and even increase the value of your property. Typical forest management objectives for areas surrounding home sites or subdivisions provide optimum recreational opportunities; enhance aesthetics; improve tree health and vigor; provide barriers against wind, noise, dust and visual intrusions; support production of firewood, fence posts and other forest commodities; or cultivate Christmas trees or trees for transplanting.

Consider the following when deciding forest management objectives in Zone 3:

- The healthiest forest is one that includes trees of multiple ages, sizes and species, and where adequate growing room is maintained over time.
- Remember to consider the hazards associated with ladder fuels. A forest with a higher canopy reduces the chance of a surface fire climbing into the tops of the trees, and might be a priority if this zone has steep slopes.
- A greater number of snags – two or three per acre, standing or fallen – can be retained in Zone 3 to provide wildlife habitat. These trees should have a minimum diameter of 8 inches. Make sure that snags pose no threat to power lines or firefighter access roads.
- While tree pruning generally is not necessary in Zone 3, it may be a good idea from the standpoint of personal safety to prune trees along trails and firefighter access roads. Or, if you prefer the aesthetics of a well-manicured forest, you might prune the entire area. In any case, pruning helps reduce ladder fuels within tree stands, thus reducing the risk of crown fire.
- Mowing grasses is not necessary in Zone 3.
- Any approved method of slash treatment is acceptable, including piling and burning, chipping or lop-and-scatter.

Other Recommendations

Windthrow

In Colorado, some tree species, including lodgepole pine, Engelmann spruce and Douglas-fir, are especially susceptible to damage and uprooting by high winds or windthrow. If you see evidence of this problem in or near your home, consider making adjustments to the defensible space guidelines. It is highly recommended that you contact a professional forester to help design your defensible space, especially if you have windthrow concerns.

Figure 21: ***During high winds, these lodgepole pine trees fell onto the house. Lodgepole pine is highly susceptible to windthrow. Photo: CSFS***

Water Supply

If possible, make sure that an on-site water source is readily available for firefighters to use, or that other water sources are close by. Lakes, ponds, swimming pools and hot tubs are all possible options. If there are no nearby water sources, consider installing a well-marked dry hydrant or cistern. If your primary water source operates on electricity, be sure to plan for a secondary water source. During wildfires, structures often are cut off from electricity. For more information on how to improve the accessibility of your water source, contact your local fire department.

Recommendations for Specific Forest Types

The above recommendations refer primarily to ponderosa pine, Douglas-fir and mixed-conifer ecosystems. For other forest types, please refer to the additional recommendations below:

Aspen

Tree spacing and ladder fuel guidelines do not apply to mature stands of aspen trees. Generally, no thinning is recommended in aspen forests, regardless of tree size, because the thin bark is easily damaged, making the tree easily susceptible to fungal infections. However, in older stands, numerous dead trees may be on the ground and require removal. Conifer trees often start growing in older aspen stands. A buildup of these trees eventually will increase the fire hazard of the stand, so you should remove the young conifers. Brush also can increase the fire hazard and should be thinned to reduce flammability.

Figure 22: ***Mature aspen stands can contain many young conifers, dead trees and other organic debris. This can become a fire hazard. Photo: CSFS***

Lodgepole Pine

Lodgepole pine management in the WUI is much different than that for lodgepole pine forests located away from homes, communities and other developments. Normally, it is best to develop fuels management and wildfire mitigation strategies that are informed and guided by the ecology of the tree species. This is not the case with lodgepole pine.

Older lodgepole pine stands generally do not respond well to selective thinning, but instead respond better to the removal of all trees over a defined area to allow healthy forest regeneration. Selectively thinning lodgepole can open the stand to severe windthrow and stem breakage. However, if your home is located within a lodgepole pine forest, you may prefer selective thinning to the removal of all standing trees.

Figure 23: ***A young lodgepole pine stand. Thinning lodgepole pines early on in their lives will help reduce the wildfire hazard in the future. Photo: CSFS***

To ensure a positive response to thinning throughout the life of a lodgepole pine stand, trees must be thinned early in their lives – no later than 20 to 30 years after germination. Thinning lodgepole pine forests to achieve low densities can best be

The defensible space guidelines in this quick guide are predominantly for ponderosa pine and mixed-conifer forests. These guidelines will vary with other forest types.

Figure 24: ***Piñon-juniper forests are often composed of continuous fuels. Creating clumps of trees with large spaces in between clumps will break up the continuity. Photo: CSFS***

Figure 25: ***Gambel oak needs to be treated in a defensible space at least every 5-7 years because of its vigorous growing habits. Photo: CSFS***

accomplished by beginning when trees are small saplings, and maintaining those densities through time as the trees mature.

Thinning older stands of lodgepole pine to the extent recommended for defensible space may take several thinning operations spaced over a decade or more. When thinning mature stands of lodgepole pine, do not remove more than 30 percent of the trees in each thinning operation. Extensive thinning of dense, pole-sized and larger lodgepole pine often results in windthrow of the remaining trees. Focus on removing trees that are obviously lower in height or suppressed in the forest canopy. Leaving the tallest trees will make the remaining trees less susceptible to windthrow.

Another option is leaving clumps of 30-50 trees. Clumps are less susceptible to windthrow than solitary trees. Allow a minimum of 30-50 feet between tree crowns on the clump perimeter and any adjacent trees or clumps of trees. Wildfire tends to travel in the crowns of lodgepole pine. By separating clumps of trees with large spaces between crowns, the fire is less likely to sustain a crown fire.

Piñon-Juniper

Many piñon-juniper (PJ) forests are composed of continuous fuel that is highly flammable. Fire in PJ forests tend to burn intensely in the crowns of trees. Try to create a mosaic pattern when you thin these trees, with a mixture of individual trees and clumps of three to five trees. The size of each clump will depend on the size, health and location of the trees. The minimum spacing between individual trees should be 10 feet between tree crowns, with increasing space for larger trees, clumps, and stands on steeper slopes.

Tree pruning for defensible space is not as critical in PJ forests as in pine or fir forests. Instead, it is more important to space the trees so that it is difficult for the fire to move from one tree clump to the next. Trees should only be pruned to remove dead branches or branches that are touching the ground. However, if desired, live branches can be pruned to a height of 3 feet above the ground. Removing shrubs that are growing beneath PJ canopies is recommended to reduce the overall fuel load that is available to a fire.

It is NOT recommended to prune live branches or remove PJ trees between April and October, when the piñon ips beetle is active in western Colorado. Any thinning activity that creates the flow of sap in the summer months can attract these beetles to healthy trees on your property. However, it is acceptable to remove dead trees and dead branches during the summer months.

For more information, please refer to the CSFS *Piñon-Juniper Management Quick Guide* at www.csfs.colostate.edu.

Gambel Oak

Maintaining Gambel oak forests that remain resistant to the spread of wildfire can be a challenge because of their vigorous growing habits. Gambel oak trees grow in clumps or groves, and the stems in each clump originate from the same root system. Most reproduction occurs through vegetative sprouts from this deep, extensive root system. You may need to treat Gambel oak near your home every five to seven years. Sprouts also should be mowed at least once every year in Zones 1 and 2. Herbicides can be used to supplement mowing efforts for controlling regrowth.

For more information, please refer to the CSFS *Gambel Oak Management* publication at www.csfs.colostate.edu.

Note: This publication does not address high-elevation spruce-fir forests. For information on this forest type, please contact your local CSFS district office.

Maintaining Your Defensible Space

Your home is located in a dynamic environment that is always changing. Trees, grasses and shrubs continue to grow, die or are damaged, and drop their leaves and needles each season. Just like your home, the defensible space around it requires regular, ongoing maintenance to be effective. Use the following checklists to build and maintain your defensible space.

Defensible Space: Initial Projects

Figure 26: *Keeping the forest properly thinned and pruned in a defensible space will reduce the chances of a home burning during a wildfire. Photo: CSFS*

- ☐ Properly thin and prune trees and shrubs within Zones 1 and 2.
- ☐ Dispose of slash from tree/shrub thinning.
- ☐ Screen attic, roof, eaves and foundation vents, and periodically check them to ensure that they are in good condition.
- ☐ Screen or wall-in stilt foundations and decks; screens should be 1/8-inch or smaller metal mesh (1/16-inch mesh is best).
- ☐ Post signs at the end of the driveway with your last name and house number that are noncombustible, reflective and easily visible to emergency responders.
- ☐ Make sure that the driveway is wide enough for fire trucks to enter and exit, and that trees and branches are adequately cleared for access by fire and emergency equipment. Contact your local fire department or check the CSFS website for information specific to access.
- ☐ Take pictures of your completed defensible space for comparison of forest growth over time.

Defensible Space Tasks: Annual Requirements

Figure 27: *Sharing information and working with your neighbors and community will give your home and surrounding areas a better chance of surviving a wildfire. Photo: CSFS*

- ☐ Clear roof, deck and gutters of pine needles and other debris. *
- ☐ Mow grass and weeds to a height of 6 inches or less. *
- ☐ Rake all pine needles and other flammable debris away from the foundation of your home and deck. *
- ☐ Remove trash and debris accumulations from the defensible space.*
- ☐ Check fire extinguishers to ensure that they have not expired and are in good working condition.
- ☐ Check chimney screens to make sure they are in place and in good condition.
- ☐ Remove branches that overhang the roof and chimney.
- ☐ Check regrowth of trees and shrubs by reviewing photos of your original defensible space; properly thin and prune trees and shrubs within Zones 1 and 2.
- ☐ Dispose of slash from tree/shrub thinning. *

**Address more than once per year, as needed.*

Be Prepared

- ☐ Complete a checklist of fire safety needs inside your home (these should be available at your local fire department). Examples include having an evacuation plan and maintaining smoke detectors and fire extinguishers.
- ☐ Develop your fire evacuation plan and practice family fire drills. Ensure that all family members are aware of and understand escape routes, meeting points and other emergency details.
- ☐ Contact your county sheriff's office and ensure that your home telephone number and any other important phone numbers appear in the county's Reverse 911 or other emergency notification database.
- ☐ Prepare a "grab and go" disaster supply kit that will last at least three days, containing your family's and pets' necessary items, such as cash, water, clothing, food, first aid and prescription medicines.
- ☐ Ensure that an outdoor water supply is available. If it is safe to do so, make a hose and nozzle available for responding firefighters. The hose should be long enough to reach all parts of the house.

Preparing your home and property from wildfire is a necessity if you live in the wildland-urban interface. It is important to adequately modify the fuels in your home ignition zone. Remember, every task you complete around your home and property will make your home more defensible during a wildfire.

Always remember that creating and maintaining an effective defensible space in the home ignition zone is not a one-time endeavor – it requires an ongoing, long-term commitment.

If you have questions, please contact your local CSFS district office. Contact information can be found at www.csfs.colostate.edu.

Figure 28: ***This house has a high risk of burning during an approaching wildfire. Modifying the fuels around a home is critical to reduce the risk of losing structures during a wildfire. Photo: CSFS***

List of Additional Resources

- The Colorado State Forest Service, http://www.csfs.colostate.edu
- CSFS wildfire-related publications, http://csfs.colostate.edu/pages/wf-publications.html
- Community Wildfire Protection Planning, http://csfs.colostate.edu/pages/community-wf-protection-planning.html
- Colorado's "Are You FireWise?" information, http://csfs.colostate.edu/pages/wf-protection.html
- National Fire Protection Association's Firewise Communities USA, http://www.firewise.org
- Fire Adapted Communities, http://fireadapted.org/
- Ready, Set, Go!, http://wildlandfirersg.org/

Figure 29: *This house survived the Fourmile Canyon Fire in 2010. Photo: CSFS*

Figure 30: ***Firefighters were able to save this house during the 2012 Weber Fire because the homeowners had a good defensible space. Photo: Dan Bender, La Plata County***

Colorado State Forest Service

www.csfs.colostate.edu

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Appendix C.
Economic Efficiency Analysis

Financial efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received on the project. The main criterion in assessing the financial efficiency of each alternative is Present Net Value (PNV), which is defined as the discounted value (at 4 percent) of agency revenue minus agency costs. When considering quantitative issues, financial efficiency analysis offers a consistent measure in dollars for comparison of alternatives. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values, benefits, and costs that are not easily quantifiable. This is not to imply that such values are not significant or important - but recognizes that non-market values are difficult to represent with appropriate dollar figures. The values not included in this part of the analysis are often at the center of disagreements and the interest people have in forest resource projects. Therefore, financial efficiency should not be viewed as a complete answer but as one tool the decision maker uses to gain information about resources, alternatives, and trade-offs between costs and benefits.

PNV is an economic measure that accounts for all current and future costs and benefits within the treated units in a single dollar figure. Future costs and benefits are estimated and discounted into today's dollars and added to the current project costs and benefits. The result is a figure that can be compared across alternatives representing the total financial impact over the life of the project. Because a dollar is worth more now than it would be in the future, discounted costs and benefits are smaller figures. For example, a benefit of $1,000,000 in 100 years is worth about $20,000 today using the standard government discount rate of four percent.

This economic analysis compares direct monetary costs and benefits associated with the Crossons-Longview Forest Restoration Project for each proposed alternative. It provides the decision maker with comparative information on the relative economic effects of the alternatives. This analysis does not evaluate the economic effects of indirect and/or unquantifiable costs and benefits that may be related to erosion control, prevention of widespread high intensity forest fire, potential economic loss of private property from high intensity fire, impacts to water supply systems and reservoirs downstream of the treatment areas, or any potential impacts both beneficial or adverse to wildlife species or recreational resources within the project area.

The EA evaluates three alternatives, Alternative A – No Action, Alternative B - Proposed Action, and Alternative C. This document describes the analysis conducted on the economic effects of implementing the forest restoration project for each alternative and estimates the NPV of vegetative treatments and associated costs and revenues generated from commercial harvesting of timber salvaged from the restoration project. An economic efficiency spreadsheet model was developed to complete the analysis, discounting current costs over the 10-year period using a US Forest Service standard discount rate of 4 percent (Appendix C). The NPVs to the Forest Service are calculated based on the direct costs and benefits per year for implementing and maintaining Alternative B - Proposed Action.

The quantifiable economic benefit for this project is the expected gross receipts to the Forest Service from the sale of commercial timber. In addition to the vegetative treatments of the proposed action, timber sale preparation and administration, road maintenance and temporary road construction, and completion of the environmental analysis (EA) are representative costs analyzed for the two action alternatives of the Crossons-Longview Reforestation Project EA.

Economic Assumptions Used in the Analysis

The following assumptions were used in this financial efficiency analysis:

1. Xeric ponderosa pine, mesic ponderosa pine and mixed conifer would yield similar timber volumes and income, estimated to be $100 per acre through timber sale contracts where traditional harvesting equipment and commercial product removal would occur. In xeric ponderosa pine, mesic ponderosa pine and mixed conifer on slopes greater than 35% and greater than 0.5 miles from roads, hand treatments would occur at a cost of $500 per acre.
2. Timber sale preparation costs average $40 per acre which is applied to xeric ponderosa pine, mesic ponderosa pine and mixed conifer.
3. Lodgepole pine, aspen and shrubland treatments would all be completed at a similar cost estimated to be $250 per acre. These treatments would likely be completed through a stewardship contract at cost.
4. Administration costs are $25 per acre and apply to all treated acres
5. Prescribed fire would be used in all treatments to reduce activity fuels. The cost for prescribed fire is $65 per acre.
6. Temporary roads would cost $500 per mile to construct and abandon.
7. Some existing roads would require maintenance, including resurfacing and drainage work. This maintenance would cost $250 per mile.
8. The analysis is in terms of 2014 dollars.
9. Both treatment costs and revenues from timber salvage are discounted over the 10 year project. Costs for road maintenance, temporary roads, and completion of the EA are anticipated to be expended in the first year.
10. It was assumed that total wood volume would be processed in each implementation year throughout the 10 year life of the project.
11. Above assumptions are based on past projects within the Upper South Platte and interviews with Arapaho-Roosevelt National Forest staff regarding costs of forest treatments completed by the Long-term Stewardship Contract.

Since both Alternatives B and C are similar except in scope of number of acres treated and the use of temporary roads, the socioeconomics impacts are anticipated to be similar over the 10 year life of the project. The addition of temporary roads in Alternative B would require some road building, but the overall employment and time frame effects of the road building and decommissioning through the 10 year period is considered to have a minimal effect on the overall socioeconomic impacts. The same crews would likely build the temporary roads. Population is not anticipated to grow significantly within the project area since much of the land is public land; however population will continue to grow in the broader study area to some degree.

ECONOMIC ANALYSIS

The economic analysis used the assumptions listed above in Section 4.2 Economic Assumptions Used in the Analysis, as well as acreage treated and harvested. These values were entered into the economic model to calculate the economic indicators of effects from the proposed action. These results were discounted over the 10 year project period.

Additional modeling assumptions;

- Alternative A is the no action alternative, so there are no direct costs or benefits.
- Alternative B treats an estimated 5,409 acres of ponderosa pine and mixed conifer. Hand vegetative treatments totaled 3,459 acres of ponderosa pine and mixed conifer, vegetative treatment of lodgepole pine, aspen and shrublands totaled 706 acres. Five miles of roads would be maintained and 3 miles of temporary roads constructed (JW Associates 2014).
- Alternative C treats an estimated 3,913 acres of ponderosa pine and mixed conifer. Hand vegetative treatments totaled 1,928 acres of ponderosa pine and mixed conifer, vegetative treatment of lodgepole pine, aspen and shrublands totaled 485 acres. Five miles of roads would be maintained. No temporary roads would be constructed.

The analysis of Present Net Value by Alternative (Table A-1), shows the financial efficiency analysis for quantifiable costs and benefits that change by alternative. This analysis is in compliance with FSM 1970.3, 1970.6 and the Region 2 Supplement. The analysis considered many costs and revenues, with timber revenues based on regional timber sale appraisal bulletin for ponderosa pine and mixed conifer. Forest Service implementation costs included vegetation treatment, sale preparation, sale administration, service contract, prescribed burn, handpiling, noxious weed surveys, temporary roads, road maintenance costs. Some treated acreage would not generate revenues. Alternative A (No Action) represents the baseline from which to compare the action alternatives and is valued at zero.

Table A-1. Present Net Value for Alternative (thousands of $).

Alternative	Discounted Total Costs	Discounted Total Benefits	Discounted Present Net Value	Benefit /Cost Ratio
A	0	0	0	0
B	$2,594	$439	-$2,156	0.17
C	$1,641	$318	-$1,324	0.19

Both action alternatives show a net loss through the analysis period, which suggests, from a timber sale standpoint, the project is not economically feasible. Since the Crossons-Longview project is primarily forest restoration not a timber sale per se, the costs involved in calculating net present value include significant costs

for fuels reduction, vegetation treatment, and forest restoration. These additional costs include prescribed burns, thinning, handpiling and other treatment of materials on site. Alternative C shows the lowest net loss of the two action alternatives analyzed since it does not include the cost of temporary road construction. The figures in Alternatives B and C reflect the discounted costs over the 10 year period and the discounted revenues generated from the improvement cuts or commercial harvesting.

The loss reflected in this analysis is largely due to (1) meeting the objectives of a restoration project, which improves forest conditions and has extensive unquantifiable benefits, (2) the cost of restoration treatments that would not normally occur in a commercial sale, (3) some lower-value and volume product being removed, and (4) limited market conditions.

The unquantifiable benefits of the project for both alternatives include the following:

Vegetative Treatment

1. Reduced risk of intense fire either small or large-scale, high-intensity fire and subsequent erosion
2. Reduced potential wildfire suppression and restoration costs
3. Reduced fire-related risk to human life and property
4. Increased water quality protection
5. Forest restoration and increased sustainability
6. Improved threatened Pawnee montane skipper habitat
7. Increased protection of recreation resources

Road Reclamation and Improvement

1. Reduced erosion and stream sediment loading
2. Increased long-term aquatic habitat productivity

Table A-2. Benefits, Costs and Revenues by Alternative.

	Alternative A	Alternative B	Alternative C
BENEFITS			
Vegetative Treatment			
Reduced risk of large high intensity fire and subsequent erosion	no	yes	yes
Reduced potential wildfire suppression and restoration costs	no	yes	yes
Reduced fire-related risk to human life and property	no	yes	yes
Increased water quality protection	no	yes	yes
Forest restoration and increased sustainability	no	yes	yes
Improved threatened prairie montane skipper habitat	no	yes	yes
Increased protection of recreation resources	no	yes	yes
Road Reclamation			
Reduced erosion and stream sediment loading	no	yes	yes
Increased long-term aquatic habitat productivity	no	yes	yes
COSTS			
Ponderosa Pine Mixed Conifer Veg. Treatment	$ -00	$ 2,224,926	$ 1,334,311
Lodgepole, Aspen, Shrublands Veg. Treatment	$ -00	$ 193,756	$ 132,581
Road Costs	$ -00	$ 2,644	$ 1,202
Total Cost for EA	$ -00	$ 173,077	$ 173,077
Total costs	$ -00	$ 2,594,402	$ 1,641,171
REVENUES			
Income from Commercial Harvesting	$ -00	$438,680	$317,480
Total revenues	$ -00	$438,680	$317,480
Present Net Value (Costs - Revenues)	$ -00	($2,155,722)	($1,323,691)

Table A-3. Cost and Revenue Detail

	Cost per unit	Alt. A	Alt. B	Alt. C
Treatment Area (acres)		0	9,574	6,326
Ponderosa pine + Mixed Conifer				
Ponderosa pine + Mixed Conifer (acres)		0	8,868	5,841
Commercial Harvesting (acres)		0	5,409	3,913
Income from Commercial Harvesting	$100	$0	$540,948	$391,347
Hand Treatment (acres)		0	3,459	1,928
Cost of Hand Treatments	$500	$0	$1,729,260	$963,765
Timber Sale Preparation	$40	$0	$216,379	$156,539
Administrative Costs	$25	$0	$221,700	$146,025
Prescribed Fire Cost	$65	$0	$576,420	$379,665
Total Ponderosa & Mixed Conifer Costs		$0	$2,743,759	$1,645,994
Lodgepole Pine, Aspen and Shrublands				
Lodgepole Pine, Aspen and Shrublands (acres)		0	706	485
Vegetation Treatment Cost	$250	$0	$176,500	$121,250
Administrative Costs	$25	$0	$17,650	$12,125
Prescribed Fire Cost	$65	$0	$45,890	$31,525
Total Lodgepole, Aspen & Shrubland Costs		$0	$240,040	$164,900
Road Costs				
Road Maintenance (5 miles)	$250	$0	$1,250	$1,250
Temporary Roads (3 miles)	$500	$0	$1,500	$0
Total Road Costs		$0	$2,750	$1,250
Other Costs				
NEPA Costs			$180,000	$180,000
Total Revenues		$0	$540,948	$391,347
Total Costs		$0	$3,166,549	$1,992,144

Table A-4. Discounted Costs and Revenues by Implementation Year

Alternative	B	C	4% Discount Rate	B	C
Year 1					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,686	1.040	$263,823	$158,352
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.040	$23,081	$15,856
Road Costs	$2,750	$1,250	1.040	$2,644	$1,202
Total Cost for EA	$180,000	$180,000	1.040	$173,077	$173,077
Total Cost	$481,130	$362,426		$462,625	$348,487
Total Revenue	$54,095	$39,202	1.040	$52,014	$37,694
Year 2					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.082	$253,676	$152,181
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.082	$22,193	$15,246
Road Costs	$0	$0	1.082	$0	$0
Total Cost for EA	$0	$0	1.082	$0	$0
Total	$298,380	$181,089		$275,869	$167,427
Total Revenue	$54,095	$39,135	1.082	$50,014	$36,182
Year 3					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.125	$243,911	$146,324
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.125	$21,339	$14,659
Road Costs	$0	$0	1.125	$0	$0
Total Cost for EA	$0	$0	1.125	$0	$0
Total	$298,380	$181,089		$265,250	$160,983
Total Revenue	$54,095	$39,135	1.125	$48,089	$34,789
Year 4					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.170	$234,529	$140,695
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.170	$20,518	$14,095
Road Costs	$0	$0	1.170	$0	$0
Total Cost for EA	$0	$0	1.170	$0	$0
Total	$298,380	$181,089		$255,047	$154,790
Total Revenue	$54,095	$39,135	1.170	$46,239	$33,451
Year 5					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.217	$225,508	$135,283
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.217	$19,729	$13,553
Road Costs	$0	$0	1.217	$0	$0
Total Cost for EA	$0	$0	1.217	$0	$0
Total	$298,380	$181,089		$245,237	$148,837
Total Revenue	$54,095	$39,135	1.217	$44,460	$32,165
Year 6					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.265	$216,847	$130,087
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.265	$18,971	$13,032
Road Costs	$0	$0	1.265	$0	$0
Total Cost for EA	$0	$0	1.265	$0	$0
Total	$298,380	$181,089		$235,818	$143,120
Total Revenue	$54,095	$39,135	1.265	$42,753	$30,929

Alternative	B	C	4% Discount Rate	B	C
Year 7					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.316	$208,508	$125,085
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.316	$18,242	$12,531
Road Costs	$0	$0	1.316	$0	$0
Total Cost for EA	$0	$0	1.316	$0	$0
Total	$298,380	$181,089		$226,750	$137,616
Total Revenue	$54,095	$39,135	1.316	$41,109	$29,740
Year 8					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,599	1.369	$200,479	$120,268
Lodgepole, Aspen, Shrublands Veg. Treatment	$24,004	$16,490	1.369	$17,539	$12,049
Road Costs	$0	$0	1.369	$0	$0
Total Cost for EA	$0	$0	1.369	$0	$0
Total	$298,380	$181,089		$218,018	$132,317
Total Revenue	$54,095	$39,135	1.369	$39,526	$28,595
Year 9					
Ponderosa Pine Mixed Conifer Veg. Treatment	$274,376	$164,009	1.423	$192,774	$115,232
Lodgepole, Aspen, Shrublands Veg. Treatment	$23,324	$15,810	1.423	$16,387	$11,108
Road Costs	$0	$0	1.423	$0	$0
Total Cost for EA	$0	$0	1.423	$0	$0
Total	$297,700	$179,819		$209,162	$126,340
Total Revenue	$54,095	$39,135	1.423	$38,007	$27,496
Year 10					
Ponderosa Pine Mixed Conifer Veg. Treatment	$273,643	$164,009	1.480	$184,869	$110,802
Lodgepole, Aspen, Shrublands Veg. Treatment	$23,324	$15,470	1.480	$15,757	$10,451
Road Costs	$0	$0	1.480	$0	$0
Total Cost for EA	$0	$0	1.480	$0	$0
Total	$296,967	$179,479		$200,626	$121,253
Total Revenue	$53,985	$39,135	1.480	$36,471	$26,439
All Years					
Ponderosa Pine Mixed Conifer Veg. Treatment	$2,743,026	$1,644,901		$2,224,926	$1,334,311
Lodgepole, Aspen, Shrublands Veg. Treatment	$238,680	$163,200		$193,756	$132,581
Road Costs	$2,750	$1,250		$2,644	$1,202
Total Cost for EA	$180,000	$180,000		$173,077	$173,077
Total	$3,164,456	$1,989,351		$2,594,402	$1,641,171
Total Revenue	$540,838	$391,414		$438,680	$317,480