Environmental Assessment

East-Central Wet Mountains

USDA Forest Service
San Isabel National Forest
San Carlos Ranger District

October 2011

Commonly Used Acronyms and Abbreviations

BMP	Best Management Practices
CDOW	Colorado Division of Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWPP	Community Wildfire Protection Plan
DAU	Data Analysis Unit
DBH	Diameter at Breast Height
ESA	Endangered Species Act
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
HFRA	Healthy Forests Restoration Act
HUC	Hydrologic Unit Code
ID Team	Interdisciplinary Team
MA	Management Area
MIS	Management Indicator Species
MSO	Mexican Spotted Owl
NDIS	Natural Diversity Information Source
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NFSR	National Forest System Road
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
PAC	Protected Activity Center
PSICC	Pike and San Isabel National Forests, and Cimarron and Comanche National Grasslands
R2	Region 2 (Rocky Mountain Region)
ROS	Recreation Opportunity Spectrum
SHPO	State Historic Preservation Office
SS	Sensitive Species
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
USDA	United States Dept. of Agriculture
USDI	United States Dept. of the Interior
USFWS	United States Fish and Wildlife Service
WCP	Watershed Conservation Practice
WIZ	Water Influence Zone
WUI	Wildland-Urban Interface

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

List of Tables

Table of Contents (continued)

List of Tables (continued)

List of Figures

This page left bank intentionally

Chapter 1.
Purpose of and Need for Action

The San Carlos Ranger District of the San Isabel National Forest has prepared this Environmental Assessment (EA) on the potential environmental effects of proposed activities in the East-Central Wet Mountains 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 and Need for Action

The purpose of the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project is to reduce fire intensity and behavior and to provide a stronghold for fire management resources to defend in the event of large wildfire(s) in that area. In addition, portions of the East-Central Wet Mountains Project Area that have moved away from historic forest conditions due to the lack of disturbances would be moved back towards more historic conditions. The restored areas would create more sustainable forest conditions that are resilient to fire, insects and diseases while providing for diverse wildlife habitat, recreational opportunities, sustainable watershed conditions and increased public and fire fighter safety. To serve this purpose, treatments may include thinning, mulching, tree removal, and prescribed burning to reduce forest canopy densities, and ground and ladder fuels in areas across the landscape.

This project is needed because current forest conditions combined with increasing human encroachment into the forest lands have dramatically increased the risk of loss of life and property from wildfires in recent years. There are hundreds of homes, related infrastructure, critical watersheds and significant associated infrastructure at risk in, adjacent to and near the East-Central Wet Mountains Project Area. The current forested landscape condition does not reflect the historic disturbance regime and is not sustainable. Past fire suppression, logging, and grazing have allowed smaller, thin-barked trees to proliferate and in other areas the lack of disturbances have allowed conifers to invade aspen stands, meadows and riparian areas. In addition, upland shrub communities and piñon juniper forests have become decadent which results in an increased risk of larger fires that threaten communities.

The forest conditions throughout the East-Central Wet Mountains Project Area have a much higher risk of catastrophic fire compared to pre-settlement conditions due to the density of trees and the continuity of fuels. In many areas, the existing small trees serve as ladder fuels, permitting surface fires to climb into the tree canopy and become crown fires. In many places in the East-Central Wet Mountains Project Area, wildfire will carry as a high-intensity crown fire under hot, dry, and windy conditions. 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 on the Front Range of Colorado. The high-intensity Mason Gulch Fire of 2005, located within the

East-Central Wet Mountains Project Area, burned over 11,000 acres and required the evacuation of thousands of people.

The Mason Fire, as well as several other recent fires on the Pike and San Isabel National Forests have destroyed homes, infrastructure and other property on private and public lands; seriously 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 have eroded soils, causing flooding, destroyed homes, damaged highways and various other facilities as well as degraded fisheries. Air quality along the Front Range of Colorado with its 3.5 million residents, has been dangerously degraded for days at a time.

The economic impact of these fires is staggering. The Hayman fire to the north cost over 38 million dollars to suppress and more than 21 million dollars for the burned area emergency rehabilitation. During the 2002 fire season alone, in excess of 10,000 residents were forcibly evacuated from their homes. The impacts to tourism and numerous other businesses also totaled in the millions

Finally, the potential benefits to the forests, watersheds and surrounding ecosystems should be highlighted. Forests around the nation have been conducting similar treatments with significant positive results for not only the treated areas but adjacent lands for many years. These lands have enjoyed healthier, more sustainable ecosystems as well as the desired lower fire hazard.

The human factor is possibly the most important benefit that can be derived from this project. The treated lands will provide a showcase for neighboring and visiting landowners to visualize the benefits of the treatments and will encourage them to conduct similar treatments on their respective properties. This project will set the stage for additional partnerships to conduct even more treatments in the area. The added value of collaborative fuels treatment efforts can possibly have an unquantifiable benefit.

1.2 Proposed Action

The San Carlos Ranger District of the Pike and San Isabel National Forest proposes to treat approximately 18,800 acres within the 111,627 acres East Central-Wet Mountains East-Central Wet Mountains Project Area (Figure 1) to restore the montane forest ecosystem to their historic conditions. The treatments would result in reducing wildfire hazards and improving the health of the forest. The 18,800 acres of treatment contain ponderosa pine, mixed conifer, upland shrublands, aspen and piñon juniper (Figure 2). 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. East-Central Wet Mountains Project Area Location

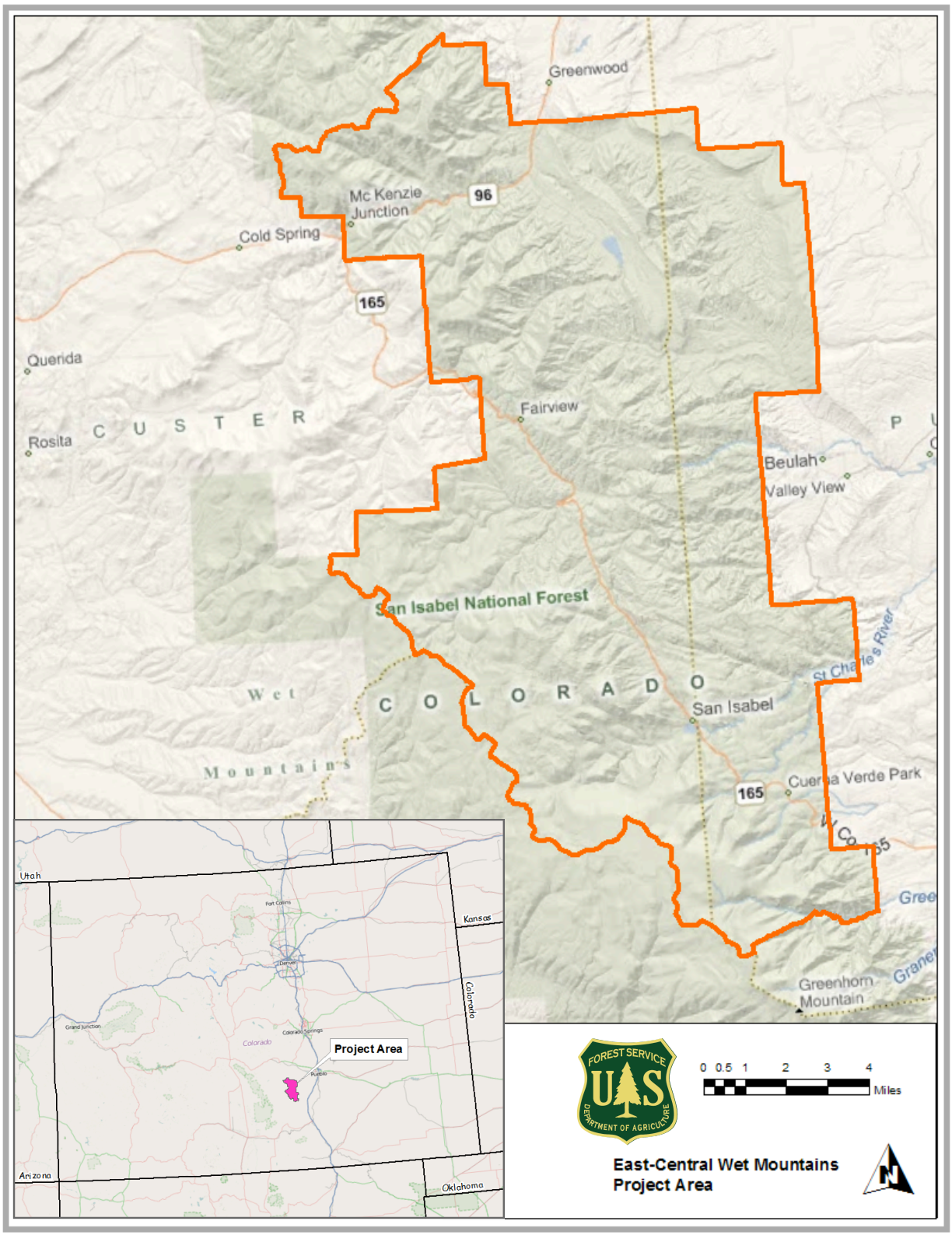
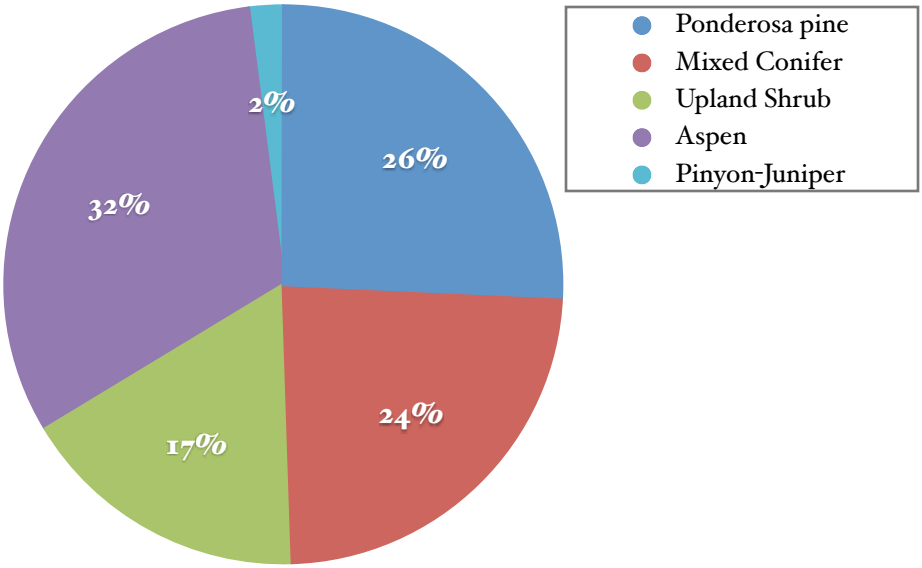


Figure 2. Estimated Distribution of Vegetation Types in East Central-Wet Mountains Proposed Action[1]



The entire East Central-Wet Mountains East-Central Wet Mountains Project Area is within the San Carlos Ranger District of the Pike – San Isabel National Forest. It is located in Custer and Pueblo Counties approximately 24 miles southwest of Pueblo (Figure 1). The community of Beulah borders the East Central-Wet Mountains East-Central Wet Mountains Project Area on the east. The communities of Wetmore and Rye are just north and south of the East Central-Wet Mountains East-Central Wet Mountains Project Area, respectively. Highway 165 (Greenhorn Highway) runs northwest from Colorado City through the heart of the East-Central Wet Mountains Project Area.

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:

1. Whether the proposed activities and alternative address the issues, are responsive to national policy/ guidance and direction in the Land and Resource Management Plan, Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands as amended (hereafter referred to as the "Forest Plan"), and meet the purpose of and need for action in the East-Central Wet Mountains Project Area.
2. Whether the information in this analysis is sufficient to implement proposed activities.
3. Whether the proposed activities would have significant effects and therefore required the preparation of an Environmental Impact Statement.

[1] The percentages presented in this figure are rounded and therefore may not add up to 100 percent.

If an action alternative is selected, project implementation could begin in the fourth quarter of 2011. Most actions would be accomplished within a decade. Certain actions could last longer.

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 East-Central Wet Mountains Hazardous Fuels Reduction & 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. 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.

Two public meetings were held to gather public comments. Scoping for the East Central-Wet Mountains Project began on November 12, 2009 when a scoping meeting was held in Beulah, Colorado. Maps of the East-Central Wet Mountains Project Area and information on the approach of the project were presented in an open house format. Twenty-six people signed in at that meeting and 9 written comments were received. A second meeting was held on April 8, 2010 in Rye, Colorado. Twenty-eight people signed in at the Rye meeting and 12 written comments were received. In addition, 5 people called the Ranger District for more information on the project. Those calls were either answered or returned.

Public outreach, meeting notices and advertisement included:

1. The posting of legal notices in local newspapers
2. Mailing letters to 555 people, groups and agencies
3. Social media including: e-mail, Twitter, and YouTube
4. An article in the Pueblo Cheftain
5. A news release that was sent to the local media and congressional staff
6. Posting a notice on the USDA Forest Service website

A scoping report was created that presents the results of a content analysis completed on the comments. Content analysis is a process that identifies specific, separate statements within each submitted comment and categorizes them. These categories were used to help frame the public issues for consideration and further refine the proposed action and developing alternatives for the Environmental Assessment.

The scoping process generated 2 letters from agencies, 19 filled-out comment forms from individuals, and 5 phone calls. The comments were clearly dominated by those from individuals. The comments are in the administrative record for this project.

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 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. Three significant issues were identified. Design features were developed to ensure the protection of natural and cultural resources.

1.5.1 Watershed Protection

The runoff from the Mason Gulch burned area continues to cause substantial erosion in North Creek (Beulah's water supply) and has destroyed bridges.

Watershed protection is an important aspect of this project. It has been documented that fuels reduction projects can reduce the fire severity and therefore reduce the potential impacts of a fire on increased erosion, sediment yield, flooding and debris flows. Those effects would be beneficial to the municipal watersheds and watersheds that contain important fish habitat. The issue is that the proposed vegetation treatments would generate increased sediment and other water quality problems through soil disturbance and compaction, and increased water yield. Water quality impacts from fine sediments are a concern because of the importance of these watersheds as a drinking water source.

1.5.2 Recreation

This area is an important recreation resource, especially for local residents. Protecting and potentially expanding recreational opportunities that focus on trails is an important issue for this project.

1.5.3 Forest Management

One of the most important forest management issues for the East-Central Wet Mountains Project Area is the presence of several roadless areas. The federal roadless areas are currently under a court-ordered injunction that limits forest management. These roadless areas comprise a large portion of the East-Central Wet Mountains Project Area.

Chapter 2. Alternatives

This chapter describes and compares the No Action and the HFRA Proposed Action to be considered in this analysis. It includes a description of each alternative considered. This section also presents a summary comparison of the effects of the alternatives based on the issues, defining the differences between each alternative and providing a basis for choice among options by the decision maker and the public. The HFRA Proposed Action was developed to respond to the purpose and need, and is fully compliant with the Forest Plan.

2.1 Alternative A - No Action

Under Alternative A (No Action), none of the proposed thinning, creating openings, prescribed burning, and removing trees and fuels breaks would be implemented in the East-Central Wet Mountains 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 municipal watersheds for the communities of Beulah, Rye, Wetmore, San Isabel, and Colorado City would remain susceptible to catastrophic 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 Proposed Action directly addresses the purpose and need of this project by restoring treatment areas to historic conditions, which would effectively reduce fire intensity and change fire behavior. The Proposed Action involves vegetation treatments including thinning, creating openings, prescribed burning, and removing trees on up to 18,800 acres (Table 1) within the East-Central Wet Mountains Project Area. It is expected that the proposed treatments would take 10 years to complete to accomplish the initial project objectives. The project would also work within the Community Wildfire Protection Plans that have been developed by Pueblo and Custer Counties. The main elements of the proposed project are presented below.

Approximately 2,475 acres of the Proposed Action are within Colorado Roadless Areas (Colorado Roadless Final Petition - April 4, 2010), but are outside the 2001 Roadless Area Conservation Rule areas (Federal Roadless Areas). No new roads would be constructed in Colorado Roadless Areas and the activities are consistent with the Colorado Roadless Final Petition. Approval for activities within Colorado Roadless Areas will be obtained from the US Forest Service Regional Office and Colorado Department of Natural Resources.

Table 1. East-Central Wet Mountains Vegetation Treatment Areas

Vegetation Type	Area (acres)	Percentage
Aspen	5,300	28%
Dry ponderosa pine	2,400	13%
Mesic ponderosa pine	1,900	10%
Mixed Conifer	4,000	21%
Upland Shrub Communities	2,800	15%
Piñon-Juniper	400	2%
Fire Breaks	2,000	11%
Total	18,800	

2.2.1 General Operations

The following items are general operating guidelines that would be used.

1. All treatments would comply with the conservation measures outlined in the EA for this project; the Water Conservation Practices and Best Management Practices (BMPs) listed in the EA; and the standard and guidelines listed in the Forest Plan as amended.
2. Prescribed fire could be used in areas that have been treated mechanically or by hand, or it could be used as a treatment by itself. The exact use and locations of prescribed fire would be determined after vegetation treatments are completed, and would depend in part on the levels of natural fuels combined with fuels created by treatment activity.
3. Prescribed fire treatments could be used outside the priority treatment areas as a primary treatment. These prescribed fires would be used to maintain or improve vegetation conditions consistent with the purpose of this project.
4. Before any prescribed burning, appropriate burn and smoke management plans that address site-specific details would be completed and approved.
5. Harvesting equipment would not be allowed on slopes greater than 35 percent to remove logs, unless the contractor can demonstrate ability to remove logs without environmental damage on steep slopes.
6. Ground-based logging systems would be used to remove logs from areas that are accessible from existing National Forest System Roads, temporary roads, or constructed temporary roads (see *Access* below). Typically, skidders would be used to yard trees off the site.

2.2.2 Adaptive Management

The project would use adaptive management to ensure that the prescribed treatments are achieving the desired results and resources are being protected. Vegetation treatments would be implemented incorporating adaptive management to meet the Forest Plan goals, objectives, standards, and guidelines. Adaptive

management is defined as a process where land managers implement vegetation treatments and design features that are intended to meet Forest Plan standards and guidelines, and would likely achieve the desired conditions in a timely manner. However, if monitoring shows that desired conditions are not being met, or if movement toward achieving the desired conditions in an acceptable timeframe is not occurring, then an adjustment to the vegetation treatments and/or design features would be implemented to achieve the desired results.

The cornerstone of any adaptive management plan is the monitoring completed to define and describe the conditions and trends. To ensure that management and resource protection objectives are achieved, treatment operations and the resulting conditions would be monitored during the life of the project to determine the effectiveness of treatment types. The monitoring would also help refine future treatment prescriptions. *Section 2.5 Monitoring* describes the planned monitoring. Monitoring is intended to answer specific questions and to inform on-the-ground management. It is intended to be rapid, practical, and cost-effective. The techniques are designed to be commensurate with the complexity of the overall situation.

2.2.3 Forest Treatments by Vegetation Type

Kaufmann and others (2006) identify five major vegetation zones of 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 East-Central Wet Mountains 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 Subalpine fir zone and vegetation patterns are more complex. Ponderosa pine is still a part of this zone however other tree species are also common including Douglas-fir, lodgepole pine, limber pine, aspen and white fir. 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) indicate 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 no vegetation zone had a uniform historical landscape structure or type of fire behavior. Instead there was a mix of fire regimes within each vegetation zone. However, the proportion of the landscape that supported low density stands and low severity fires most likely decreased with elevation as the amount of more mesic conditions increases. Under the more mesic conditions a mixed severity fire regime would have resulted in a greater variety of stand structures. At the higher elevations and most mesic sites a low frequency, high severity fire regime would likely have prevailed resulting in large blocks of dense homogenous stand conditions as is typical of the spruce-fir stands found in the Subalpine zone.

Based on the information found within the references listed below, recommended treatments have been developed for the stands within the East-Central Wet Mountains Project Area. These recommended treatments are based on elevation, slope, aspect, topographic position as well as the current forest vegetation.

The vegetation treatment areas that are the target of the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project cover about 18,800 acres (Figure 3). Reserve areas are included as part of the design of the Proposed Action. Reserve areas include areas where fuels reduction or forest health treatments are not needed, or federal roadless areas. Where stand variations dictate an alternative treatment to the majority treatment, this variation would be accommodated. For example; a quarter acre pocket of aspen within a conifer stand would be cleared of conifers within and up to one tree length (50 feet) from the edge of the aspen pocket to promote aspen sprouts.

Ponderosa Pine

Ponderosa pine in the East-Central Wet Mountains Project Area can be divided into two classifications; dry and mesic (Kaufmann et al. 2006).

Dry Ponderosa Pine

Dry ponderosa pine likely had frequent low intensity fires and open forest conditions historically. The objective of the prescribed treatments is to create and maintain the more open forest conditions that historically characterized these dry site forests. The residual stand basal area would range between 30-60 square feet per acre. The resulting forest would be more resilient to surface fires and have a lower risk of sustaining a crown fire.

Dry ponderosa pine is classified as:

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

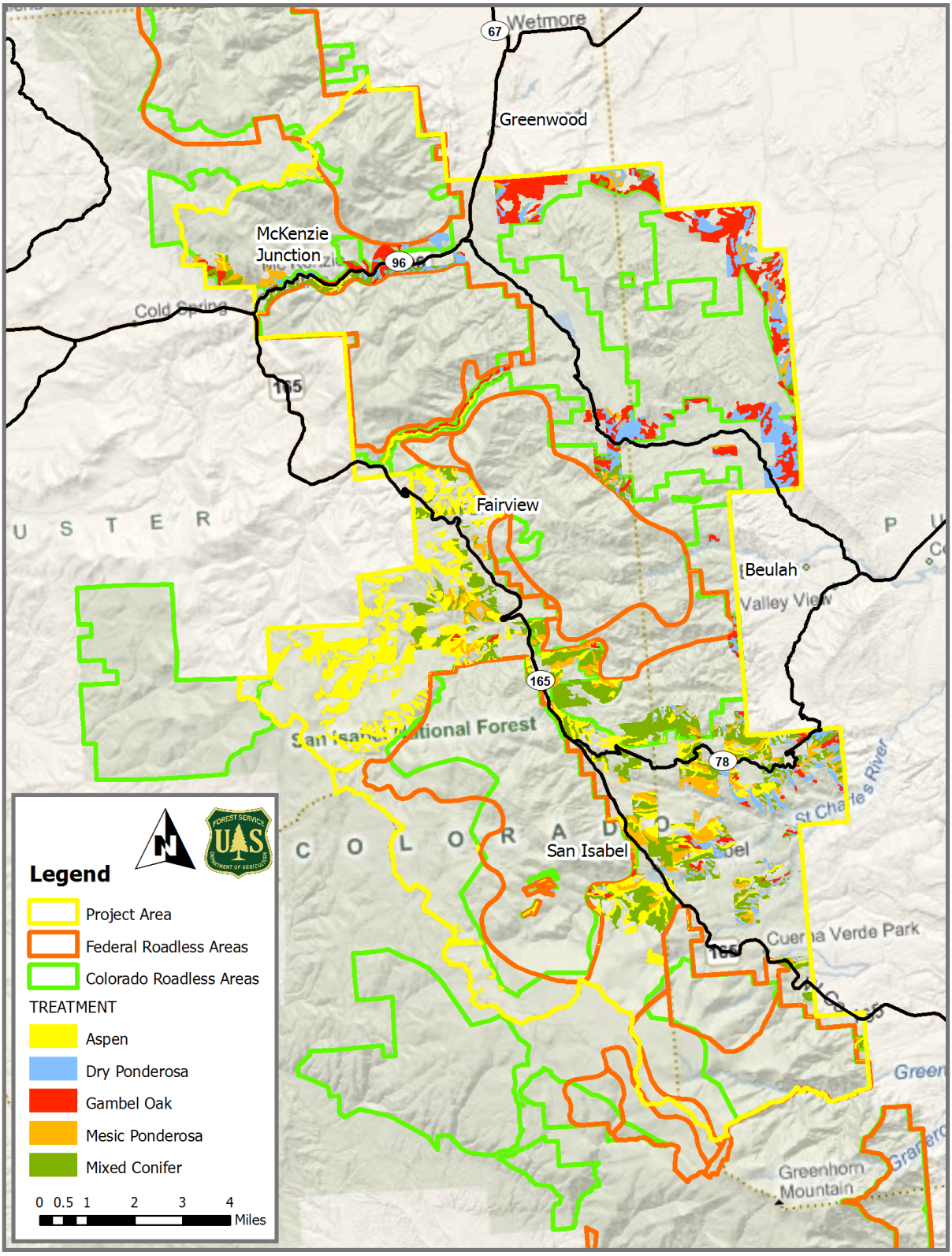
Mesic Ponderosa Pine

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 ponderosa pine sites. As with the drier ponderosa pine, the objective would be to create more open forest conditions. However, there would be a greater range of residual stand densities and fewer fire maintained openings in these more mesic areas. There would also be a greater amount of Douglas fir left within the residual stands. Residual stand densities would range from 40 to 100 square feet per acre.

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

Figure 3. East-Central Wet Mountains Vegetation Treatment Areas



Ponderosa Pine Guidance and Constraints

The following guidance and constraints will be used in treating ponderosa pine:

a. In ponderosa pine stands, thin trees to a canopy closure that would average about 20 to 25 percent. Overall, canopy cover may differ substantially from one point to another, but across a given area it would average 20 to 25 percent.

b. Preference would be given to retaining ponderosa pine over Douglas-fir and retaining larger trees with few low branches. Larger more mature trees would typically 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 small irregular openings or areas of lower tree density. Existing stand structure and site conditions would determine where "clumps" and small 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. Slash left on-site would be lopped and scattered or crushed with yarding and harvesting equipment. Heavy slash would be piled for burning.

e. Provide opportunities for holiday tree cutting and firewood gathering by the public.

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

a. Openings would be between 1 and 40-acres in size.

b. The lowest tree densities and majority of openings would occur on the dry ponderosa pine sites. The more mesic ponderosa pine sites would have fewer openings and higher tree densities.

c. Approximately 40 percent of the acres in openings would have no trees and the remaining 60 percent would have canopy closures of 1-10 percent.

d. In addition to physical site characteristics, the level of insect and disease within an area would be used to determine the location of openings. Areas with higher levels of insects or disease would be priority areas for the creation of openings.

e. Slash left on-site would be lopped and scattered or crushed with yarding and harvesting equipment.

Prescribe 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:

a. Prescribe burn slash after material has sufficiently dried after completing treatments, where appropriate.

b. Prescribe burn the new openings again five to six years later if necessary to minimize tree regeneration, then every 10 to 30 years as needed to maintain the openings.

c. Before any prescribed burning would take place, appropriate burn and smoke management plans that address site-specific details would be completed and approved.

d. 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.

Aspen

Aspen provides many benefits to the landscape, including natural fire breaks, species diversity and important wildlife habitat. In the East-Central Wet Mountains Project Area, the objective of vegetation management in aspen would be to restore the health and vigor of the existing aspen stands and expand their extent. Existing stands of aspen are also experiencing Sudden Aspen Decline (SAD), which may be linked to reduced vigor due to the age of the aspen stands. Conifers have encroached upon the area's aspen stands due to fire suppression and the lack of other disturbances across the landscape.

Aspen treatments would include a mixture of treatments depending on the condition of the existing aspen clones and the site conditions. In some situations, the removal of competing conifer trees and cutting of aspen would be used to encourage new growth. In areas with SAD, coppice 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. In some mixed conifer areas where there is an aspen component, small clearcuts would be used to convert those areas to aspen, increasing the percentage of aspen in the East-Central Wet Mountains Project Area. However, aspen clones at lower elevations on dry sites may have a very poor response and may not re-sprout. In these areas, conifers may be removed for fuel reduction purposes and if aspen do not re-establish, they could be planted with conifers.

Mixed Conifer

Mixed conifer is classified as;

1. Douglas fir, limber pine, white fir, lodgepole pine, blue spruce, bristlecone pine and Englemann spruce-subalpine fir cover types between 6500 and 7500 feet in elevation on north aspects

2. Douglas fir, limber pine, white fir, lodgepole pine, blue spruce, bristlecone pine and Englemann spruce-subalpine fir cover types between 7500 and 8500 feet in elevation on north and east aspects

3. Douglas fir and Limber pine cover types between 8500 and 9500 feet in elevation on all aspects.

Mixed conifer areas are generally composed of limber pine, Douglas-fir, and white fir. There may also be inclusions of lodgepole pine, Engelmann spruce-subalpine fir, bristlecone pine and blue spruce. The density of these stands has increased due to the lack of natural disturbances. White fir is very susceptible to fire due to its

high flammability and lower crown base heights. White fir has proliferated within the mixed conifer forest during this period of fire suppression. These areas most likely developed under a mixed severity fire regime (Crane 1982) that would have resulted in a greater variety of stand structures and ages than currently exists. Therefore, the mixed conifer forests within the East-Central Wet Mountains Project Area are at a high risk of large crown fires that did not exist historically. The objective for these more mesic sites would be to increase the age and spatial diversity of stand structures across the landscape.

In some areas, the management strategy would be to remove flammable white fir trees to reduce fire hazards. Younger white fir with low crown heights would be thinned out of these areas. White fir with few low branches would be retained. The more mature trees with larger, fuller crowns would typically be retained. Some areas would be thinned from below leaving a more or less even-aged stand of the larger cohorts. The more mature trees would be retained within these thinned areas and the more flammable understory trees would be removed. Residual stand basal areas would range from 60 to 100 square feet per acre.

An example of the dense forest conditions in the East-Central Wet Mountains Project Area

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 1 to 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.

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 preclude the use of prescribed fires because of the density of the vegetation.

Piñon/juniper Woodlands

The expansion of the piñon juniper woodlands is well documented throughout the West. The piñon juniper woodlands in the East-Central Wet Mountains Project Area are expanding into grasslands and have become more decadent with the advent of fire suppression. Grazing has also played a role in reducing the fine fuels that are needed to carry the more frequent ground fires that were typical of historic piñon juniper woodlands disturbances. The current piñon juniper woodland has become sufficiently dense to eliminate grass, forbs and

other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. A recent fire (Iron Mountain) in piñon juniper woodlands that destroyed several homes in the area is evidence of these conditions.

The objective for these stands would be to remove some of the piñon juniper trees to stimulate understory vegetation and reduce crown fuels. This would be accomplished by mechanical treatments of decadent piñon juniper patches. The treated areas would be converted to grasslands in the short-term. Piñon juniper would eventually regenerate within the grasslands as young vigorous woodlands. The conditions following mechanical treatment would allow the use of prescribed fire as a tool to reintroduce fire as a disturbance agent.

Upland Shrub Communities

Similar to the piñon juniper woodlands, the upland shrub communities have become more decadent over time due to the lack of fire as a disturbance agent. The oak brush becomes denser as it ages and shades out grasses and other ground cover. As the crowns of the oak brush become larger, the risk of crown fires increases. Grazing has also reduced ground cover in this community.

The objectives of treatments in the upland shrub communities are to improve the vigor and palatability of plants used as forage for wildlife species and to create fuel breaks. In the WUI, mastication (hydroaxe) would be used to remove oak brush and stimulate grass and other ground cover. These treatment areas would function as fuel breaks in the WUI. Mastication treatments do promote suckering in oak brush, which makes it a less preferred treatment technique. Therefore, the treatment area would need periodic maintenance to retain their effectiveness as fuel breaks. Prescribed fire would be used as a natural ecological process to restore upland shrub communities outside of the WUI.

2.2.4 Other Vegetation Treatments

Fuel Breaks

A fuel break is a gap in forest vegetation or other forest fuels. The main goal of a fuel break would be to break the continuity of forest fuels at strategic locations that would slow the progress of a wildfire or modify its behavior so that fire suppression efforts are more effective. The proposed action would create up to 2,000 acres of fuel breaks. The specific locations for the fuel breaks would be determined during project implementation.

Fuel breaks would be created and maintained at strategic locations throughout the East-Central Wet Mountains Project Area. The fuel breaks would likely be located where natural features, such as ridgetops, or manmade features, such as roads, would increase their effectiveness. The activities required to construct a fuel break would vary depending on the existing conditions, but would likely include thinning and prescribed fire. These activities would create and maintain open conditions.

Meadows

Meadows in the East-Central Wet Mountains Project Area have also experienced encroachment by conifers, similar to aspen. This conifer encroachment has the adverse effects of decreasing the effectiveness of these

areas as fire breaks as well as reducing their ecological function as unique habitats. Fire suppression and grazing have removed fire as a natural disturbance and allowed conifers to grow where surface fires would have killed them historically.

Treatments would have the goal of restoring and maintaining meadow areas that are at risk from encroachment by conifers. Removal of the encroaching trees would maintain these meadows. The use of prescribed fire would be determined once the meadows are cleared of trees.

Riparian Areas

Willows and other shrub species historically dominated many riparian areas in the East-Central Wet Mountains Project Area. Fire suppression and grazing have removed fire from these areas. Conifers are now encroaching on many of the riparian areas in the East-Central Wet Mountains Project Area. These conifers reduce the function of these riparian areas as fire breaks and crowd out some of the willows that have a unique ecological function in riparian areas. Willows provide more nutrients and shade to streams than large conifers, as well as browse for wildlife. Willows also do not burn as hot during wildfires as conifers do, and recover very quickly from fire. That feature of willows, allows riparian areas to recover quickly from wildfires.

Treatments in riparian areas would have the goal of removing conifers to restore more historic and sustainable conditions. Conifers would be removed carefully to minimize damaging riparian areas and causing physical damage to the streams.

2.2.5 Vegetation Treatment Methods

A variety of methods will be used to accomplish the vegetation treatments described above. The treatment methods vary based primarily on access. Broad definitions of the treatment methods are listed below and in Table 2.

Standard Mechanical - This method includes traditional tree removal methods including the use of heavy machinery to cut and remove trees. Skidders would likely be used to move trees to landings. Ground disturbance from 10 up to 15 percent.

Forwarder - Forwarders are large machines that can pick up logs with an arm and put them into a bunk that transports logs above ground. They can haul trees from longer distances than traditional skidders with less impact.

Mastication - Mastication equipment breaks trees and branches into small chips. The chips end up scattered throughout the treatment area and remain on the ground as mulch. These machines can operate efficiently further away from roads because this treatment method does not require hauling logs.

Hand - Hand cutting involves cutting trees with chain saws. The trees would be cut and limbed in areas where they could be piled and burned, or broadcast burned the following season.

Prescribed Fire - Prescribed fire would be used in some situations as a primary treatment method. On slope less than 20 percent, mechanical fire lines would be built. On slopes greater than 20 percent,

hand lines would be the method for constructing control features. OHVs may be used to construct control lines where appropriate.

Table 2. East-Central Wet Mountains Vegetation Treatment Methods[2]

Vegetation Treatment Method	Distance from Roads that Method is Applicable	Acres of Method in Proposed Action	Percentage of Method in Proposed Action
Standard Mechanical	⅕ mile (1,000 feet)	9,257	49%
Forwarder/Mastication	½ mile (2,640 feet)	6,490	35%
Mastication/Hand	¾ mile (3,960 feet)	1,997	11%
Hand/Prescribed Fire	1 mile (5,280 feet)	554	3%
Prescribed Fire	1 ½ miles (7,920 feet)	502	3%
Total		18,800	

2.3 Community Wildfire Protection Plan Priorities

Two Community Wildfire Protection Plans (CWPPs) have been prepared that cover the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects some of which are located within the East-Central Wet Mountains Project Area. These projects would be implemented on National Forest System lands to the extent practical and in collaboration with the CWPP partners. In addition to the following projects, critical community infrastructure would be protected within treatment areas in the East-Central Wet Mountains Project Area. Critical community infrastructure would include communications, power lines and water features.

A. The Pueblo County Community Wildfire Protection Plan (2006) identified the following high priority project:

    1. The USDA Forest Service would work with the Pueblo County CWPP partners to create shaded fuel breaks approximately 500 feet wide from the centerline of SR 165 on both sides of the highway from Rye to Lake Isabel and along 12-Mile Road (SR 78), where feasible; from Highway 165 to Beulah.

B. The Custer County Community Wildfire Protection Plan (2007) identified the following high priority projects.

    1. The USDA Forest Service would work with the Custer County CWPP partners to identify fuel modification projects in the Wet Mountain/San Isabel high-density neighborhood.

[2] The acres displayed on this table are based on the percentages of areas within the stated distances from existing roads.

2.4 Design Features

The following design features are part of Alternative B (Proposed Action). The Design Features are divided into implementation components. They include an identification of the resource area that they are designed to address. Following the implementation components, they are some resource specific Design Features that do not fit into specific implementation components.

2.4.1 Vegetation Treatment

Treat-1 Leave a variety of tree stockings per acre over the East-Central Wet Mountains Project Area as a whole with some areas containing larger clumps of trees and others more open-canopied forest, creating a multi-aged multi-structured natural mosaic over the landscape to promote biological diversity for flora and fauna and to mimic historical conditions (Fish and Wildlife Protection).

Treat-2 Leave maximum amount of biomass possible for soils as long as that amount is acceptable from a fuels standpoint (Soil and Water Quality Protection).

Treat-3 Maintain a minimum of 40 percent effective ground cover in slash, coarse wood, grass, forbs, and shrubs for filtered sunlight and cooler soil surface temperatures (Soil and Water Quality Protection).

Treat-4 Integrate no-treatment islands in steeper portions of ground-based logging units. Use of ground-based equipment on steeper areas should be closely monitored (Soil and Water Quality Protection).

Treat-5 Leave a minimum of 8 snags/recruitment snags per acre (4 dead and 4 live, disease or insect prone, fork-topped, "wolfy", broken-topped, crooked, etc. preferred). Snag minimums can be averaged over a 5 acre area (Fish and Wildlife Protection).

Treat-6 Maintain at least 200 linear feet per acre of coarse woody debris (CWD) 12 inches or larger diameter at the small end; or largest and longest available (Fish and Wildlife Protection).

Treat-7 Pre-treatment goshawk surveys would be conducted to identify any active nests within the treatment areas. If an active nest was identified, the USDA Forest Service biologist would be notified immediately. Work would stop in that area until a USDA Forest Service biologist made a determination of potential impacts and mitigation needed (Fish and Wildlife Protection).

Treat-8 If any active raptor nest is discovered, the Forest Service wildlife biologist would be contacted immediately. Work would stop in that area until a Forest Service biologist makes a determination of impacts and mitigation needed (Fish and Wildlife Protection).

Treat-9 Protect existing or provide for one Abert's squirrel nest tree clump (0.1 acre of 9 to 22 inch dbh ponderosa pine with a basal area of 180 to 220, if available, and interlocking canopy) per six acres in ponderosa pine (Forest Plan, pg. III – 29). In red squirrel (pine squirrel) habitat, intact tree retention groups would be centered on existing food caches (middens). These intact tree retention groups would be at a minimum 6 large (less than 9 inches dbh) trees with interlocking

canopies up to 2 ½ acres in size depending on quality of habitat (concentration of middens) (Fish and Wildlife Protection).

Treat-10 Raptor nesting and carnivore denning sites would be reported to the Wildlife Biologist and appropriate protection measures would be implemented (Fish and Wildlife Protection).

Treat-11 Avoid implementing project activities in and near all raptor nest sites that show signs of recent activity over the last 0-3 years (i.e., fecal whitewash, feathers, bolus pellets, skeletal bones, or fur of prey species present at or around the base of a tree). Should active raptor nest sites be discovered CDOW recommended buffer zones and timing limitations would apply (CDOW 2008) (Fish and Wildlife Protection).

Treat-12 If new site information regarding threatened, endangered, proposed, and sensitive species is located during the course of ground disturbing activities, all work in the vicinity of those species would cease and the appropriate specialist would be notified (Fish and Wildlife Protection).

Treat-13 Conduct pre- and post-project field surveys as needed to identify and treat noxious weeds in proposed treatment areas until controlled or eradicated (Noxious Weeds).

Treat-14 Conduct field surveys to locate specific special plant species as indicated in the BE/BA as needed, and determine the appropriate management activity (Sensitive Plants).

Treat-15 Leave higher densities of trees around rock outcrops (except specific areas that may be opened to enhance scenic quality), resembling natural fire patterns (Fish and Wildlife Protection).

Treat-16 Require contractor/purchaser to clean all heavy equipment that operates on USDA Forest Service projects before entering treatment areas in compliance with established contract language (Noxious Weeds).

Treat-17 All hay, straw, and mulch used for revegetation or watershed protection measures on National Forest System lands will be certified as noxious weed-free (Noxious Weeds).

Treat-18 Mark trees on the side away from roads, campgrounds and trails for 300 feet or sight distance (Visual Quality).

Treat-19 Mark cut trees instead of leave-trees where reasonable. The objective is to reduce marking paint visibility to the casual observer (Visual Quality).

Treat-20 Vary spacing and blend thinned areas with untreated areas (Visual Quality).

Treat-21 Leave stumps no higher than eight inches (Visual Quality).

Treat-22 Leave trees in natural patterns around rock outcrops (Visual Quality).

Treat-23 Retain elements of a park-like setting (larger ponderosa pines, random tree spacing, understory grasses and shrubs) for visual variety (Visual Quality).

Treat-24 Slash depth would be retained at less than 18 inches and scattered to mimic natural surroundings (Visual Quality).

Treat-25 Signage should be posted in appropriate locations warning users of treatment activities (Recreation).

Treat-26 Maintain a visual screen within 200 feet of natural openings to deter off-road/trail use (Recreation).

Treat-27 Attempt to close treatment units to dispersed recreational activities during implementation. Provide notice of such closures at the District office, on the forest web page, and in visible locations near the treatment units and along main roadways (Recreation).

Treat-28 Notify all potentially impacted Special Use Permit holders of pending activities near or within their areas of operation (Recreation).

Treat-29 Favor winter logging to reduce resource impacts (Recreation).

Treat-30 Do not place merchantable materials or slash on developed recreation sites, at recreation staging areas or trailheads, or trail corridors (Recreation).

Treat-31 Fuels reduction treatments within National Historic Register eligible site boundaries may occur with mitigation to protect the integrity and character of the historic resource (Heritage Resources).

Treat-32 Special use permittees and those with Rights-of-Way would be contacted before implementation to avoid conflicts (Other Concerns).

Treat-33 Provide wood products, including firewood, consistent with demand and treatment prescription (Other Concerns).

Treat-34 Meet all applicable laws regarding safety; follow Occupational Safety and Health Administration (OSHA) and State safe work practice guidelines (Other Concerns).

Treat-35 A spill plan would be part of contracts used to implement this project (Other Concerns).

Treat-36 Respond to neighbors' concerns identified as part of implementation planning (Other Concerns).

2.4.2 Roads

Road-1 Existing National Forest System Roads (NFSRs) would provide the primary access to the East-Central Wet Mountains Project Area.

Road-2 No new NFSRs would be constructed.

Road-3 NFSRs used for the project would be maintained or reconstructed as needed to accommodate safety or environmental considerations.

Road-4 Unclassified roads/trails considered suitable for operations would also be maintained or reconstructed for use during this project, but would be closed and rehabilitated once operations were completed. These unclassified roads are not part of the USDA Forest Service system, are not open to the public, and are candidates for restoration based upon roads analysis.

Road-5 Temporary roads would be constructed to the minimum standard needed for safe and efficient use by project equipment, which may include vegetation clearing and minor earth movement. These activities would be reviewed by the USDA Forest Service Engineer and Hydrologist (Soil and Water Quality Protection).

Road-6 Unclassified and temporary roads used to access the treatment areas would be restored by combinations of water barring, scarifying, seeding, and blockading access after treatments are completed. These restoration treatments would be reviewed by the USDA Forest Service Engineer and Hydrologist (Soil and Water Quality Protection).

Road-7 Private roads adjacent to the East-Central Wet Mountains Project Area could increase access for ground-based logging systems or reduce the need for some roadwork on National Forest System lands. During implementation, these options would be pursued to reduce the cost and impact of the project.

Road-8 Avoid temporary road construction on slopes steeper than 20 percent; avoid stream crossings (Soil and Water Quality Protection).

Road-9 Subsoil temporary roadbed where original slope was less than 10 percent; re-contour as needed to rehabilitate roads to near natural conditions on steeper slopes (Soil and Water Quality Protection).

Road-10 Consult a fisheries biologist if barriers to fish passage are identified (created) during roadwork. Barriers would be evaluated and redesigned if they are suspected to have unacceptable impacts on fish (Fish and Wildlife Protection).

Road-11 Bury or scatter stumps that are pulled up as a part of roadwork (Visual Quality).

Road-12 Install physical barriers along roads in areas where illegal off road use is likely to occur (Recreation).

Road-13 Use boulder and earthen barriers, fencing, slash, etc. to deter access to treatment areas during implementation if monitoring shows that unwanted use is occurring (Recreation).

Road-14 Haul routes should be clearly identified and considerations for impacts to recreationalist identified (Recreation).

Road-15 Pursue standard contracts/agreements relative to County Road maintenance and damage (Other Concerns).

Road-16 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 (Other Concerns).

Road-17 Require contractor/purchaser to reseed disturbed roadbeds with a certified noxious weed-free native seed mix (Noxious Weeds).

2.4.3 Yarding/Skid Trails

Skid-1 Where whole-tree yarding occurs, return slash with skidder to the skid trail with each turn to keep landing size down and redistribute slash onto the skid trails to function as organic waterbars to dissipate overland flow energy (up to two tons per acre) (Soil and Water Quality Protection).

Skid-2 Fell, lop, and scatter vegetation onto rehabilitated roads for effective ground cover (integrate with down wood requirement) (Soil and Water Quality Protection).

Skid-3 Limit ground based skidding equipment to slopes less than 35 percent, except steep pitches less than 40 percent for less than 200 feet (Soil and Water Quality Protection).

Skid-4 No skidding allowed down ephemeral draws (Soil and Water Quality Protection).

Skid-5 Cross draws at a steep angle with equipment to minimize length of crossing (Soil and Water Quality Protection).

Skid-6 Require ground based skidding over frozen ground or dry soils (less than 20 percent soil moisture) (Soil and Water Quality Protection).

Skid-7 Require at least partial suspension of logs for all yarding systems (Soil and Water Quality Protection).

Skid-8 Require contractor/purchaser to use designated skid trails, landings, and travel routes that would avoid spreading weeds from infested areas (Noxious Weeds).

Skid-9 Return skid trails to as near natural condition as possible (Visual Quality).

2.4.4 Prescribed Fire

Fire-1 Machine piles would be clean of dirt (Air Quality).

Fire-2 Allow machine piling only if detrimental soil conditions would not exceed 15 percent standard (Soil and Water Quality Protection).

Fire-3 Allow slash to cure at least one year before prescribed burning so that nutrients will leach into the soil (Soil and Water Quality Protection).

Fire-4 Use low to moderate intensity burn to retain most of the three inch and greater material and some of the fine material (Soil and Water Quality Protection).

2.4.5 Riparian Areas/Water Influence Zones

WIZ-1 Hand treatments may be allowed in the Water Influence Zone (WIZ), but only after consultation and concurrence with the project Hydrologist or Fisheries Biologist. Pile burning would not be allowed in the WIZ. Mechanical thinning treatments would not occur inside the WIZ as delineated by a Fisheries Biologist or Hydrologist. If the area has not been delineated, then treatments would occur outside a 100-foot buffer from all perennial and intermittent streams. The 100-foot WIZ also applies to all lakes, ponds, kettles and other forms of standing water.

Some activities such as prescribed burning and hand treatments may be allowed in the WIZ, but only after consultation and concurrence with the project Hydrologist or Fishery Biologist.

WIZ-2 Heavy equipment and vehicles would be kept out of the WIZ, streams, swales, and lakes, except to cross at designated points, building crossings, conduct restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil. Before heavy equipment or vehicles would be allowed to cross streams, the project Fishery Biologist or Hydrologist would be consulted to determine where crossings would occur or be constructed, and to specify any stipulations necessary to minimize negative impacts on aquatic resources. Heavy equipment or vehicles would not be allowed in streams during fish spawning, incubation, and emergence periods.

WIZ-3 Fuel storage and refueling areas for harvesting equipment would be keep outside of the WIZ.

WIZ-4 Hazard trees within the riparian buffer felled for safety reasons should be directionally felled across the stream if the top can reach more than halfway across. Trees would otherwise be felled on the contour.

2.4.6 Timing

Time-1 Do not close developed recreations sites between Memorial Day and Labor Day (Recreation).

Time-2 Haul routes should be clearly identified and considerations for impacts to recreationalist identified. Routes should be used Monday through Friday only. Avoid hauling on holidays that occur on weekdays (Recreation).

Time-3 Avoid disturbing elk calving and mule deer fawning concentration areas between May 15 and June 30 (Fish and Wildlife Protection).

Time-4 Work collaboratively with contractors to evaluate potential for avoiding mechanical treatments (logging/thinning activities) from May 1 to August 15 in order to avoid disrupting nesting or breeding migratory birds. When possible, give similar consideration in the implementation of prescribed fire (Fish and Wildlife Protection).

2.4.7 Soil and Water Quality Protection

Soils and water quality design features include all the features identified above as Soil and Water Quality Protection features and the following.

SW-1 Meet or exceed Colorado Forest Stewardship Guidelines to Protect Water Quality.

SW-2 Limit detrimental soil compaction and displacement to 15 percent (or less) of each treatment area by implementing the recommended methods listed in *2.4.3 Yarding/Skid Trails*.

SW-3 Monitor unit for detrimental soil conditions following yarding.

2.4.8 Fish and Wildlife Protection

Fish and wildlife design features include all the features identified above as Fish and Wildlife Protection features, and the following.

FW-1 Mexican spotted owl (MSO) protection criteria:

b. No treatment would occur within Protected Activity Centers (PACs)

c. A qualified biologist would conduct site visits to all the proposed treatment areas that are mapped as Mexican Spotted Owl (MSO) protected or restricted habitat to determine if the site can provide suitable MSO habitat. If so, the following criteria apply:

i. Within MSO Protected habitat areas outside of PACs (including mixed conifer and pineoak habitat with slopes of greater than 40 percent where timber harvest has not occurred in the past 20 years):

1. No harvest of trees greater than nine inches dbh is allowed.

2. A combination of thinning trees less than nine inches dbh, treatment of fuels, and prescribed fire can be used to reduce fire hazard and to improve habitat conditions for owl prey. Habitat components that should be retained or enhanced include large logs (greater than 12 inch midpoint diameter), grasses and forbs, and shrubs. Emphasis of the spatial configuration of treatments should be to mimic natural mosaic patterns.

3. On steep slopes treated to reduce fire risk, either by the use of prescribed fire alone or in conjunction with removal of stems and ground fuels, pre-and posttreatment monitoring of habitat conditions should be done. Specific habitat characteristics to be measured include fuel levels, snag basal area, volume of large logs (>30 cm midpoint diameter), and live tree basal area.

ii. Within MSO Restricted habitat areas:

1. Emphasize uneven-aged management systems. If even-aged stands are included, extend rotation age to greater than 200 years. Retain trees greater than 24 inches dbh unless overriding management situations require their removal to protect human safety and/or property.

2. Except for treatments designed to reduce the risk of catastrophic wildfire, retain hardwoods, large down logs, large trees (greater than 18 inches dbh), and snags. Within treatment areas designed to reduce risk of catastrophic wildfire in restricted stands, hardwoods, large down logs, large trees (greater than 18 inches dbh) and snags are retained to an extent that does not significantly impede the overriding objective of reducing the risk of catastrophic wildfire in owl habitat.

3. No stand that meets threshold conditions can 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 on larger landscape levels (e.g., no less than the size of a FS District). This does not preclude use of treatments to reduce fire risks or lessen insect or disease problems, nor does it preclude management to meet other ecosystem objectives as long as stand-level conditions remain at or above the threshold values shown in Table III.B.1 of the MSO Recovery Plan

iii. Prior to project implementation, all areas that were determined to contain suitable MSO breeding habitat based on review by qualified biologists should be surveyed as necessary according to U.S. Fish and Wildlife Service protocol (2003), if MSO are present at a site, then the site becomes a PAC and specific guidelines as established in the 1995 MSO Recovery Plan would be followed.

FW-2 Lynx protection criteria:

a. In lynx denning or winter foraging habitat, locate patch cuts in areas that have no to poor/ marginal snowshoe hare horizontal cover (i.e., understory conifers/shrubs less than 8 feet high) presently in the forest understory.

b. Within mapped suitable lynx habitat the following restrictions apply:

i. Patchcuts in mixed conifer and ponderosa pine habitat would be a maximum of 1.5 acres in size.

ii. Aspen treatments would occur only for 1) the purpose of conifer removal in aspen, 2) daylight thinning around individual aspen trees or, 3) where aspen is in decline.

iii. Aspen treatments will focus on creating irregular shaped units, creating mosaics of variable densities as well as harvested and unharvested areas.

c. Treatments will provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

d. Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx

2.4.9 Air Quality

Air quality design features include all the features identified above as Air Quality features, and the following.

AQ-1 Any burning would follow all State and local laws and air quality permit restrictions

AQ-2 Air Quality monitoring as required would occur per permitting process, depending on category of burn.

2.4.10 Recreation

Recreation design features include all the features identified above as Recreation features, and the following.

Rec-1 Review motorized travel corridors in the selected alternative to assure that adequate screening is retained to reduce risk of increased off-road use as well as routes that have been closed as depicted on the MVUM.

Rec-2 Review non-motorized trail corridors, both system and non-system in the selected alternative to assure that adequate screening is retained on system trails and minimize user conflicts and warn visitors of potential safety issues.

2.4.11 Visual Quality

Visual quality design features include all the features identified above as Visual Quality features, and the following.

Vis-1 The visual recommendations apply to areas in the immediate foreground (within 300 feet or sight distance, whichever is less) of federally designated scenic highways and trails, and developed campgrounds and trailheads in order to meet Forest Plan Visual Quality Objective of Retention. For treatment areas located within 300 feet of other forest roads, the visual quality guidelines would be implemented to meet a Forest Plan VQO of Partial Retention. A landscape architect or recreation specialist would help determine site-specific methods to meet retention guidelines.

2.4.12 Heritage Resources

Heritage resources design features include all the features identified above as Heritage Resources features, and the following.

Hert-1 The agency would ensure procedures for compliance with the National Historic preservation act of 1966, as amended (NHPA) (1992; P.L. 89-665 Stat.915); are followed including but not limited to sections 106 and 110 of the act. Prior to any undertaking and or any potential ground disturbing activities for improvements, a cultural Resource Investigation would be initiated including but not limited to a survey of the area of potential effect by Heritage resource personnel. Measures would be taken to avoid/protect cultural resources which are eligible for inclusion to the National Register of historic Places (NRHP)

Hert-2 Locate developments/improvements away from archaeological sites so as to discourage use and potential damage of sites. Use improvements to appropriately protect sites.

Hert-3 Heritage resource personnel conducting Cultural Resource Investigations shall meet/follow the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation for Archaeologists and Historians (48FR190:44716-44742)

Hert-4 If, during the field inventory, cultural resources are located, the Forest would follow processes specified in federal regulations "Protection of Historical and Cultural Properties" (36CFR part

800) and would not proceed with the undertaking until either (a). The State Historic Preservation Officer concurs with no effect or no adverse effect or (b) if an adverse affect is found, would not proceed, until the consultation process in 36 CFR part 800.6 has been completed.

Hert-5 In the event of inadvertent discovery or if a dispute arises pertaining to adverse effect, pursuant to 336 CFR part 800.7(c), the Advisory Council on Historic Preservation (ACHP) would be notified and subsequent procedures followed.

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 East-Central Wet Mountains Project Area resources to ensure resource management objectives are achieved.

1. Northern Goshawks would be surveyed for, and any nest sites recorded and monitored, if found.
2. Other FS sensitive species or MIS would be informally surveyed for and monitored. If MIS or Forest Sensitive Species are found during monitoring surveys, then apply the following protection measures as appropriate:
    a. No ponderosa pine with signs of active Abert's squirrel nesting or feeding will be cut.
    b. No elk calving concentration areas will be modified or disturbed from May 15 – June 30.
    c. No treatment activities will occur within a 650-foot buffer surrounding active northern goshawk nest sites.
    d. No treatment activities will occur within a 2,500-foot buffer surrounding active northern goshawk nests during post-fledgling periods (March thru September).
    e. Protect other raptor nesting sites using measures similar to those for goshawk.
    f. Apply Forest Plan standards and guidelines for wildlife and fish.
3. 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.
4. 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.

5. 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.

6. 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 unauthorized OHV trails and/or

    b. Gate and/or sign with "closed to motor vehicles" to discourage use of temporary roads or unauthorized OHV trails and increase law enforcement.

2.6 Alternatives Considered but Eliminated from Detailed Consideration

The ID team considered one potential alternatives raised by scoping comments. A brief description of that alternative and the rationale for not carrying it forward for detailed analysis follows:

2.6.1 Expand Vegetation Treatments into Federal Roadless Areas

One of the alternatives that was explored in depth was expanding the vegetation treatments into the 2001 Roadless Rule-Federal Roadless Areas. A detailed proposal was developed by the ID Team that would have resulted in more than 19,000 acres of treatment in the federal roadless areas (see project record). These treatments in federal roadless areas were viewed as a reasonable alternative that would address the purpose and need by reducing fire intensity and behavior and would provide a stronghold for fire management resources to defend in the event of large wildfire(s) in that area. It would also protect municipal watersheds to a much greater extent.

In August 2009, the Ninth Circuit Court of Appeals upheld a lower court ruling to reinstate the roadless rule for most roadless areas. Now a Tenth Circuit Court of Appeals decision on the rule is still pending. The decision authority for actions in roadless areas currently rests with the Secretary of Agriculture. Until that legal action is resolved, vegetation treatments in these roadless areas would likely not be supported by agency direction.

Chapter 3. Affected Environment and Environmental Consequences

This section describes the affected environment and discloses potential effects of the proposed action and each alternative. It forms the scientific and analytical basis for the comparison of the potential environmental effects of the alternatives. In determining potential environmental consequences of each alternative, the interdisciplinary team considered the following:

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.

3.1 Vegetation

The vegetation section is divided into two sections. The first section is forest vegetation which has been described in some detail in Sections 1.1 through 1.3 in Chapter 1 and Section 2.2.2 in Chapter 2. The other section addresses special status plants. The discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Silviculture Specialist Report (JW Associates 2010a) and the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Botany Specialist Report (USDA Forest Service 2010a).

3.1.1 Forest Vegetation Affected Environment

Cover Types

Cover types are used to describe the vegetation that currently occupies a site. They are named for the dominant vegetation occupying a site; other tree species may also be present on these sites but in lesser amounts. Table 3 presents the area occupied by all cover types within the East-Central Wet Mountains Project Area. Figure 4 displays a map of the cover types in the East-Central Wet Mountains Project Area.

The East-Central Wet Mountains Project Area is dominated by forest vegetation. Forest cover types represent 78 percent of the total East-Central Wet Mountains Project Area and 80 percent of the national forest lands. Douglas-fir, Engelmann spruce-subalpine fir, ponderosa pine, aspen, and limber pine are the major forest cover types present in the area (Figure 4). Lesser amounts of bristlecone pine, piñon-juniper, white fir, blue spruce and lodgepole pine cover types also occupy sites within the East-Central Wet Mountains Project Area.

Table 3. East-Central Wet Mountains Project Area Cover Types[3]

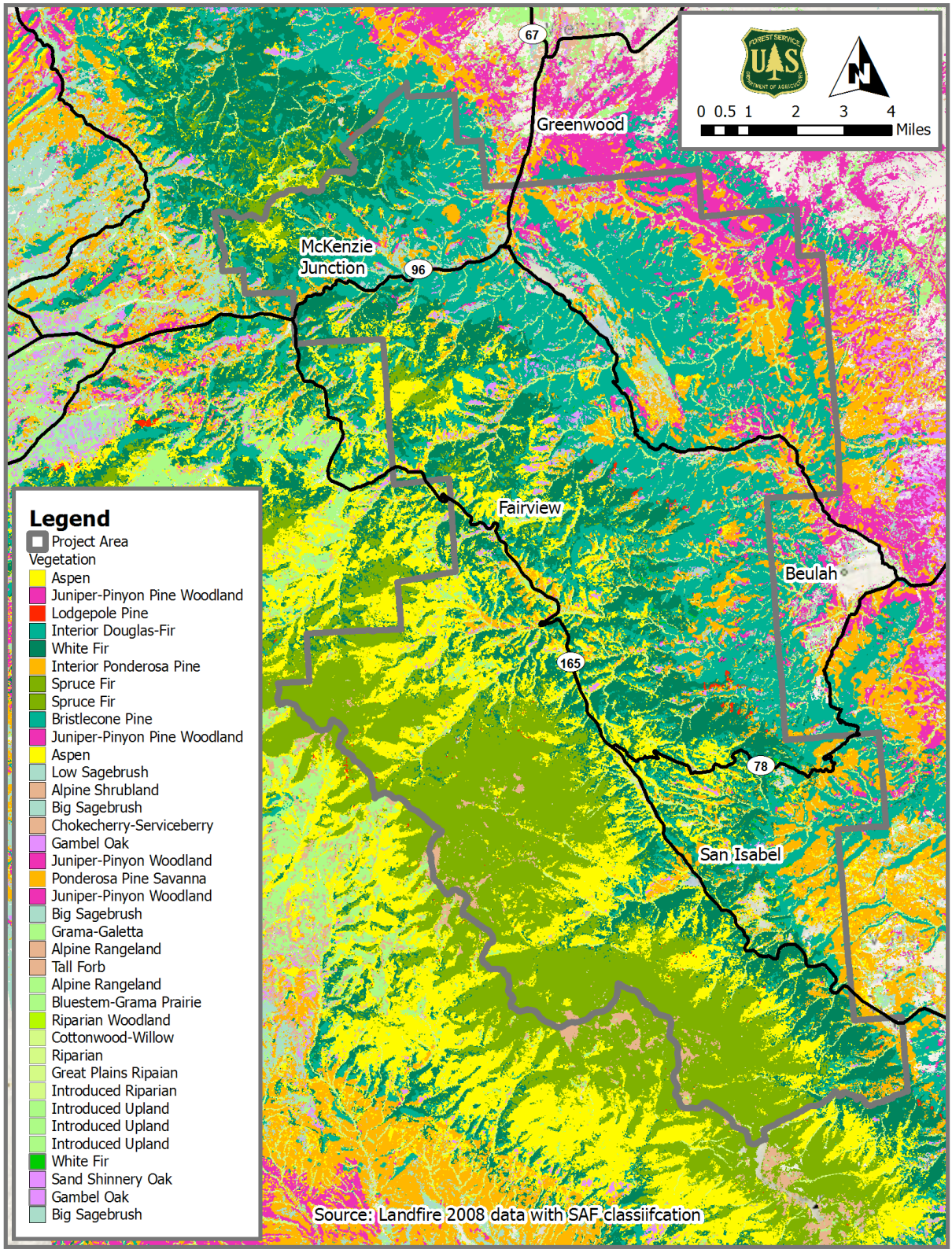
Cover Type	Project Area (acres)	National Forest (acres)
Douglas Fir	29,057	24,904
Spruce-Fir	18,299	17,912
Ponderosa Pine	15,373	9,509
Grass/Forb	13,756	9,176
Aspen	13,750	11,226
Gambel Oak	9,642	8,060
Limber Pine	7,769	7,581
Shrub	1,055	1,000
Bristlecone Pine	876	870
Piñon Juniper	751	448
White Fir	432	174
Rock/bare	426	391
Blue Spruce	159	128
Cottonwood	142	54
Lodgepole Pine	109	91
Water	41	36
Total	111,637	91,560

The diverse topography, soils and climate of the region is reflected in the variety of cover types present (Figure 4). There is a climatic gradient that runs from east to west along the front range of the Colorado Rockies. Precipitation generally increases and the average temperature decreases as you move from the eastern plains up into the mountains. The increase in moisture allows the growth of open woodlands and then higher, dense forest vegetation. At the highest elevations temperatures become so cold and the growing season is so short that trees are not able to grow. Soils also change along this gradient from the well developed fine soils of the plains to the more acidic less fertile and shallow soils found in the mountains. These changes in soil also affect the types of plants that can grow along this gradient.

Elevations within the East-Central Wet Mountains Project Area range from 6,000 feet to 11,500 feet. Kaufmann and others (2006) identified five major vegetation zones based on the climatic gradient found in the Northern 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 East-Central Wet Mountains Project Area covers three of these vegetation zones including: the lower ecotone, montane, and subalpine zones.

3 The East-Central Wet Mountains Project Area column includes all ownerships and the National Forest column includes only National Forest System lands in the East-Central Wet Mountains Project Area.

Figure 4. Cover Types of the East-Central Wet Mountains Project Area

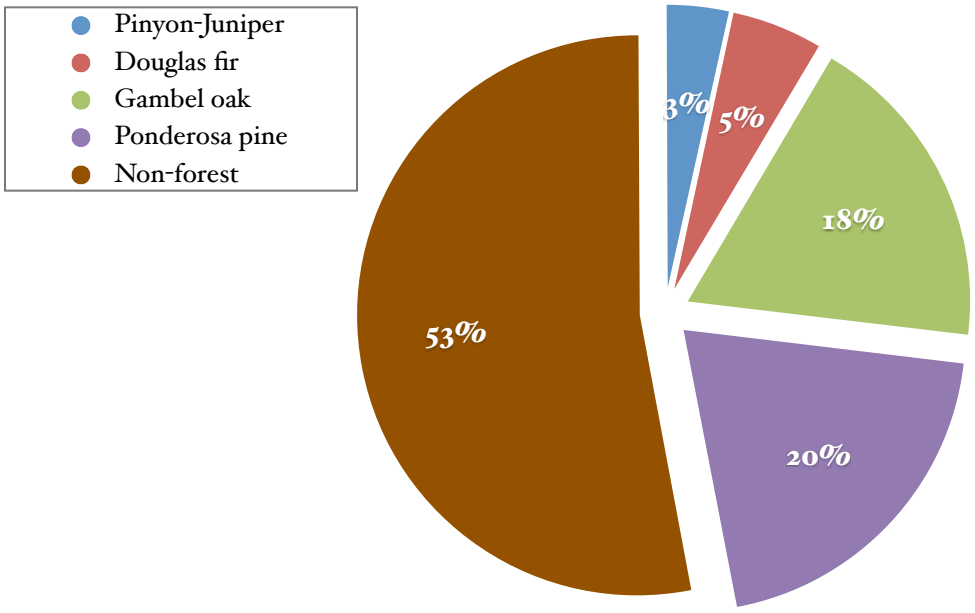


Vegetation of the Lower Ecotone Zone

In the East-Central Wet Mountains the lower ecotone is generally found between 5,500 feet and 6,500 feet in elevation. The lower ecotone is the transition zone from predominantly non-forest to forest vegetation found in the foothills of the Colorado Rockies. The forests of this zone are adapted to hot dry conditions. ponderosa pine woodlands and Piñon-Juniper are common forest types of this zone. Gambel Oak shrublands are also a common cover type of this zone.

Figure 5 shows for cover types of the lower ecotone found within the East-Central Wet Mountains Project Area. The cover types are named for the predominant species on the site; other species may be present but in lesser amounts. Because this area is a transition zone from non-forest to forested environments, much of the area is characterized by open grasslands. The lower ecotone occupies about two percent of the East-Central Wet Mountains Project Area.

Figure 5. Cover Types of the Lower Ecotone (below 6,500')



Forest Vegetation of the Montane Zone

Sixty-eight percent of the lands in the East-Central Wet Mountains Project Area are within the montane vegetation zone. In the East-Central Wet Mountains the montane zone is generally found between 6,500 feet and 9,500 feet in elevation. The montane zone supports the greatest diversity of forest cover types. Within this zone open stands of ponderosa pine may be found on dry south-facing slopes while cooler north-facing slopes will support denser stands of ponderosa pine, Douglas-fir, white fir and at higher elevations, Engelmann spruce. In areas with higher soil moisture quaking aspen may be found and on drier exposed areas at higher

elevations limber pine may dominate. Many of these stands in the upper montane zone area composed of a mixture of tree species.

Natural and man induced disturbances affect what types of vegetation develop in an area and plant succession. 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, live stock 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. Their research indicates that the historic disturbance regimes were different for the stands within the dryer lower montane as compared to the upper montane forests. Table 4 is based on Veblen and Donnegan (2005) who describe the historical vegetation of the National Forests of the Colorado Front Range and compares the current forested landscape with conditions found from 1500 to 1850 AD.

Figure 6 shows the cover types found within the East-Central Wet Mountains Project Area that fall within the lower montane vegetation zone. The forests of this zone are predominately Douglas fir and ponderosa pine. Gambel oak is also a dominant cover type of the lower montane zone. Twenty percent of this area is non-forest some of which is the result of the 2005 Mason Gulch Fire that burned 11,000 acres. This high intensity fire swept through the northeast portion of the East-Central Wet Mountains Project Area and burned through an area of predominantly ponderosa pine, Douglas fir, and low elevation shrublands. This fire resulted in creating large openings in this area of the East-Central Wet Mountains Project Area.

Figure 6. Cover Types of the Lower Montane (6,500-8,500')

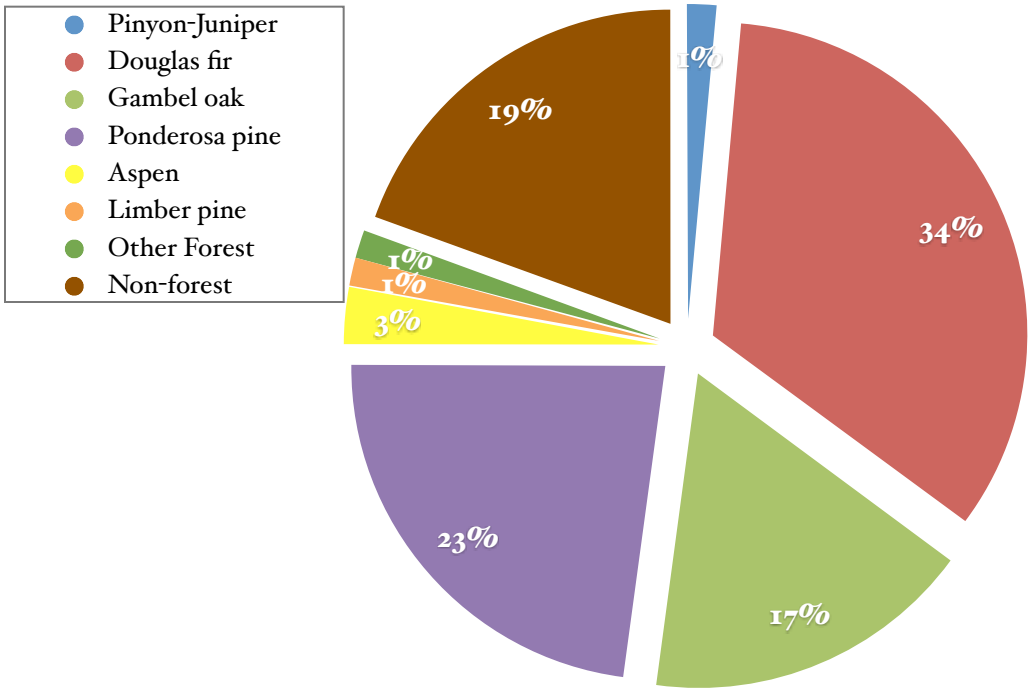


Table 4. Comparison of the Current Forested Landscape to the Range of Landscape Variation Expected[4]

Zone and Main Cover Types	Historical Landscapes	Current Landscapes
Lower Montane ponderosa pine	**Pattern**: Open woodlands of ponderosa pine, extensive grasslands, riparian forests, small dense patches of ponderosa, shrublands. **Mechanisms**: Moderately frequent low-severity fires maintained open pine woodlands; patches of higher severity fires resulted in openings or dense regeneration of pines or shrubs.	**Pattern**: More continuous forest cover and generally denser pine stands than occurred historically. Extreme conversion and fragmentation of natural landscape. **Mechanisms**: 20th century fire exclusion, late 19th and early 20th century grazing and logging conducive to ponderosa pine establishment. Widespread exurban development.
Mid and Upper Montane ponderosa pine Douglas-fir / mixed conifer	**Pattern**: Heterogeneous landscape mainly of ponderosa pine dominated patches of variable sizes and ages, Douglas-fir on more mesic sites, openings consisting of grasslands and severely burned former forest sites. **Mechanisms**: A variable severity fire regime in which forest structure was shaped mainly by severe fires; low-intensity fires were less significant in forested areas but probably important in meadows.	**Pattern**: Still highly heterogeneous landscape in relation to site conditions influencing stand densities and composition, but much less heterogeneous forest stand ages mostly dating from c. 1850 to 1920. Meadows persist but show limited tree encroachment. Relative dominance of ponderosa pine and Douglas-fir not significantly changed from the historic landscape. **Mechanisms**: Major influence of severe, widespread fires of the 2nd half of the 19th century reflected in even-aged post-fire stands; relatively young stands also triggered by logging and other anthropogenic disturbances. Substantial exurban development.
Subalpine Lodgepole pine Aspen Spruce-fir	**Pattern**: Very large patches of even aged forests varying in composition from pure lodgepole pine or aspen to spruce-fir. **Mechanisms**: Infrequent, high severity fires followed both by successional replacement of species or recovery to the same dominant tree species according site conditions and seed/sprout availability.	**Pattern**: Relatively unchanged from the historical patterns except where logging or exurban development has affected limited areas. **Mechanisms**: Fire regimes have not changed significantly from the historic fire regime of large fires occurring at highly variable intervals.

Piñon-Juniper

Piñon-juniper is a common woodland type found in the lower ecotone and lower montane zones of the Front Range. Mature Colorado piñon trees are short with open crowns and do not self-prune their dead branches. The accumulated fuel in the crowns, thin bark, and the relative flammability of the foliage make individual trees highly susceptible to fire. Rocky Mountain juniper grows alone or in combination with Piñon pine. It typically grows on dry sites with little understory vegetation. Due to its thin bark and compact crown, trees

[4] from Veblen and Donnegan 2005

are easily killed by fire. High volatile oil content, especially in the lower branches, also makes these trees more flammable.

Stand structure can affect the fire susceptibility of this vegetation type; open stands of trees with large amounts of fine grass fuel or dense, mature trees capable of carrying crown fire during dry, windy conditions are the most flammable. With sparse fuels, Colorado piñon survives fire because it is seldom exposed to lethal heat. Many of the piñon-juniper woodlands in the East-Central Wet Mountains Project Area are expanding into grasslands and some have become more decadent due to fire suppression. Grazing has also played a role in reducing the fine fuels that are needed to carry ground fires that were likely a part of the historic piñon-juniper woodlands disturbance regime. Some of the current piñon-juniper woodland has become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. A recent fire in piñon-juniper woodlands that destroyed several homes in the area is evidence of these conditions.

Gambel Oak

Gambel Oak is a dominant shrub species in a large portion of the xeric shrublands of the foothills. This species is a tall shrub or short tree where it occurs on the Pike 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. This species is often a component of the lower elevation woodlands. Large areas that burned during the Mason Gulch fire were quickly colonized by Gambel oak following the fire. Many of the Gamble oak communities in other parts of the East-Central Wet Mountains Project Area have become more decadent over time in the absence of fire. Gamble oak becomes denser as it ages and shades out grasses and other ground cover.

Ponderosa Pine

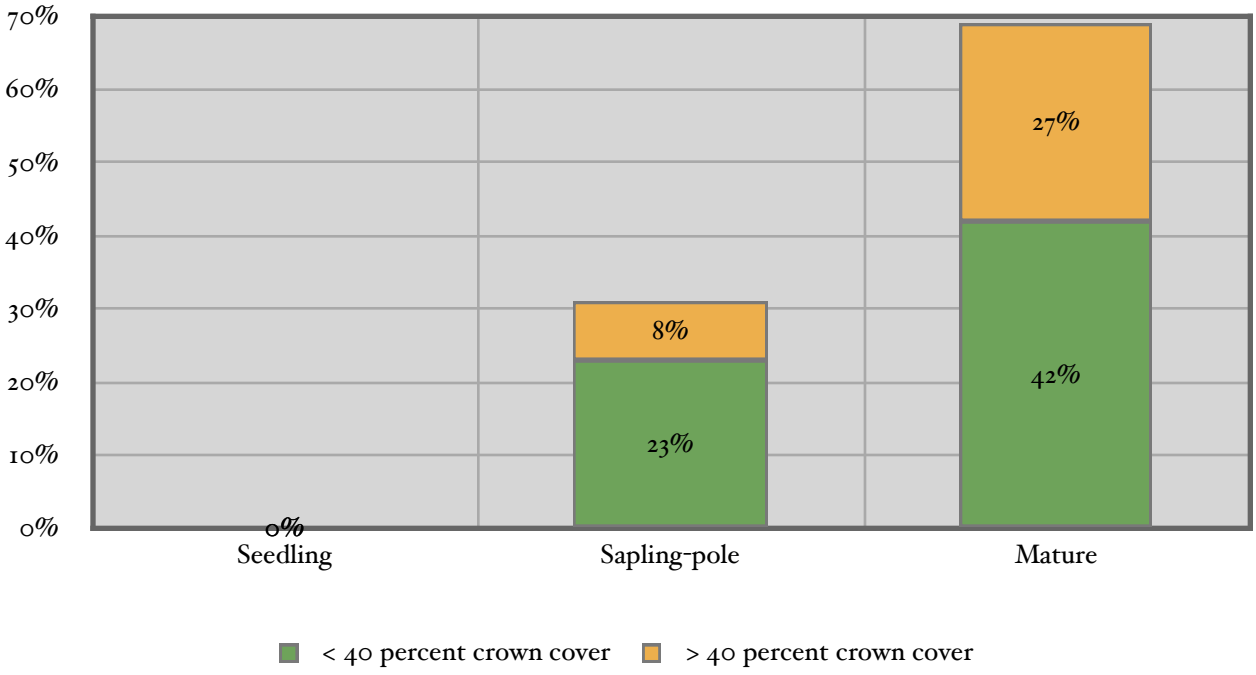
Ponderosa pine is one of the most common forest types of the montane zone. Ponderosa pine is a fire-adapted species and has many fire-resistant characteristics. Pole-sized and bigger trees are temperature resistant due to thick bark and the tendency for the meristems to be shielded by needles and thick bud scales. These features help trees survive the heat of wildfires. Ponderosa pine seedling establishment is favored when ground fires remove the forest floor litter and expose mineral soil. However, for successful natural regeneration, a good seed crop and ample moisture the spring following seed fall are also needed.

Prior to active fire suppression in the region, fire return intervals for this cover type were likely five to fifty years. Fires within this type were both low severity surface fires as well as mixed severity fires (see Table 4). Reoccurring surface fires would have helped to maintain open stand conditions by limiting the growth of understory trees and vegetation. Mixed severity fires would have resulted in some areas of crown torching intermixed with ground fire. This type of burn would have created openings and areas of new pine regeneration. These historic fires resulted in maintaining a variety of stand conditions across the landscape. Very open stand conditions would have characterized the lower elevation ponderosa pine and a mosaic of stand ages and densities would have prevailed at higher more mesic sites. The open and variable stand

conditions would have helped to reduce the occurrence of large wind driven crown fires, particularly in the lower montane zone and lower ecotone.

Figure 7 displays the habitat structural stages for the ponderosa pine stands in the lower ecotone and lower montane zones of the East-Central Wet Mountains Project Area. Habitat structural stage is a way of describing the successional stage of forest stands based on tree size and crown cover. The seedling-shrub stage describes areas that are predominantly shrub or tree seedlings. Sapling-pole stands are forest stands that are dominated by small to medium sized trees ranging from 1 to 9 inches dbh. Mature stands are forest stands composed of older trees that are generally 9 inches dbh or bigger. Crown cover is used to describe stand density or how open or closed the tree crowns are within a stand. The total crown closure of an area cannot exceed 100 percent. 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 densities may have characterized some ponderosa pine stands in the upper montane.

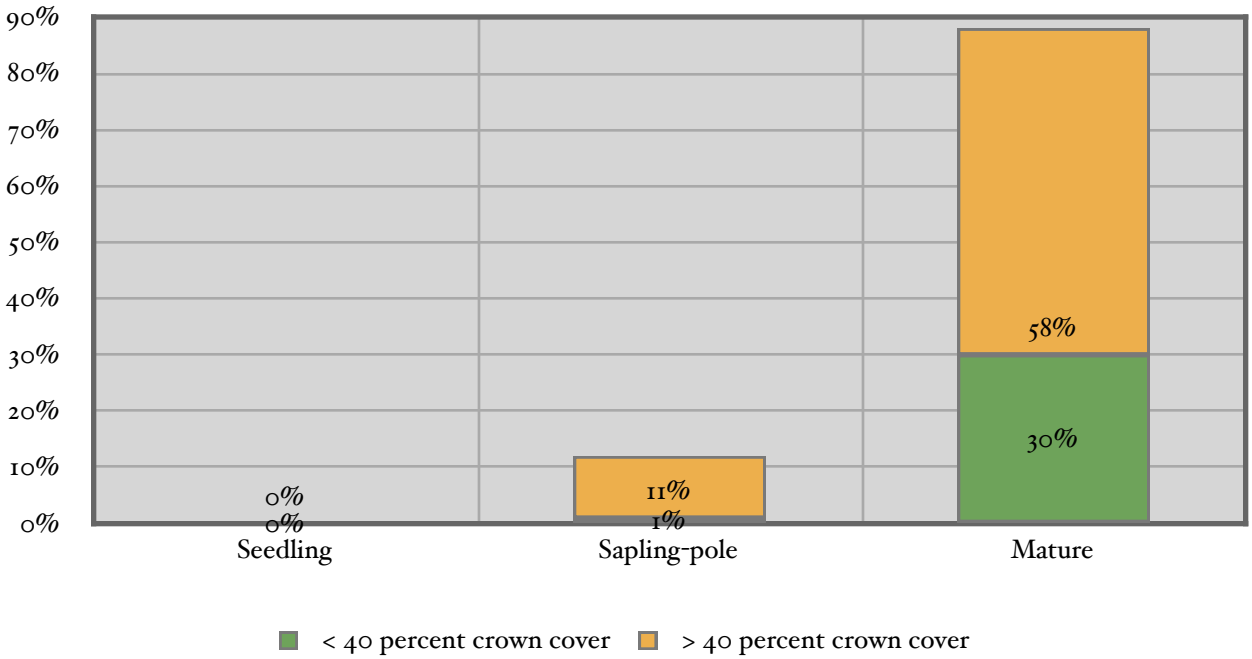
Figure 7. Ponderosa Pine Habitat Structural Stages – Lower Ecotone and Lower Montane Zone



Ponderosa pine stands within the lower montane zone and the lower ecotone of the East-Central Wet Mountains Project Area are predominately mature but sapling-pole sized stands are also present. No areas with established seedlings were identified. However, it is likely that pine seedlings are present within some of the older structural stages. Most of the ponderosa pine stands at these lower elevations have crown covers of less than 40 percent.

Figure 8 displays the structural stages for the ponderosa pine stands in the upper montane zone of the East-Central Wet Mountains Project Area. As would be expected, a greater proportion of these stands have crown covers greater than 40 percent. These stands would generally have additional moisture and better growing conditions than those at lower elevations where drier conditions prevail. These higher elevation pine stands in the East-Central Wet Mountains Project Area are predominately older mature stands.

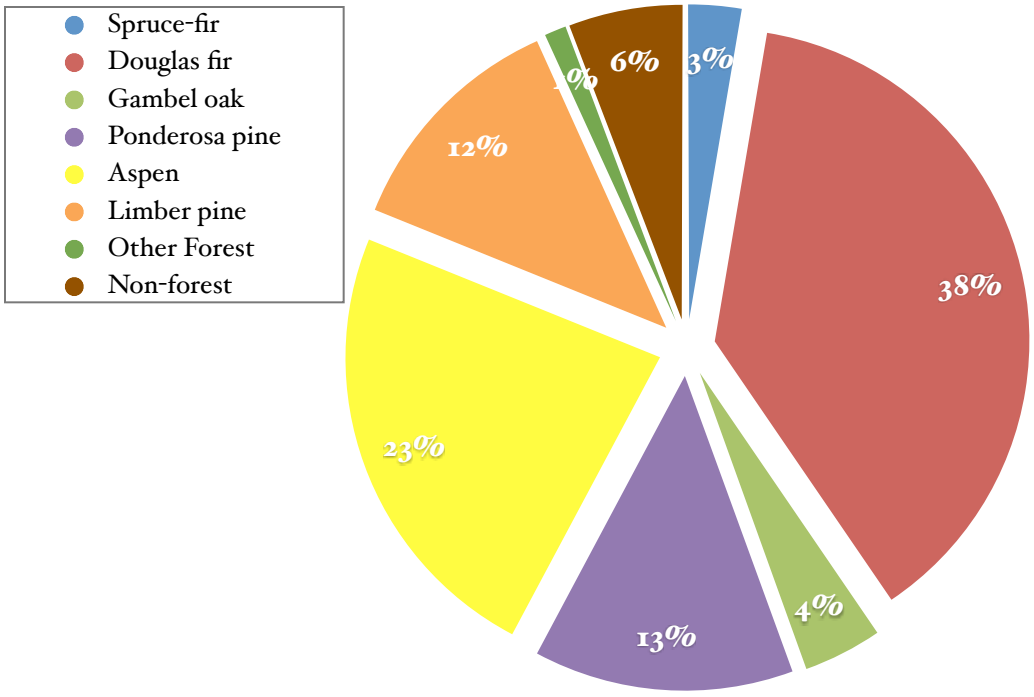
Figure 8. Ponderosa Pine Habitat Structural Stages – Upper Montane Zone



While there is some variety of structural stages within the ponderosa cover type in the East-Central Wet Mountains Project Area, the historic landscape most likely would have had a greater proportion of area with less than 40 percent crown cover and more openings, particularly at the lower elevations. The denser ponderosa pine stands found within the East-Central Wet Mountains Project Area create conditions suitable for large stand replacing fires to occur. Denser canopies with smaller 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 2001a).

Figure 9 displays the vegetation found in the East-Central Wet Mountains Project Area in the upper montane zone. While ponderosa pine is still a common forest type at this elevation, Douglas fir and Aspen are the dominant forest types in this zone. Limber pine also becomes more abundant in the upper montane. The cover types displayed are named for the dominant tree species found within the stand; however many of these forest stands have other tree species present. This shift in species composition reflects the increased precipitation and generally cooler temperatures found in the upper montane. Gambel oak is better adapted to the xeric slopes of the lower montane while limber pine is adapted to the cooler environments found at higher elevations. Aspen is also better suited for the more moist sites that are more abundant in the upper montane.

Figure 9. Cover Types of the Upper Montane (8,500-9,500')



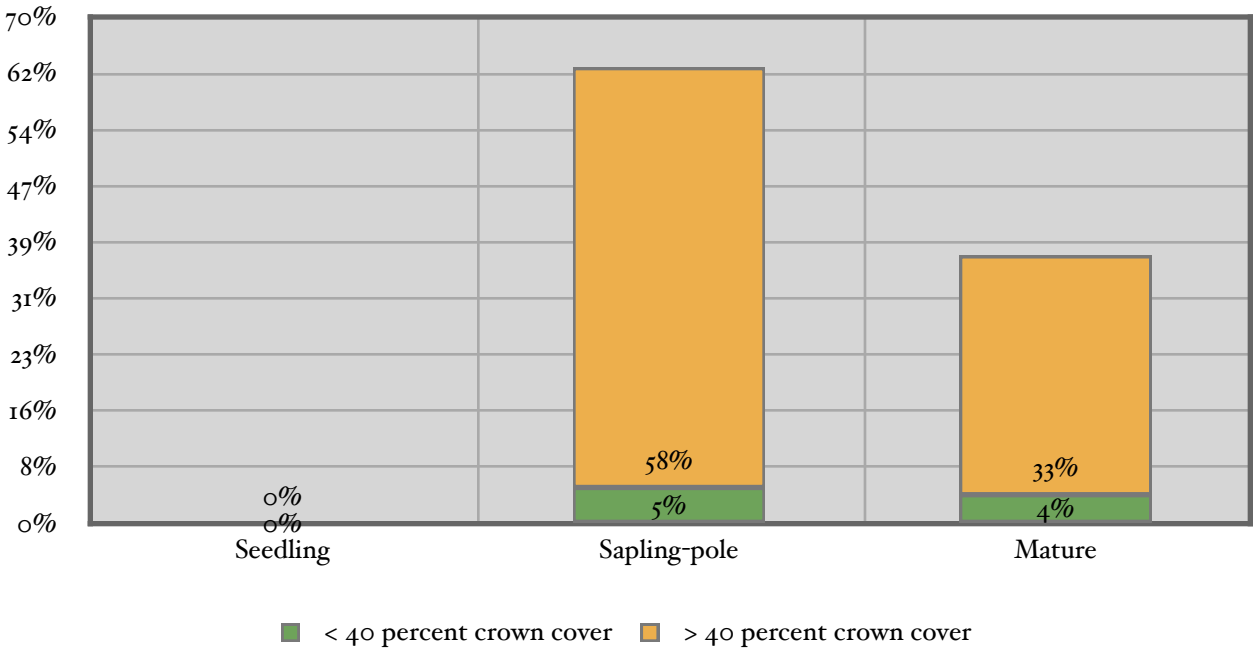
Aspen

Aspen provides many benefits to the landscape, including natural fuel breaks, species diversity and important wildlife habitat. The aspen cover type is common both in the upper montane and subalpine zones of the East-Central Wet Mountains Project Area. This species is adapted to a wide range of habitats from relatively xeric sites at lower elevations to more mesic sites at higher elevations. Aspen primarily regenerates from sprouts that arise from long lateral roots often in response to disturbances such as fire or logging. This ability to sprout after fire enables this species to dominate sites following fire. Aspen 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. 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).

In the East-Central Wet Mountains Project Area, aspen in the montane zone 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. Figure 10 displays the habitat structural stages for the aspen stands in the montane zone of the East-Central Wet Mountains Project Area. These stands are predominantly sapling-pole size stands. No areas of seedlings occur. Because aspen generally regenerate by sprouting, they can grow rapidly from the seedling stage into the sapling stage following disturbance. If an aspen clone is healthy prior to disturbance,

the established root system enables the new sprouts to flourish by providing ample nutrients and water. This is very different from most conifers which regenerate from seed and must first establish a root system and therefore may remain as small seedlings for a longer period of time. However, if an aspen clone is under stress either from competition from conifers or from insect and disease infestation, if may be less able to re-sprout and produce a vigorous growing younger stand.

Figure 10. Aspen Habitat Structural Stages – Montane Zone



In the subalpine zone the aspen cover type is adjacent to limber pine and spruce-fir stands. These areas would have much longer fire return intervals historically and are likely similar to what would have developed under the historic disturbance regimes. Like the aspen stands in the montane zone, these stands are predominantly sapling-pole sized stands (Figure 11).

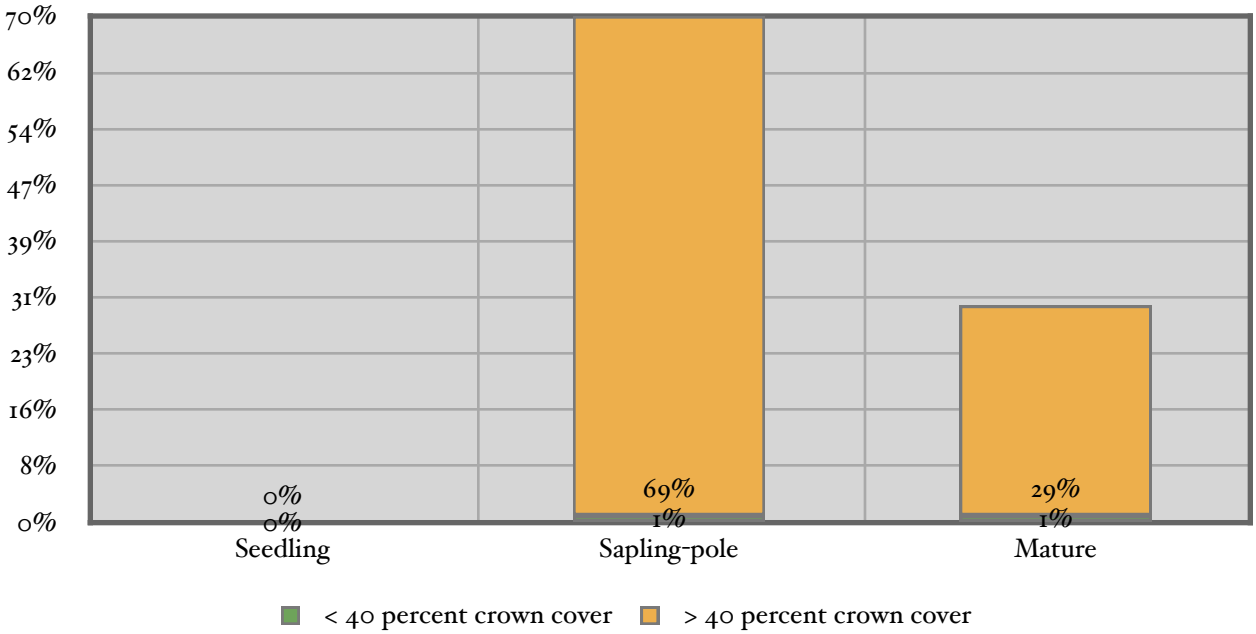
Many of the aspen stands in the East-Central Wet Mountains Project Area have an established conifer component which over time will overtop and shade out the aspen. Other aspen stands have been weakened by sudden aspen decline, these conditions can result in a reduced ability for these stands to thrive and regenerate.

Douglas fir

Large areas of pure Douglas fir are common on the Pike-San Isabel National Forest (Veblen and Donnegan, 2005). However, in the upper montane and on north slopes of the lower montane this species often co-occurs with ponderosa pine and white fir. As with ponderosa pine, mature Douglas fir trees have thick fire resistant bark but seedling and sapling sized trees are easily killed by fire. Where Douglas fir and ponderosa pine occur together in the upper montane, Douglas fir tends to eventually replace ponderosa pine in the absence of

disturbance because it is more tolerant of shaded conditions. Douglas fir may also occur in mixed stands with limber pine especially on rocky, xeric sites in the upper montane.

Figure 11. Aspen Habitat Structural Stages – Subalpine Zone

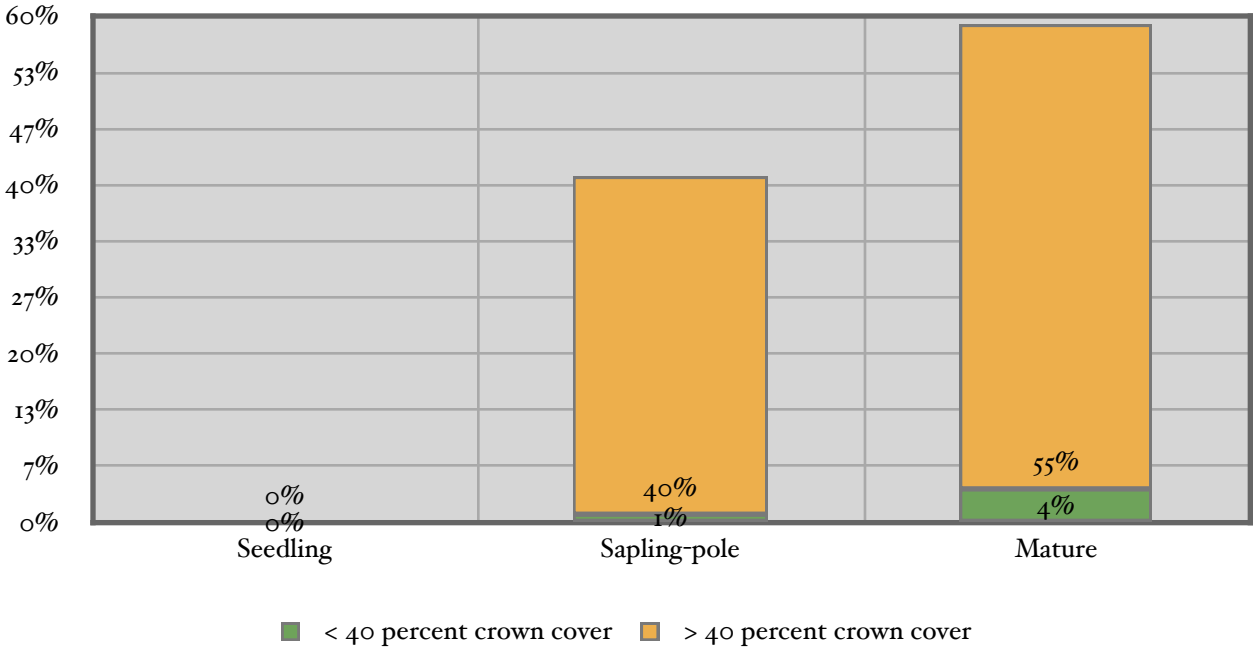


Limber Pine

Limber pine is found within mixed conifer stands in the upper montane and the spruce fir communities of the subalpine zone. Limber pine is relatively intolerant of shade and is seral to most of its associated trees. On most forest sites, limber pine acts as a pioneer species following fire. However, on severe sites where trees remain widely spaced, limber pine may co-dominate with bristlecone pine or Douglas fir. Limber pine may dominate on dry, rocky, windswept sites where it may persist for centuries. Fire can easily kill young limber pines because of their thin bark. Larger trees are able to survive low severity ground fires.

Figure 12 displays the habitat structural stages and crown cover for the mixed conifer forests of the montane zone in the East-Central Wet Mountains Project Area. Mixed conifer areas generally include mixtures of Douglas-fir, white fir, limber pine and some ponderosa pine. These mixed conifer stands include stands within the Douglas fir, white fir, limber pine and blue spruce cover types. Currently there is slightly more area within the mature stage than the sapling-pole stage. Ninety-five percent of the mixed conifer area has a crown cover greater than forty percent.

Figure 12. Mixed Conifer Habitat Structural Stages – Montane Zone

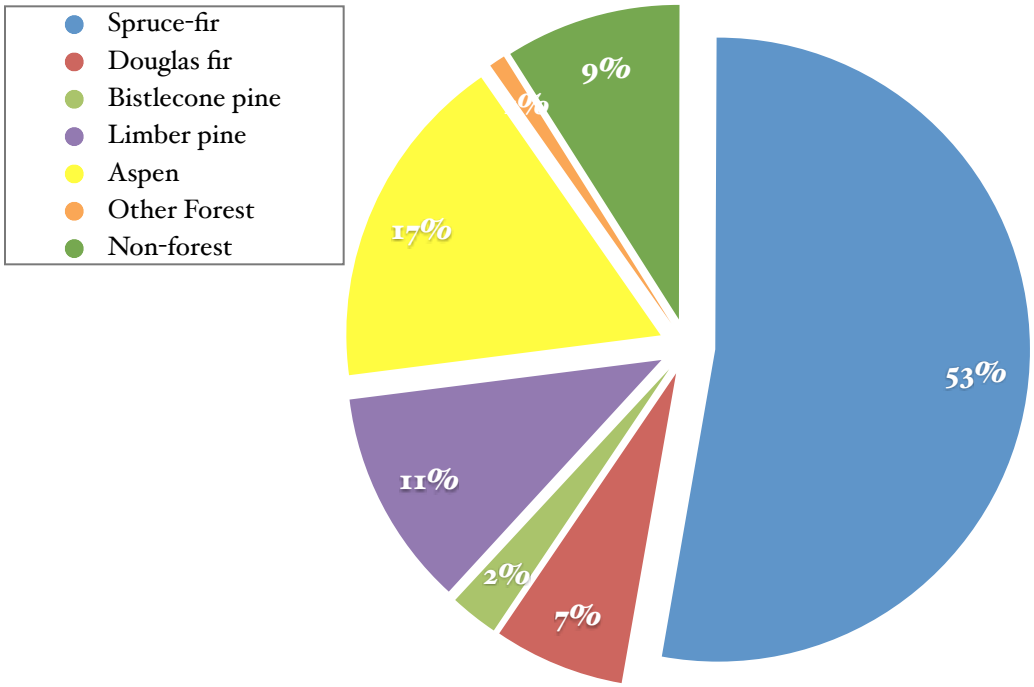


Historically, the disturbance regime for mixed conifer stands of the area was mixed-severity fires with a fire recurrence interval of 30-100 years (Crane 1982). Therefore, a mosaic of conditions composed of structural stages ranging from young to old trees was typical of the mixed conifer areas of the 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 East-Central Wet Mountains Project Area today have higher densities (crown cover) than would have existed under the historic disturbance regimes.

Forest Vegetation of the Subalpine Zone

Thirty percent of the East-Central Wet Mountains Project Area is within the subalpine vegetation zone. The subalpine zone is typically dominated by tree species that are adapted to cooler environments and a shorter growing season found at the higher elevations. The subalpine forests of the East-Central Wet Mountains are predominately Engelmann spruce and subalpine fir, aspen, and limber pine. Douglas fir and Bristlecone pine stands are also found within this zone.

Figure 13. Cover Types of the Subalpine Zone (9,500-11,500')



The subalpine forest of the East-Central Wet Mountains Project Area appears to be what would have been expected under the historic disturbance regimes. The area is characterized by large areas of spruce-fir forest with smaller amounts of aspen and limber pine. Historically fire was a major disturbance factor within the subalpine forest although, windthrow and insect outbreaks also contributed to disturbance patterns. Fires in the subalpine zone appear to have been less frequent and more catastrophic than at lower elevations. A typical fire pattern would be a stand-replacing crown fire that caused extensive mortality followed by a long (up to 300 or more years) fire-free period. This would result in the establishment of even aged lodgepole pine or aspen stands which are able to quickly establish after intense burns. Other areas would have been re-colonized by a mixture of Engelmann spruce, aspen and lodgepole and some of the more exposed sites would have been re-vegetated by limber pine. Eventually Engelmann spruce and subalpine fir would become established as an understory and eventual climax species on many of these subalpine sites.

3.1.2 Forest Vegetation Environmental Consequences

This section describes the effects of Alternative A (No Action) and Alternative B (Proposed Action) on the forest vegetation of the East-Central Wet Mountains Project Area. The analysis concentrates on the potential effects of the alternatives on forest structure. Forest structural stages and crown cover (stand density) are used to assess the potential effects on forest structure. The effects on insect and disease occurrence are assessed by comparing the post treatment stand characteristics to characteristics of high risk stands. The discussion of the direct and indirect effects concentrates on the effects on the forest stands within the treatment areas. The cumulative effects assessment includes the whole East-Central Wet Mountains Project Area.

Effects Common to All Alternatives

Under both Alternative A (No Action) and Alternative B (Proposed Action) there would be large proportions of the forest that would not be treated. These untreated stands would include the forests within the 2001 inventoried roadless areas, forests on steep slopes, areas set aside to meet 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 (see discussion below).

Alternative A (No Action) - Direct and Indirect Effects

Alternative A (No Action) would have no direct short term effect on the forest structure of the East-Central Wet Mountains 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.

Piñon-Juniper

The piñon-juniper woodlands in the East-Central Wet Mountains Project Area have been expanding into grasslands and have become more decadent with the advent of fire suppression. The piñon-juniper woodlands in the area have become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. Under Alternative A, this cover type would continue to encroach in to adjacent grasslands reducing the amount of forage available to wildlife and livestock.

Upland Shrublands

Most of the upland shrub communities in the priority treatment area have become more decadent over time in the absence of fire. Gamble oak is the primary species within these communities. Gamble 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 hotter wildfires due to greater volumes of woody fuels.

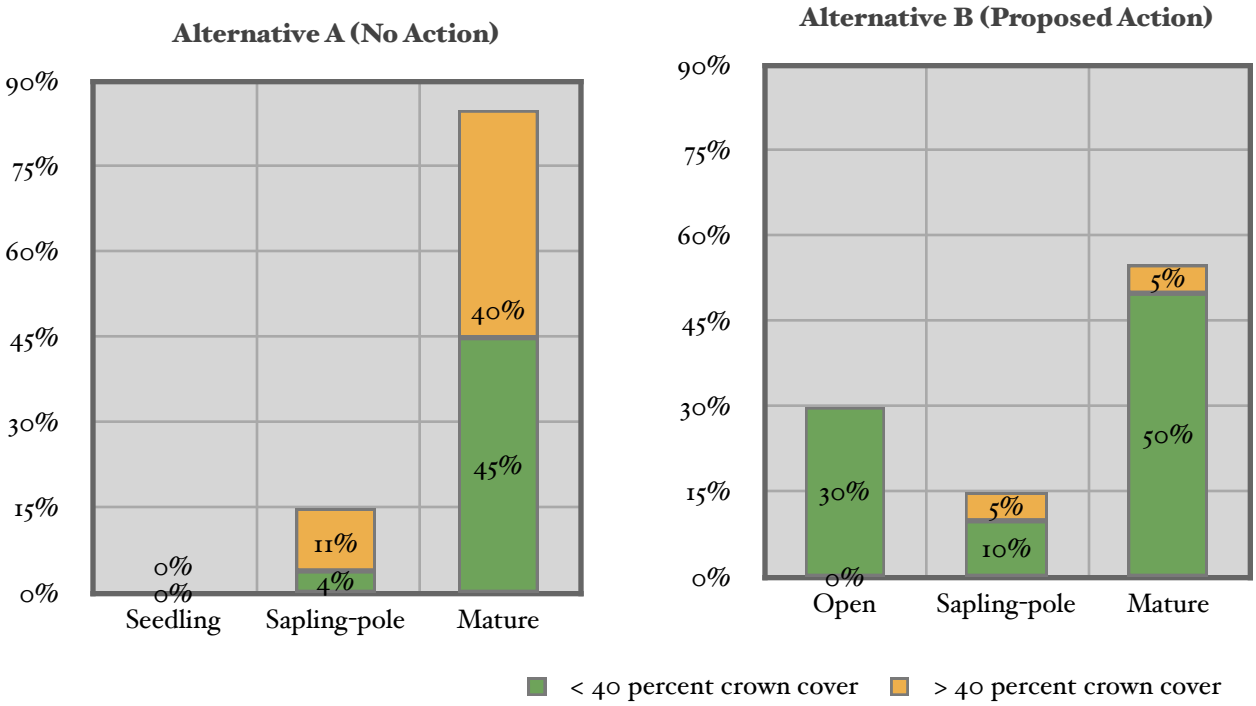
Aspen

Under Alternative A (No Action) the amount of aspen cover type within the East-Central Wet Mountains Project Area would likely decline over time. Many of the aspen stands in the area have an established conifer component. In the absence of fire or conifer removal, these sites are in the process of converting to conifers as the aspen is being shaded out and no new sprouts are being 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.

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. Figure 14 displays the current structure of these dry site stands within the priority treatment area. In the absence of disturbance more of this area would progress to the mature stage and develop a crown cover of greater than forty percent. Openings would 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. 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 more competition for site resources. This additional stress can make these stands more susceptible to injury from insects, disease, and drought. The amount of Douglas-fir would also increase on some of these sites over time as the more shade tolerant Douglas-fir replaces the ponderosa pine.

Figure 14. Estimated Structural Stages of Dry Ponderosa Pine - Alternative B (Proposed Action)[5]



The potential changes over time within the more mesic ponderosa pine stands would be similar to the dry site pine under the Alternative A (No Action). However, these forest stands would have had more variation under the historic disturbance regimes than was present on the dryer sites. Under Alternative A (No Action),

[5] The structural stage estimates are within the dry ponderosa pine treatment areas only.

younger sapling-pole stands would progress into the mature stage. Without disturbance most of these stands would develop a crown cover over forty percent. Over time these mesic stands would become more homogenous with less variation in density and structural stage. The amount of Douglas-fir would also increase within many of these more mesic stands. It is likely that the more shade-tolerant Douglas-fir would increase over time as it better able to regenerate in more shaded conditions than is ponderosa pine.

The risk of loss due to bark beetles would likely increase within many of the ponderosa pine stands over time as they increase in density and average stand diameter. If the population of mountain pine beetles were to increase in the area, high rates of mortality would be expected within these 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 and white 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. As these stands mature they would become more susceptible to damage caused by Douglas fir beetles.

The Alternative A (No Action) would have no direct effect on the forest structure of the East-Central Wet Mountains Project Area. However, it could have a profound indirect effect on the disturbance regimes of the montane zone. 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 out breaks. This kind 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 contiguous blocks of land in the same 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.

Alternative A (No Action) - Cumulative Effects

This section presents the potential cumulative effects of the past, present and future foreseeable actions in and adjacent to the East-Central Wet Mountains Project Area. The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and ending 10 years into the future. The cumulative effects analysis area includes the East-Central Wet Mountains Project Area.

The existing condition of the vegetation within the East Central Wet Mountains area is largely the result of past and present human activities. The Euro-American settlement of the 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. By the turn of the century much of the original forest vegetation had been altered through mining, timber harvesting, and livestock grazing. 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 than what would have historically existed with more frequent, low-intensity and mixed severity fires.

A couple of recent fires within the East-Central Wet Mountains Project Area have resulted in creating large areas of early successional vegetation. The largest of these fires was the 2005 Mason Gulch fire which burned 11,000 acres in the northeast corner of the East-Central Wet Mountains Project Area. This high intensity fire burned through a part of the lower montane vegetation zone and created large openings and resulted in substantial erosion.

Limited timber harvesting has occurred within the East-Central Wet Mountains Project Area over the past twenty years. These projects have been limited in scope and have affected only a small portion of the forest stands within the East-Central Wet Mountains Project Area. There was more extensive timber harvesting in the spruce-fir forests in the southwestern portion of the East-Central Wet Mountains Project Area beginning in the 1940s and into the early 1990s.

Currently there is a spruce salvage project planned for an area that lies partially within the East-Central Wet Mountains Project Area. The San Carlos Ranger District of the San Isabel National Forest is currently in the planning phase for the Greenhorn Blowdown, Spruce Beetle and Forest Management Project (also known as the Greenhorn Blowdown Project). The Greenhorn Blowdown Project includes some of the southwest flank of the ECWM project East-Central Wet Mountains Project Area and extends south and west across the top of the primary ridgeline of the Wet Mountains.

The purpose of the proposed Greenhorn Blowdown Project is to reduce the adverse effects of an incipient spruce beetle epidemic, create forest conditions less favorable to future beetle infestations and retrieve economic value from forest products. The USDA Forest Service proposes to take advantage of the existing road system on Greenhorn Mountain to salvage trees killed or infested by spruce beetles and those blown down by a 2007 wind event. This proposal is also designed to create conditions less favorable to future spruce beetle infestations in nearby non-impacted stands by reducing the density of live trees, diversifying the stand structure, and initiating seedling regeneration.

The proposed action includes using trap tree techniques to draw spruce beetles away from standing live timber. Thinning, group selection, single-tree selection, shelterwood or patch-cutting methods are proposed to improve overall forest health for the long term. In addition, salvage harvesting is proposed where there are economically viable concentrations of trees that have either been blown down by the wind event; or have been killed by, or are presently infested, with spruce beetles. Approximately 7,000 acres of spruce and aspen forests are proposed for various types of timber management treatments.

Foreseeable future actions within the East-Central Wet Mountains Project Area include fuel hazard reduction treatments initiated under the Community Wildfire Protection Plans (CWPP) that have been developed for communities within the area. Two Community Wildfire Protection Plans (CWPPs) have been prepared that

cover the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects some of which are located within the East-Central Wet Mountains Project Area.

The Pueblo County Community Wildfire Protection Plan (2006) identified the following high priority project:

> The USDA Forest Service would work with the Pueblo County CWPP partners to create shaded fuel breaks approximately 500 feet wide from the centerline of SR 165 on both sides of the highway from Rye to Lake Isabel and along 12-Mile Road (SR 78), where feasible; from Highway 165 to Beulah.

The Custer County Community Wildfire Protection Plan (2007) identified the following high priority projects.

> The USDA Forest Service would work with the Custer County CWPP partners to identify fuel modification projects in the Wet Mountain/San Isabel high-density neighborhood.

Under Alternative A, there would be no additional vegetation treatments on National Forest lands in the East-Central Wet Mountains Project Area. The potential future treatments would only affect a very small portion of the East-Central Wet Mountains Project Area. Even with these on-going and potential future activities, a large portion of the East-Central Wet Mountains 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 East-Central Wet Mountains Project Area under Alternative A, would result in an area dominated by forest stands that are relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

Alternative B (Proposed Action) - Direct and Indirect Effects

A variety of vegetation treatments are proposed under Alternative B (Proposed Action). This alternative would treat up to 18,800 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 East-Central Wet Mountains Project Area.

Piñon-Juniper Woodlands

Under the Alternative B (Proposed Action), up to 400 acres of piñon-juniper woodlands would be treated. Currently these woodlands have become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. Under Alternative B, some of the piñon-juniper trees would be removed to stimulate understory vegetation and reduce crown fuels. This would be accomplished by mechanical treatments of decadent piñon-juniper patches. The treated areas would be converted to grasslands in the short-term. Piñon-juniper would eventually regenerate within the grasslands as young vigorous woodlands. The conditions following mechanical treatment would allow the use of prescribed fire as a tool to reintroduce fire as a disturbance agent.

Upland Shrub Treatment Areas

Under Alternative B (Proposed Action) up to 2,800 acres of upland shrublands would be treated. The objectives of the proposed treatments would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication and/or prescribed fire would be used to thin or remove Gamble oak and other shrub species and to stimulate grass and other ground cover. These treatment areas

would function as fuel breaks. The proposed treatments would promote suckering. Therefore, the treatment area would need periodic maintenance to retain their effectiveness as fuel breaks.

The upland shrub communities, primarily Gamble oak, in the East-Central Wet Mountains Project Area have become more decadent over time. Gamble oak becomes denser as it ages and shades out grasses and other ground cover. As the crowns of the oak brush become larger, the risk of crown fires increases. With treatment, these areas would be more open and likely support a greater variety of vegetation including more grasses and forbs as the overstory shade is reduced and increased sunlight is able to reach the ground vegetation.

Aspen Treatment Areas

Under the Alternative B (Proposed Action) up to 5,300 acres of aspen would be treated. The treated stands would be primarily within the montane vegetation zone where aspen may eventually be replaced by conifers in the absence of fire or other disturbance. Aspen stands affected by SAD are also a priority for treatment. The objective of the proposed treatments within the aspen stands would be to restore the health and vigor of the existing aspen stands and expand their current extent.

The proposed treatments 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. However, aspen clones at lower elevations on dry sites may have a very poor response and may not re-sprout. In these areas, conifers may be removed for fuel reduction purposes and if aspen do not reestablish, they would be planted with conifers. 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.

The 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 fuel breaks, species diversity and important wildlife habitat.

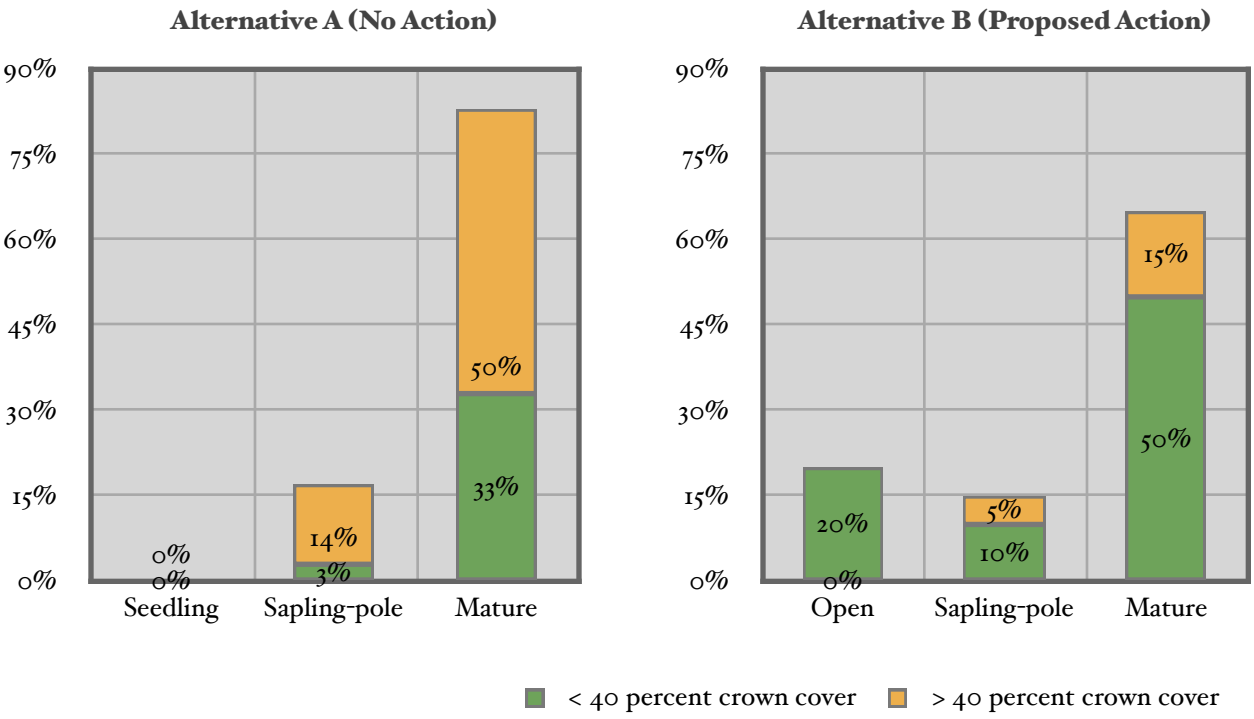
Ponderosa Pine Treatment Areas

Alternative B (Proposed Action) would treat up to 4,300 acres of ponderosa pine; changing the structure of many these montane forest stands. The proposed actions would reduce the density of these stands and create openings ranging from 1 to 40 acres in size. In the thinned areas, smaller understory trees would generally be selected for removal, leaving larger more dominant trees. The exception would be in stands where there are only younger/smaller trees or stands with an overstory infected with mistletoe or bark beetles. In these areas, some of the healthier young trees would be left. The resulting stands would be composed primarily of mature trees with patches of immature trees scattered throughout the area, as well as many large openings. In the forested areas, canopy closure would average 25 to 30 percent. Prescribed burning, which would follow the tree cutting, would remove some of the smaller trees as well as reduce woody fuels. The proposed treatments would create patches of different structural stages in a mosaic pattern across the treated areas.

Figure 14 displays a comparison of the effects of the alternatives on structural stages following implementation of vegetation treatments. Currently 51 percent of the dry site ponderosa have a crown cover greater than 40 percent and there are few openings or seedling dominated stands within these areas (Figure 14). Following the implementation of the proposed treatments up to 30 percent of the treatment area would be maintained in openings and only about ten percent of the area would have a crown cover greater than 40 percent (Figure 14).

The mesic ponderosa pine areas are dominated by closed canopied stands with 64 percent of the priority treatment area having a crown cover of greater than 40 percent (Figure 15). Like the drier sites, there are few openings within the mesic ponderosa pine areas. Following the vegetation treatments proposed under this alternative, about 20 percent of the mesic pine treatment areas would be in openings and 80 percent of the area would have a crown cover of 25 to 30 percent (Figure 15).

Figure 15. Estimated Structural Stages of Mesic Ponderosa Pine - Alternative B (Proposed Action)[6]



The ponderosa pine treatment areas would be converted to open mature and sapling-pole forest interspersed with openings. The ponderosa pine forests in these areas would begin to resemble the historical conditions that were maintained by the natural disturbance regimes that existed prior to European settlement. The open stand conditions in thinned areas 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

[6] The structural stage estimates are within the mesic ponderosa pine treatment areas only.

maintained by discouraging the establishment of understory trees. However, if fire is suppressed and no other means is used to maintain open conditions, stands would eventually grow back to the denser conditions that exist today.

In addition to the change in the overstory vegetation, there would likely be an increase in the diversity of understory plants within many of the treated pine stands due to reduced forest canopy cover and the disturbance caused by tree removal, fuel reduction activities, and prescribed fire. These treatments would open up these stands and result in more sunlight, moisture and nutrients being available for understory plants including 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 within these pine stands would benefit from these treatments.

Mixed Conifer Treatment Areas

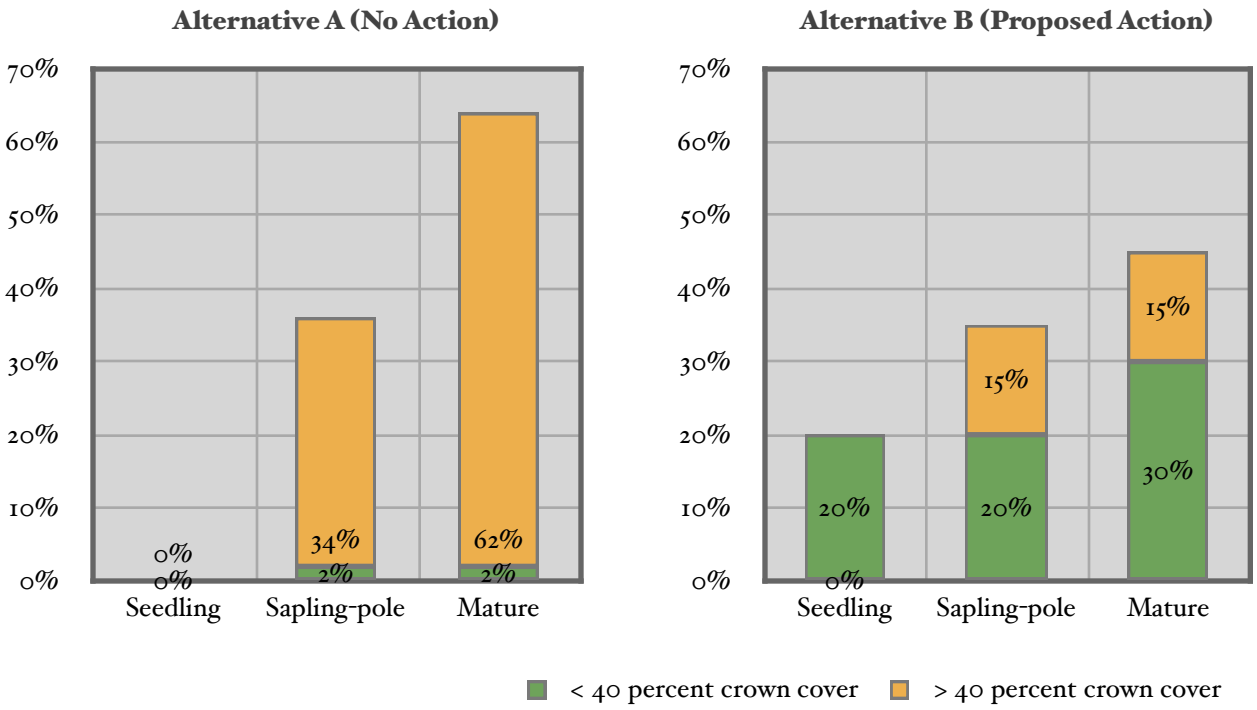
The Alternative B (Proposed Action) includes treating up to 4,000 acres of mixed conifer forest within the montane zone. Some areas would be thinned from below leaving a more or less even-aged stands of the larger cohorts. The larger trees would be retained within these thinned areas and the more flammable understory trees would be removed. Residual stand basal areas would range from 60 to 100 square feet per acre. 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 1 to 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.

Figure 16 displays a comparison of the effects of the alternatives on mixed conifer structural stages following implementation of vegetation treatments. Currently 96 percent of the mixed conifer treatment areas have a crown cover greater than 40 percent and there are no new stands (seedlings) that have been recently established (see Figure 16). Following the implementation of the proposed treatments, up to 20 percent of the mixed conifer area would be opened up and new regeneration encouraged and only about 30 percent of the area would have a crown cover greater than 40 percent. The result of these proposed treatments would be to increase the age and spatial diversity of the mixed conifer stands within the treatment areas.

Fuel Breaks

Up to 2,000 acres of forest would be treated to create fuel breaks under the Alternative B (Proposed Action). These fuel breaks would be located in areas where other vegetation treatments are not prescribed. Some of these treatments would be within the subalpine zone. A fuel break is a gap in forest vegetation or other forest fuels. The main goal of these fuel breaks 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. Fuel breaks are commonly placed on the National Forest side of public and private land boundaries. Fuel breaks are intended to serve as places that fire can effectively be fought from.

Figure 16. Estimated Structural Stages of Mixed Conifer - Alternative B (Proposed Action)[7]



Fuel Breaks would be created and maintained at strategic locations throughout the East-Central Wet Mountains Project Area. The fuel breaks would likely be located where natural features, such as ridge tops, or manmade features, such as roads, would increase their effectiveness. The activities required to construct a fuel break would vary depending on the existing conditions, but would likely include thinning and prescribed fire. These activities would create and maintain open conditions.

The effects of these fuel breaks would be similar to those discussed above for the mixed conifer and ponderosa pine treatments. Like the openings within the ponderosa pine treatments, these fuel breaks would be maintained through periodic prescribed fire or mechanical treatments that would maintain the open forest conditions. These open forest conditions are not typical of what would have developed within the spruce fir communities of the subalpine zone under historic conditions. These forests historically developed under a disturbance regime of infrequent high severity fires. These proposed fuel breaks may result in uncharacteristic conditions within these stand types. However, only a small fraction of the subalpine zone would be affected.

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 bark 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

[7] The changes are within the mixed conifer treatment areas only.

due to lower stand densities, and the larger number of openings. Over time as the trees within the thinned areas grow, stand densities would increase as would average diameters. Given enough time, these stands would once 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 for two to three years following treatment.

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 area on the composition and condition of the forest vegetation of the East-Central Wet Mountains Project Area. The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and ending 10 years into the future. The cumulative effects analysis area includes all lands within the East-Central Wet Mountains Project Area.

The existing condition of the vegetation within the East-Central Wet Mountains Project Area is largely the result of past and present human activities within the area. Large changes to the forest took place with the settlement of the area in the mid to late 1800s. This period of intensive logging and wildfires was followed by a period of fire suppression and reduced logging. In more recent years, vegetation treatments have been limited in scope and area.

The current and future foreseeable actions are described in *Alternative A (No Action) - Cumulative Effects* above. The proposed actions under Alternative B (Proposed Action) in combination with these more recent and future foreseeable vegetation treatments in surrounding areas would have a cumulative effect on the forest structure of the East-Central Wet Mountains Project Area.

The treatment areas proposed for the East-Central Wet Mountains Project Area represent about 25 percent of the montane within the East-Central Wet Mountains Project Area and they account for only 17 percent of the entire East-Central Wet Mountains Project Area. The proposed action as well as potential future treatments in adjacent areas would have a positive cumulative effect on the forest vegetation of the area. These treatments would reduce the risk of a wildfire or beetle infestation developing in the area that could spread to the forest stands within the untreated proportions of East-Central Wet Mountains Project Area. However, even with the amount of treatment proposed under Alternative B (Proposed Action), there would still be a large area of untreated montane forest within the 2001 inventoried roadless areas. Stands within these areas would still pose an increased risk of widespread damage by wildfire and/or insect and disease infestations.

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) has further refined this list, to include only those species with the potential to occur within its administrative boundaries. 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 East-Central Wet Mountains Project Area. Based on review of the list and research of other records (e.g., Colorado Natural Heritage Program 2009), it was determined that the habitat in the East-Central Wet Mountains Project Area could be suitable for two sensitive plant species (Table 5).

Table 5. Federally listed and Regional Forester Sensitive Species (RFSS) plants

Scientific name **Common name**	**Habitat**	**Status**	**Species present?**	**Habitat present?**
Cypripedium parviflorum Lesser yellow-lady's-slipper	Montane; moist forest, aspen groves; 7500-9000 feet.	RFSS	No	Yes
Viola selkirkii Selkirk's violet	Montane; cold mountain forests; 7000-9000 feet.	RFSS	No	Yes

Rare plant species habitats within the East-Central Wet Mountains Project Area were identified using the state heritage database records and USDA Forest Service vegetation data. Species habitat preferences are based on CNHP data for "S" level precision, i.e. locations mapped with second accuracy (within three arc seconds of latitude and longitude). This approach provides a reasonable level of confidence in determining site conditions where plants occur. While species may occur on other substrates or cover types, data suggests logical places to prioritize searches for additional occurrences. Should other occurrences be found having conditions different from those predicted, that information will be added to species analysis. These data were used to avoid effects on threatened and endangered plant species in the project design.

The USDI Fish and Wildlife Service (USFWS) has identified two federally listed species as having part of their range on the Pike and San Isabel National Forest. These species are the threatened Penland's alpine fen mustard (*Eutrema penlandii*) and the threatened Diluvium ladies' tresses (*Spiranthes diluvialis*). There are no documented occurrences of, nor habitat for, Penland's alpine fen mustard or diluvium ladies' tresses within the East-Central Wet Mountains Project Area, so the proposed project would have no effect on these species. As a result, consultation with US Fish and Wildlife Service is not required.

Two species on the RFSS list have potential to occur within the proposed East-Central Wet Mountains Project Area, but only one has been documented as occurring there. Other species on the RFSS list were not considered because of the East-Central Wet Mountains Project Area is outside the known range of the species, there is no appropriate habitat in the East-Central Wet Mountains Project Area, or for other reasons stated (Table 5). The effects analysis focused on the two plant species listed in Table 5 and described below.

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 (Spackman et al. 1997). It is most often on cool, shaded, north-facing slopes (Mergen 2006). This species has been found in association with a variety of geological formations including biotitic

gneisses, schist, and migmatite. Locations are known on moist sites in derived from colluvium and residuum. 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 CA, NM, AR, and GA (NatureServe 2009). It has been found in Custer County. Two sites are known on the San Carlos Ranger District (Colorado Natural Heritage Program 2009). Sites for lesser yellow lady's-slipper are within the Wet Mountains. Sites for this plant have been documented in the St. Charles River watershed.

Lesser yellow lady's-slipper is ranked G5 by NatureServe (2009). It is tracked by the Colorado Natural Heritage Program and is ranked S2. Threats include timber harvest operations and invasive species. Lesser yellow-lady's-slipper may also respond favorably to light disturbances.

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. Rocks underlying the local site are mapped as felsic and hornblendic gneisses. Soils are derived from residuum. Elevations range from 8,500 to 9,100 feet (Spackman et al. 1997).

Selkirk's violet ranges from BC to Greenland, south to WA and NM. Distribution in CO includes a site along Newlin Creek on the San Carlos Ranger District (Colorado Natural Heritage Program 2009). Selkirk's violet is ranked as G5 by NatureServe (2009). It is tracked by the Colorado Natural Heritage Program and is ranked S1. The Colorado populations of Selkirk's violet are disjunct from the greater range of the species.

Habitat within the East-Central Wet Mountains Project Area for lesser yellow lady's-slipper and Selkirk's violet occurs near small perennial streams. Habitat characteristics appropriate for both of these species occur, and both are known within watersheds partly within the East-Central Wet Mountains Project Area. Forest Plan standards and guidelines and best management practices protect streamside habitats from most adverse impacts. Habitat in the treatment areas is generally appropriate for the occurrence of these species, but there are no known individuals present. Yellow lady's-slipper habitat is more widespread in the East-Central Wet Mountains 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.

3.1.4 Special Status Plants Environmental Consequences

Alternative A (No Action) - Direct and Indirect Effects

Alternative A (No Action) would have no direct effects on the sensitive plants in the East-Central Wet Mountains 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. In the event of a wide outbreak of beetle infestation, the resulting more open canopy conditions could alter habitat conditions for yellow lady's-slipper and Selkirk's violet. These more open conditions could lead to a decline in habitat quality and loss of individuals through declines in growing conditions from reduced shading. Loss of tree canopy cover would continue in some areas due to the effects of insects and disease. At the same time, habitat conditions could decline with increased competition several species of noxious weeds.

Alternative A (No Action) may also improve conditions for yellow lady's-slipper by allowing more light to the forest floor from the decline of spruce stands in the area. At the same time, dying trees would increase the accumulation of fuels and increase the chance of severe wildfires leading to adverse changes in habitat conditions for both the slippers and the violets.

Alternative A (No Action) - Cumulative Effects

Under Alternative A (No Action), there would be no additional vegetation treatments on NFS lands in the East-Central Wet Mountains Project Area. While the recent and on-going vegetation treatments on private lands within the East-Central Wet Mountains Project Area would help to reduce stand densities and create a more diverse landscape, NFS lands account for more than 80 percent of the area. Without any treatments on these lands, a large portion of the area would be characterized by relatively dense stands of ponderosa pine and mixed conifer. The increased risk of intense wildfire could result in an intense wildfire that could negatively impact all species by reducing habitat quantity or quality. The cumulative effect of the past, present, and reasonably foreseeable future actions on the condition of the forest vegetation in the East-Central Wet Mountains Project Area under Alternative A would be dominated by forest stands that are generally healthy but relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

Alternative B (Proposed Action) - Direct and Indirect Effects

There are no known occurrences of federally listed threatened, endangered, or proposed plant species in the East-Central Wet Mountains Project Area. There is also no known habitat, including proposed or designated critical habitat, for any of these species in the East-Central Wet Mountains Project Area. For these reasons, there will be no effect to any federally listed threatened, endangered, or proposed species. The action would not destroy or adversely modify any proposed or designated critical habitat. Because there are no known occurrences of, and no habitat for, Penland's alpine fen mustard or diluvium ladies' tresses in or near the East-Central Wet Mountains Project Area, the proposed project would have no effect (direct, indirect, or cumulative) on these species.

Untreated portions of the East-Central Wet Mountains Project Area would be on an ecological pathway essentially the same as in Alternative A (No Action). Several activities associated with vegetation treatment operations could impact habitat for sensitive plants. Timber harvest and skidding may cause: light to heavy soil disturbance; removal of the soil A-horizon; incidental to heavy soil compaction; disturbance or removal of the sites' herbaceous vegetation and shrubs; alter local hydrology; increase the likelihood of non-native invasive plants and their subsequent treatment; and seeding of soil stabilizing non-native plants. Sensitive plants would probably benefit from nutrient release from prescribed burning, and from reduced shading from understory trees and shrubs.

Vegetation treatment operations can cause light to moderate ground disturbances and soil removal. These operations would disturb or compact soils in the areas where skid trails and temporary roads are used. It is anticipated that this could account for as much as 15 percent of the landscape in the treatment areas. This could dislodge herbaceous plants, including lesser yellow lady's-slipper and Selkirk's violet, and break stems of shrubs where the actions occur. The amount of disturbance to the soils and plants would vary considerably. Areas at the distant ends of skid trails would receive the least damage, while log landings would receive the

most. Plants in the less disturbed sites would less likely to be severely damaged because the degree of initial disturbance was lower. These plants would then be able to recover quickly. Where there are more disturbances, plants that would be naturally recovering would receive additional stress, and some may not survive.

Noxious weed invasion potentially poses a negative impact to all plant habitats. These potential effects result from removal of vegetation and opening up the area to additional light. 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.

Alternative B (Proposed Action) - Cumulative Effects

There will be continued maintenance of existing Forest roads and trails in the East-Central Wet Mountains Project Area. Other roads will be maintained by the state, county, and by private individuals. Development will continue to occur on private land in the area. Concurrent with these will be the likely increase in traffic on roads in the vicinity. Dispersed recreation use will also continue on NFS lands.

Presently, a categorical exclusion and decision memo (CE/DM) has been completed addressing salvaging windthrown and damaged trees along the Greenhorn Road and other NFS roads and trails. Activities authorized by this 2007 CE/DM will continue, and may be concurrent with this proposed action.

Nearly all the forested lands within the East-Central Wet Mountains Project Area have had one or more timber harvest treatments within the past 50 years. The 1960s and 1970s witnessed extensive logging and road construction activities in the Greenhorn area. Some of the more recent timber harvesting treatments occurred on the north flanks of Deer Peak during the early 1990s and in the upper Williams Creek drainage during the late 1990s.

The proposed vegetation treatment operations and prescribed fire treatments in the East-Central Wet Mountains Project Area total about 18,800 acres. The proposed maximum treatment area accounts for less than five percent of the San Carlos Ranger District. The design features (see *2.4 Design Features)* would minimize impacts to sensitive plants. No adverse cumulative effects are expected.

3.2 Fire-Fuels/Air Quality

This section is divided into two; wildfire hazard and fuels, and air quality. The discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Fire-Fuels Specialist Report (JW Associates 2010b) and the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Air Quality Specialist Report (JW Associates 2010c).

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. As suppression actions increased, natural recurrent underburning was eliminated. The result has been a transformation of forest stands moving from open park-like areas into more dense stands. Extended human development, fire suppression, prolonged fire exclusion, and climate changes have created over-accumulated vegetative conditions in these fire-adapted ecosystems that predispose areas to severe wildfire threats. Historical conditions for the East-Central Wet Mountains Project Area can best be described as areas with wildfires spatially widespread, having significant stand-replacing events. This resulted in a variety of vegetative structures on the landscape. (USDA Forest Service 2001a).

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 from 1000 to 1870. Although there were areas of severe 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 extensive fires because of the distance between tree crowns and the openings (USDA Forest Service 2002a). Smaller fires that did not move into the crowns 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. The smaller fires would also have kept the forest more open by limiting the growth of understory trees.

Fire burning the understory but not harming the large trees in an open ponderosa pine stand in the East-Central Wet Mountains Project Area

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 fires to skip around rather than kill all trees over large areas. 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 extensive 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.

In the subalpine forest, fire would also have been the major disturbance factor; however, windthrow (trees felled or broken off by wind) and insect outbreaks may also have contributed to disturbance patterns. Fires in the subalpine zone appear to have been less frequent and more catastrophic. A typical fire pattern would be a stand-replacing crown fire that caused extensive mortality followed by a long (up to 300 or more years) fire-free period. This would have led to the establishment of large stands of primarily even-aged limber pine with some aspen and spruce; spruce/fir would become established as an understory and eventual climax species.

In the piñon juniper woodlands, fire would have been the major disturbance factor; grazing also played an additional role in reducing the fine fuels needed to carry the more frequent ground fires that were typical of historic conditions. The current piñon juniper woodland has become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. A recent fire in piñon juniper woodlands that destroyed several homes in the area is evidence of these conditions.

Similar to the piñon juniper woodlands, the upland shrub communities have become more decadent over time due to the lack of fire as a disturbance agent. The oak brush becomes denser as it ages and shades out grasses and other ground cover. As the crowns of the oak brush become larger, the risk of crown fires increases. Grazing has also reduced ground cover in this community.

Past Vegetation Management

Early records indicate the East-Central Wet Mountains Project Area was heavily logged during the late 1800s and into the early 1900s. Designated a National Forest in 1905, extensive logging activities, primarily consisted of salvage operations and illegal harvesting occurred during the early years of the forest. USDA Forest Service policy at the time allowed the harvesting of dead trees but those operations raised suspicions, some human caused fires were intentionally set. Much of the ponderosa pine and Douglas fir overstory was removed during this era and in combination with larges wildfires, resulted in very little old growth stands remaining within the montane forests of the East-Central Wet Mountains Project Area today. Large-scale fires were caused by lightning, human carelessness, and as a cover-up for illegal logging operations. Fire suppression has occurred on the forest since its establishments a Forest Reserve in 1902. However, several decades were needed to develop the infrastructure and personnel to effectively suppress fires. These factors have all contributed to the development of a mostly even aged overstory dominating the montane and sub-alpine forest types within the East-Central Wet Mountains Project Area (USDA Forest Service 2008).

During the last decade there have been few vegetative management activities occurring on USDA Forest Service lands in the East-Central Wet Mountains Project Area. This includes timber sales, thinning activities, and/or prescribed fire activity.

Wildland Urban Interface (WUI)

The National Fire Plan, written in 2001, outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration on Federal, State, and private lands. Goals of the National Fire Plan are to prevent loss of life, reduce firefighter injuries, and lessen damage to communities and the environment from severe, unplanned, and unwanted fires. Two of the main priorities of the Plan include targeting funding towards communities that have a Community Wildfire Protection Plan (CWPP) in place and WUI areas with the potential for reduction in high risk (USDA Forest Service 2001a).

The WUI is generally described as the zone where structures and other human developments meet and/or intermingle with undeveloped wildland or vegetative fuels (Preparing a Community Wildfire Protection Plan, A Handbook for Wildland Urban Interface Communities March 2004). There are two CWPPs, one for Custer County and the second for Pueblo County. The Custer County CWPP references WUI areas but does not specify distances for defining the WUI. It is presumed that the WUIs would be defined as meeting the national standard specified in the National Fire Plan. Additionally a major portion of the project is in Wildland Urban Interface (WUI) areas as defined by the Colorado Roadless Final Petition - April 4, 2010 (Final Petition).

The Pueblo County CWPP identifies WUIs as being within 1 mile of all inhabited structures. In both counties, hazardous fuels should be reduced to the point where a high intensity crown fire would not be supported.

In the East-Central Wet Mountains Project Area approximately 18,800 acres are defined as vegetation treatment areas. Within the East-Central Wet Mountains Project Area there are approximately 18,071 acres are identified as WUI and approximately 729 acres are in Non-WUI areas.

Community Wildfire Protection Plans (CWPP)

The Healthy Forest Restoration Act (HFRA) of 2003 emphasizes the role of community planning and offers a variety of benefits to communities with a Community Wildfire Protection Plan (CWPP) including matching federal grants for fuel reduction projects. A CWPP requires approval by local governments, fire authorities, and the state forest management agencies in consultation with federal land management agencies. Within the Wildland Urban Interface (WUI) areas as defined by the Colorado Roadless Final Petition - April 4, 2010 (Final Petition) are the definition for two different levels of Community Protection Zones (CPZs). These CPZs are defined as being:

CPZ1 - ½ mile from at-risk communities

CPZ2 - between ½ and 1-½ miles from at-risk communities

The at-risk communities are defined in section 101 of the Healthy Forest Restoration Act (Pub. L. 108-148). There are two definitions of at-risk communities that apply to this project. The first category is defined as "(i)

an interface community as defined in the notice entitled "Wildland Urban Interface Communities Within the Vicinity of Federal Lands That Are at High Risk From Wildfire" issued by the Secretary of Agriculture and the Secretary of the Interior in accordance with title IV of the Department of the Interior and Related Agencies Appropriations Act, 2001 (114 Stat. 1009) (66 Fed. Reg. 753, January 4, 2001)"

The second criteria is "(ii) a group of homes and other structures with basic infrastructure and services (such as utilities and collectively maintained transportation routes) within or adjacent to Federal land". These at-risk communities were defined using Pueblo and Custer County data on subdivisions. These subdivisions were individually checked to confirm that they fit this definition. Figure 2 shows the at-risk communities with the CPZ1 and CPZ2 areas and Colorado Roadless Areas. There are approximately 1,144 structures within 1½ miles of the East-Central Wet Mountains Project Area.

The Final Petition lists three characteristics for CPZ2s (between ½ and 1 ½ miles from at-risk communities) that those areas need to "exhibit one or more of the following characteristics:"

- Has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community;
- Has a geographic feature that aids in creating an effective fire break, such as a road or a ridge top; or
- Is in condition class 3 as defined by HFRA.

Two Community Wildfire Protection Plans (CWPPs) have been prepared that cover the East-Central Wet Mountains Project Area and are inclusive of CPZs. These CWPPs have identified high priority projects some of which are located within the East-Central Wet Mountains Project Area. These projects would be implemented on National Forest lands to the extent practical and in collaboration with the CWPP partners. In addition to the following projects, critical community infrastructure would be protected within treatment areas in the East-Central Wet Mountains Project Area. Critical community infrastructure would include communications, power lines and water features.

1. The Pueblo County Community Wildfire Protection Plan (2006) identified the following high priority project:

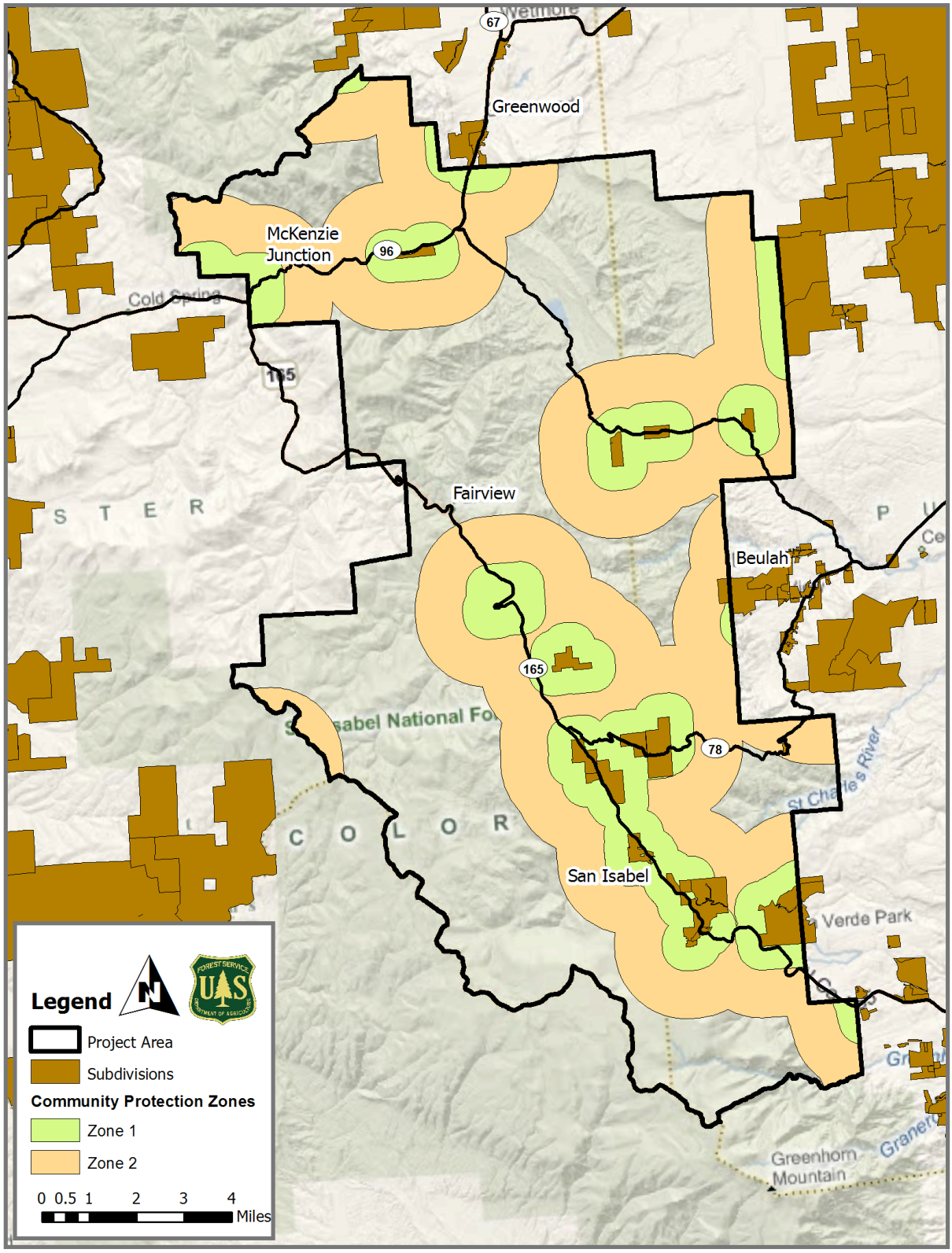
   The USDA Forest Service would work with the Pueblo County CWPP partners to create shaded fuel breaks approximately 500 feet wide from the centerline of SR 165 on both sides of the highway from Rye to Lake Isabel and along 12-Mile Road (SR 78), where feasible; from Highway 165 to Beulah.

2. The Custer County Community Wildfire Protection Plan (2007) identified the following high priority projects:

   The USDA Forest Service would work with the Custer County CWPP partners to identify fuel modification projects in the Wet Mountain/San Isabel high-density neighborhood.

3. The Community Protection Zones (CPZ1 and CPZ2) are shown in Figure 17.

Figure 17. Community Protection Zones for the East-Central Wet Mountains

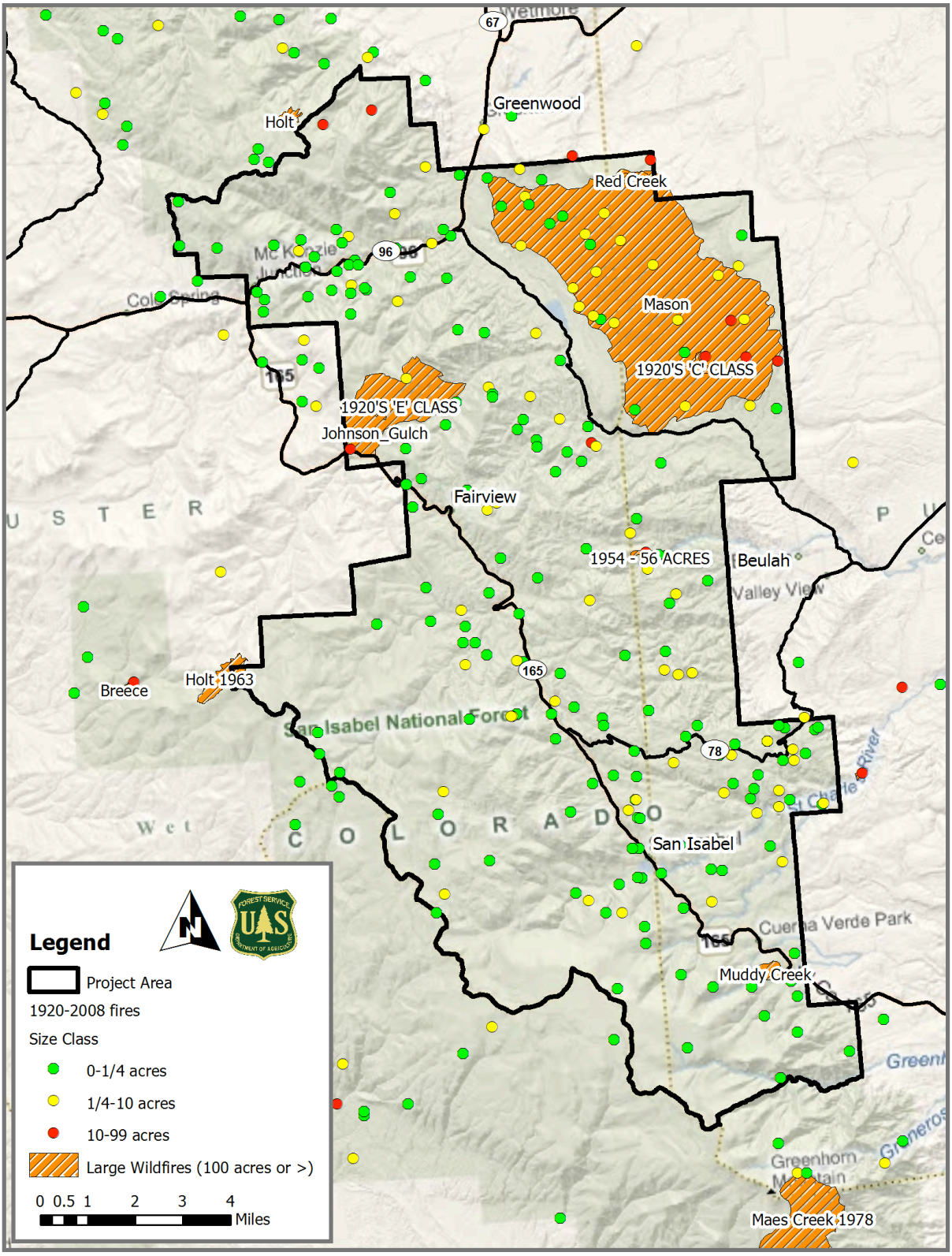


Fire History/Fire Hazard

Fire history is a factor in evaluating fire risk. This information, along with use patterns is helpful in identifying areas with high potential for wildfire ignition. The Fire History map shows the fire occurrence within the East-Central Wet Mountains Project Area over the past 38 years (Figure 18). Within the East-Central Wet Mountains Project Area, 321 wildfires were recorded between 1970 and 2008 averaging approximately 9 fires per year. The majority of these fires (313) were between ¼ acre and 10 acres. Only 8 fires greater than 10 acres were recorded. Of these eight fires, seven ranged between 10 and 150 acres, and the eighth was 11,357 acres. Of these 321 fires, the majority was lightning-caused representing 60 percent of the total number of fires. The size of each fire is determined by several variables related to fire behavior as well as response time and suppression efforts. The fire risk for an area is calculated by incorporating the risk of ignition, values at risk and fire hazard.

The high-intensity Mason Fire of 2005, located within the East-Central Wet Mountains Project Area, burned 11,357 acres and reflects the significance of the consequences from impacts upon not only the vegetative cover but to people and human resources. This fire required the evacuation of thousands of people. The Mason Fire, and the more recent Fourmile Fire of September 2010 that burned approximately 6,200 acres and destroyed 169 structures in the northern Front Range of Colorado, as well as several other recent fires on the Pike and San Isabel National Forests have destroyed homes, infrastructure and other property on private and public lands; seriously 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 have eroded soils, causing flooding, destroyed homes, damaged highways and various other facilities as well as degraded fisheries. Air quality along the Front Range of Colorado with its 3.5 million residents, has been dangerously degraded for days at a time.

Figure 18. East-Central Wet Mountains Project Area Fire History 1970-2008



Fuels Conditions and Measures

Several measures can be used to explain forest condition that relate to fire hazard and threat from crown 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.

Condition Class 1: Forest stands generally produce fires that are low-intensity, low-severity burns that leave the soil intact and functioning normally. These fires generally have little risk, and provide positive benefits to biodiversity, soils, and water quality.

Condition Class 2: Forest stand fires occur when fire return intervals are missed generally due to suppression efforts. During the missed fire return, the understory vegetation continues to grow, and ladder fuels may develop. Fires would burn more intensely when they occur under this condition class, and the impacts on soils, biodiversity, and water quality are more pronounced.

Condition Class 3: Fires are high risk. Due to a continued departure from the forest norms because of a long fire return interval, the forest is full of ladder fuels from dead and down material and precommercial sized trees. When the climatic conditions are suitable, all the fuels are available for immediate consumption, and the fires become severe, high intensity wildland fires. Mortality is usually high throughout all age and stand classes. This condition class is considered high risk or high hazard to life and property and other values at risk due to catastrophic nature of the fire that occurs. This condition class also suffers from the most negative and long-lasting impacts to species, watersheds, and soils after high severity and stand replacing fires.

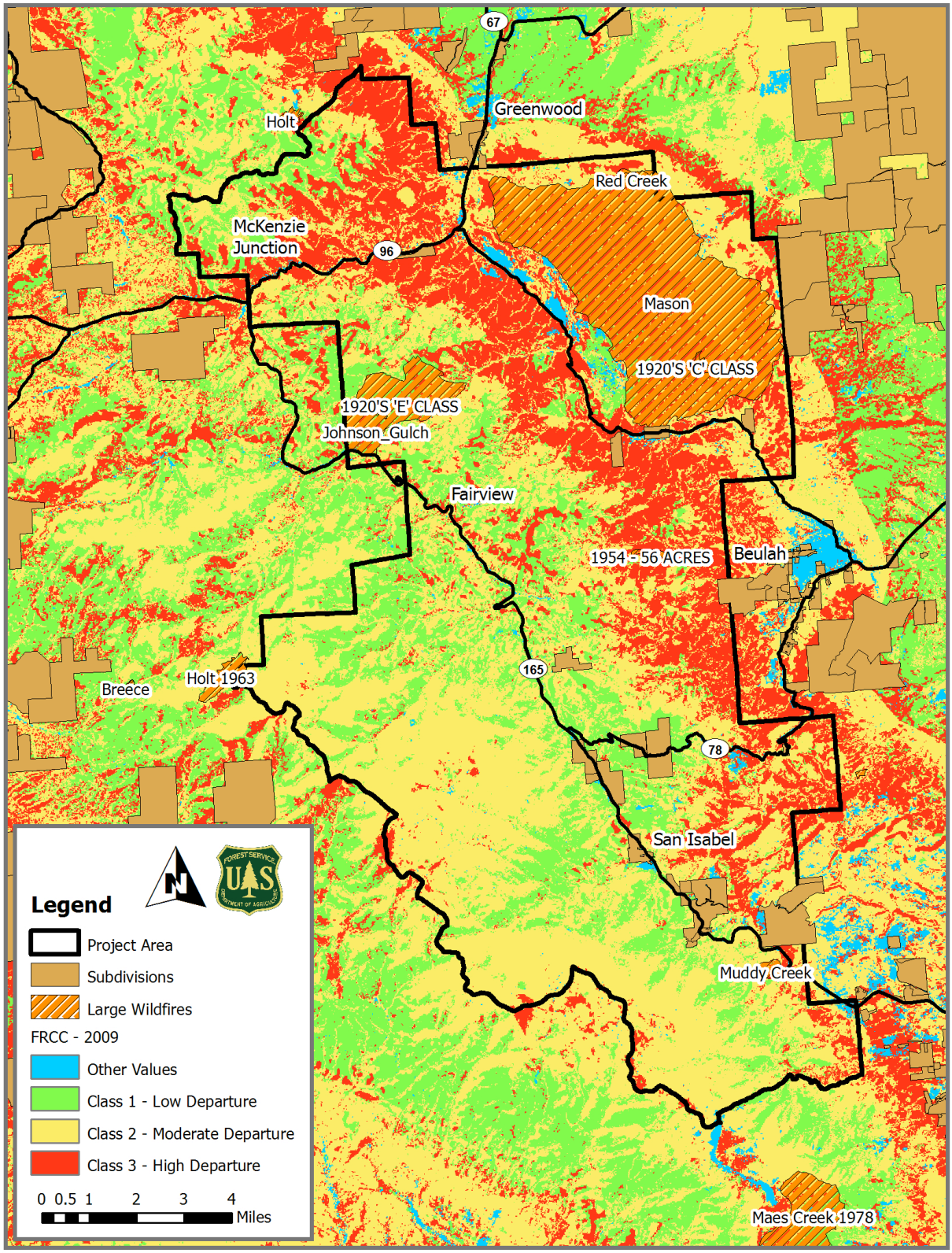
Analysis and mapping of the current Fire Regime Condition Classes for the East-Central Wet Mountains Project Area shows that the majority of the area is in Condition Classes II and III (Table 6 and Figure 19).

Table 6. Condition Classes in the East-Central Wet Mountains Project Area[8]

Condition class	Vegetation Treatment Area (acres)	Percent of Area
Condition Class 1	4,400	27%
Condition Class 2	7,800	48%
Condition Class 3	4,100	25%
Totals	16,300	100%

[8] Note that some of the vegetation treatment areas do not have a condition class defined and therefore the total acres in this table do not add up to the total vegetation treatment acres.

Figure 19. East-Central Wet Mountains Fire Regime Condition Classes (FRCC)



3.2.2 Fire-Fuels Environmental Consequences

The proposed treatments would meet 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:

1. Reintroducing fire into a fire dependent ecosystem.
2. Improving the vigor of treated ponderosa pine stands to increase resistance to mountain pine beetle and pine engraver beetle attacks.
3. Returning nutrients back into the soil through prescribed burning and/or mechanical mastication of residual vegetative material.
4. Protecting soils from the effects of severe wildfire.
5. Enhancing plant and animal habitat by releasing hardwood stands from competing conifer encroachment.
6. In the event of a wildfire giving firefighters a safer place to work by breaking up the continuity of the fuels and reducing the threat of a crown fire in the East-Central Wet Mountains Project Area.

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 least susceptible to crown-fire initiation and spread.

Change in structural stage is the criterion used in this analysis for assessing changes in the fire hazard of stands in the East-Central Wet Mountains 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). The direct and indirect effects of the proposed fuel treatments include lands within and adjacent to the East-Central Wet Mountains Project Area. Cumulative effects are also analyzed for similar lands.

Vegetation management and mechanical treatments are 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).

A mix of treatments in and around At Risk Communities and other WUI areas can be very effective against crown fire and spotting from firebrands if they are targeted toward the factors influencing the threat (i.e. structure of vegetation, fuels loadings, topographic influences, ingress and egress, and predominate winds). This improves the fire hazard rating within stands that are predominately hardwoods. Hardwoods have been

found to create excellent fuel breaks, as they do not support sustained crown fires (USDA Forest Service 2001a).

Alternative A (No Action) - 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 East-Central Wet Mountains Project Area. With no treatment, vegetative material would add volume and structure to the fuel matrix. Continued needle and timber 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 active crown fire. Fire behavior, especially how it relates to surface to crown fire transition in ponderosa pine stands, would have the potential to become more intense. Crown fire may be sustained more easily once initiated.

Growth of conifers in hardwood stands could eventually convert these natural fuelbreaks 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 white fir to become established. 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 Alternative A (No Action) would combine with effects from other activities in the East-Central Wet Mountains Project Area. As the fire hazard in the East-Central Wet Mountains Project Area continues to move toward high and very high, and development of private property within the East-Central Wet Mountains Project Area continues to increase, the risk of property damage, and public and firefighter exposure to wildfire would increase. Firefighters would be required to continue 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 would increase, fires would become larger, more mechanized equipment, more personnel, and larger burnout operations would be required to control wildfires. Suppression costs would increase; negative ecological effects would increase, and firefighter exposure to erratic fire behavior would be increased.

Piñon-Juniper

The piñon-juniper woodlands in the East-Central Wet Mountains Project Area have been expanding into grasslands and have become more decadent with the advent of fire suppression. The piñon-juniper woodlands in the area have become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. Fire suppression is more effective in dealing with surface fires versus stand fires which is exhibited by these piñon-juniper stands. Under Alternative A (No Action), this cover type would continue to encroach in to adjacent grasslands reducing the amount of forage available to wildlife and livestock.

Upland Shrublands

Most of the upland shrub communities in the treatment area have become more decadent over time in the absence of fire. Gamble oak is the primary species within these communities. Gamble oak becomes more dense 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 which is much less palatable for wildlife. 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.

Aspen

Under Alternative A (No Action) the amount of aspen cover type within the East-Central Wet Mountains 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 (SAD) 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, grasses, and conifers may become the dominant vegetation in these areas.

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 many of these sites. Table 7 displays the current structure of these dry site stands within the treatment areas. 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 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. Without periodic fires, seedlings that develop in the more open areas will grow and develop into saplings and pole size 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, disease, and drought.

Table 7. Fire Hazard Rating for Montane Zone Dry Ponderosa Pine – Alternative A

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	0	Low	4	Moderate	45	Moderate
> 40	0	Low	11	High	40	Very High

The potential changes over time within the more mesic ponderosa pine stands would be similar to the dry site 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 risk of loss due to mountain pine beetles would likely increase within many of the ponderosa pine stands over time as they increase in density and average stand diameter. If the population of mountain pine beetles were to increase in the area, high rates of mortality would be expected within these higher risk stands with the potential to lose both young and older ponderosa in the area.

Table 8 displays the percentage of each structural stage by crown cover in the three timber stages, seedlings, sapling-poles and mature trees. The greater the crown cover, the greater risk for crown fire propagation and consequent increase in the Fire Hazard Rating.

Table 8. Fire Hazard Rating for Montane Zone Mesic Ponderosa Pine – Alternative A

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	0	Low	3	Moderate	33	Moderate
> 40	0	Low	14	High	50	Very High

Mixed Conifer

Table 9 displays the current structural stages of the mixed conifer stands in the treatment area. Under the Alternative A (No Action), the mixed conifer stands within the montane zone would continue to mature. The amount of White fir would be expected to increase on these sites as the less shade tolerant species are shaded 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 and sustained crown fires due to the density of the stands.

Table 9. Fire Hazard Rating for Montane Zone Mixed Conifer – Alternative A

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	0	Low	2	Moderate	2	Moderate
> 40	0	Low	34	High	62	Very High

Alternative A (No Action) would have no direct effect on the forest structure of the East-Central Wet Mountains Project Area. However, it could have a profound indirect effect on the disturbance regimes of the montane zone. Under Alternative A (No Action) forest stands of the montane zone would continue to become more homogenous with 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 out breaks. This kind 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 contiguous blocks of land in the same 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 (No Action) 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 kind of disturbance regime and the resulting landscape pattern is much different from the historical landscape. Ladder fuels in the intermediate zone would continue to increase the probability of crown fire initiation.

Alternative A (No Action) - Cumulative Effects

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 or creation of fuels breaks would be implemented in the East-Central Wet Mountains 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 WUIs and outside of WUIs 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 increase losses to private improvements within the East-Central Wet Mountains Project Area.

Fire management activities would continue; however suppression activities could become more difficult and dangerous as forest structure complexity increases under this alternative. Attempts at using naturally-ignited fires to reduce the risks may not be feasible due to a lack of control features and a high risk of high severity fire effects. At risk communities and municipal watershed reserves associated with the communities of Beulah, Colorado City, Greenwood, Rye, and Wetmore, would remain susceptible to catastrophic 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.

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. In the long term, adverse effects to people and the environment from wildfire and suppression activities would increase.

Alternative B (Proposed Action) - Direct and Indirect Effects

Piñon-Juniper Woodlands

Under the Alternative B (Proposed Action), up to 400 acres of piñon-juniper woodlands would be treated. Currently these woodlands have become sufficiently dense to eliminate grass, forbs and other ground cover. Crown fires during extreme fire weather are the most likely disturbance event for these areas in their current condition. Under Alternative B, some of the piñon-juniper trees would be removed to stimulate understory vegetation and reduce crown fuels. This would be accomplished by mechanical treatments of decadent piñon-juniper patches. The treated areas would be converted to grasslands in the short-term. Piñon-juniper would eventually regenerate within the grasslands as young vigorous woodlands. The conditions following mechanical treatment would allow the use of prescribed fire as a tool to reintroduce fire as a disturbance agent.

Upland Shrub Treatment Areas

Under the Alternative B (Proposed Action) up to 2,800 acres of upland shrublands would be treated. The objectives of the proposed treatments would be to create fuel breaks and improve the vigor and palatability of plants used as forage for wildlife species. Mastication would be used to thin or remove Gamble oak and other shrub species and to stimulate grass and other ground cover. These treatment areas would function as fuel breaks. The proposed treatments would promote suckering. Therefore, the treatment area would need periodic maintenance to retain their effectiveness as fuel breaks.

The upland shrub communities, primarily Gamble oak, in the East-Central Wet Mountains Project Area have become more decadent over time. Gamble oak becomes denser as it ages and shades out grasses and other ground cover. As the crowns of the oak brush become larger, the risk of crown fires increases. With treatment, these areas would be more open and likely support a greater variety of vegetation including more grasses and forbs as the overstory shade is reduced and increased sunlight is able to reach the ground vegetation.

Aspen Treatment Areas

Under the Alternative B (Proposed Action) up to 5,300 acres of aspen would be treated. The treated stands would be primarily within the montane vegetation zone where aspen may eventually be replaced by conifers in the absence of fire or other disturbance. Aspen stands affected by SAD are also a priority for treatment. The objective of the proposed treatments within the aspen stands would be to restore the health and vigor of the existing aspen stands and expand their current extent.

The proposed treatments 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. However, aspen clones at lower elevations on dry sites may have a very poor response and may not re-sprout. In these areas, conifers may be removed for fuel reduction purposes and if aspen do not re-establish, they would be planted with conifers. 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.

The 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 fuel breaks, species diversity and important wildlife habitat.

Ponderosa Pine Treatment Areas

Alternative B (Proposed Action) would treat up to 4,300 acres of ponderosa pine; changing the structure of many these montane forest stands. The proposed actions would reduce the density of these stands and create openings ranging from 1 to 40 acres in size. In the thinned areas, smaller understory trees would generally be selected for removal, leaving larger more dominant trees. The exception would be in stands where there are only younger/smaller trees or stands with an overstory infected with mistletoe or bark beetles. In these areas, some of the healthier young trees would be left. The resulting stands would be composed primarily of mature trees with patches of immature trees scattered throughout the area, as well as many large openings. In the forested areas, canopy closure would average 25 to 30 percent. Prescribed burning, which would follow the tree cutting (where possible), and would remove some of the smaller trees as well as reduce woody fuels. The proposed treatments would create patches of different structural stages in a mosaic pattern across the treated areas.

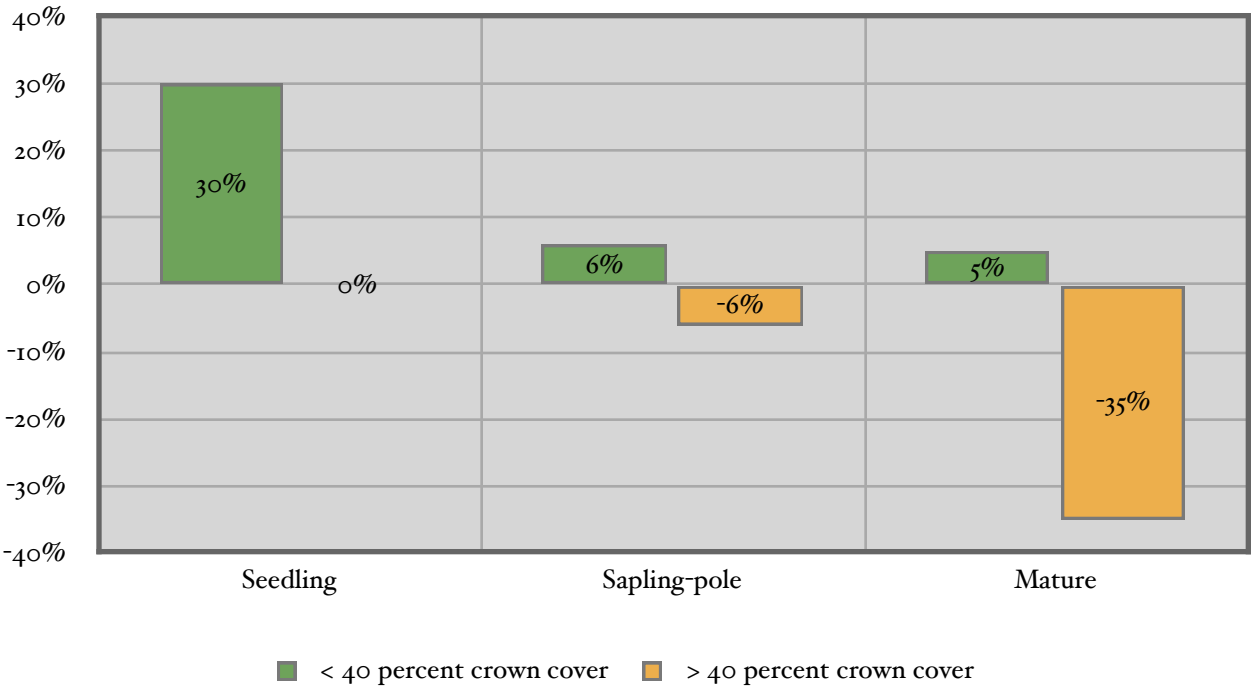
Currently 51 percent of the dry site ponderosa have a crown cover greater than 40 percent and there are few openings or seedling dominated stands within these areas (Table 7). Following the implementation of the proposed treatments up to 30 percent of the treatment area would be maintained in openings and only about ten percent of the area would have a crown cover greater than 40 percent (Table 10).

Table 10. Fire Hazard Rating for Montane Zone Dry Ponderosa Pine – Alternative B

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	30	Low	10	Moderate	50	Moderate
> 40	0	Low	5	High	5	Very High

Changes in the dry ponderosa pine structural stages under Alternative B (Proposed Action) would reduce the fire hazard of the East-Central Wet Mountains Project Area. These changes include a reduction in the highest fire hazard category (greater than 40 percent crown cover mature stage) of 35 percent (Figure 20). There would also be a reduction in the greater than 40 percent crown cover sapling-pole stage by 6 percent (Figure 6). The effects of these proposed treatments would be to move stand conditions toward the open forest conditions representative of historical conditions identified by Kaufman and others (2006). The forest would be moved toward the objective of creating and maintaining more open forest conditions that historically characterized these dry site forests. The resulting forest 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 20. Percentage Changes in Structural Stages of Dry Ponderosa Pine Associated with Alternative B (Proposed Action)



The mesic ponderosa pine areas are currently dominated by closed canopied stands with 64 percent of the treatment area having a crown cover of greater than 40 percent (Table 8). Like the drier sites, there are few openings within the mesic ponderosa pine areas. Following the vegetation treatments proposed under Alternative B (Proposed Action), about 20 percent of the mesic pine treatment areas would be in openings and 80 percent of the area would have a crown cover of 25 to 30 percent (Table 11).

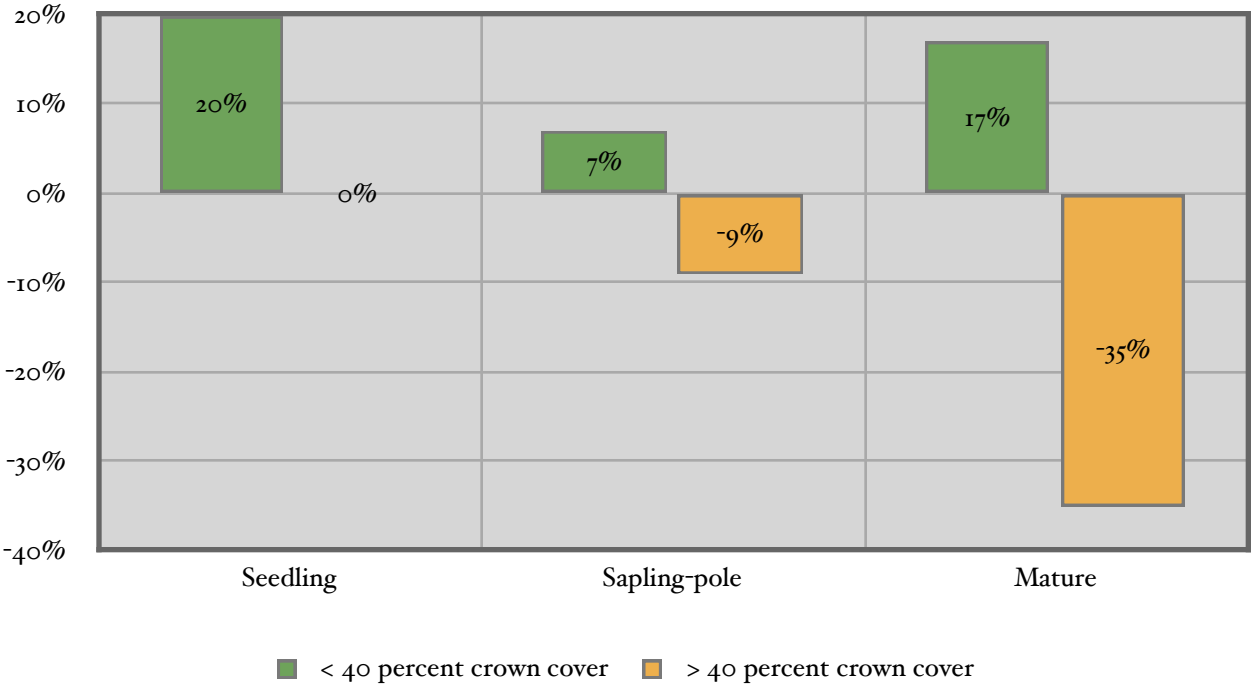
Table 11. Fire Hazard Rating for Montane Zone Mesic Ponderosa Pine – Alternative B

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	20	Low	10	Moderate	50	Moderate
> 40	0	Low	5	High	15	Very High

Changes in the mesic ponderosa pine structural stages under Alternative B (Proposed Action) would reduce the fire hazard of the East-Central Wet Mountains Project Area. These changes include a reduction in the highest fire hazard category (greater than 40 percent crown cover mature stage) of 35 percent (Figure 21). There would also be a reduction in the greater than 40 percent crown cover sapling-pole stage by 9 percent. The seedling category would increase by 20 percent. 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 II and III would be moved toward the historical Condition Class I.

Figure 21. Percentage Changes in Structural Stages of Mesic Ponderosa Pine Associated with Alternative B (Proposed Action)



In addition to the change in the overstory vegetation, there would likely be an increase in the diversity of understory plants within many of the treated pine stands due to reduced forest canopy cover and disturbance caused by tree removal, fuel reduction activities, and prescribed fire. These treatments would open up these stands and result in more sunlight, moisture and nutrients being available for understory plants including 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 within these pine stands would benefit from these treatments.

The ponderosa pine treatment areas would be converted to open mature and sapling-pole forest interspersed with openings. The ponderosa pine forests in these areas would begin to resemble what is thought to be the historical conditions that were maintained by the natural disturbance regimes that existed prior to European settlement. The open stand conditions in thinned areas 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. However, if fire is suppressed and no other means is used to maintain open conditions, stands would eventually grow back to the denser conditions that exist today.

Mixed Conifer Treatment Areas

The Alternative B (Proposed Action) includes treating up to 4,000 acres of mixed conifer forest within the montane zone. Some areas would be thinned from below leaving a more or less even-aged stands of the larger cohorts. The larger trees would be retained within these thinned areas and the more flammable understory trees would be removed. Residual stand basal areas would range from 60 to 100 square feet per acre. 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 1 to 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.

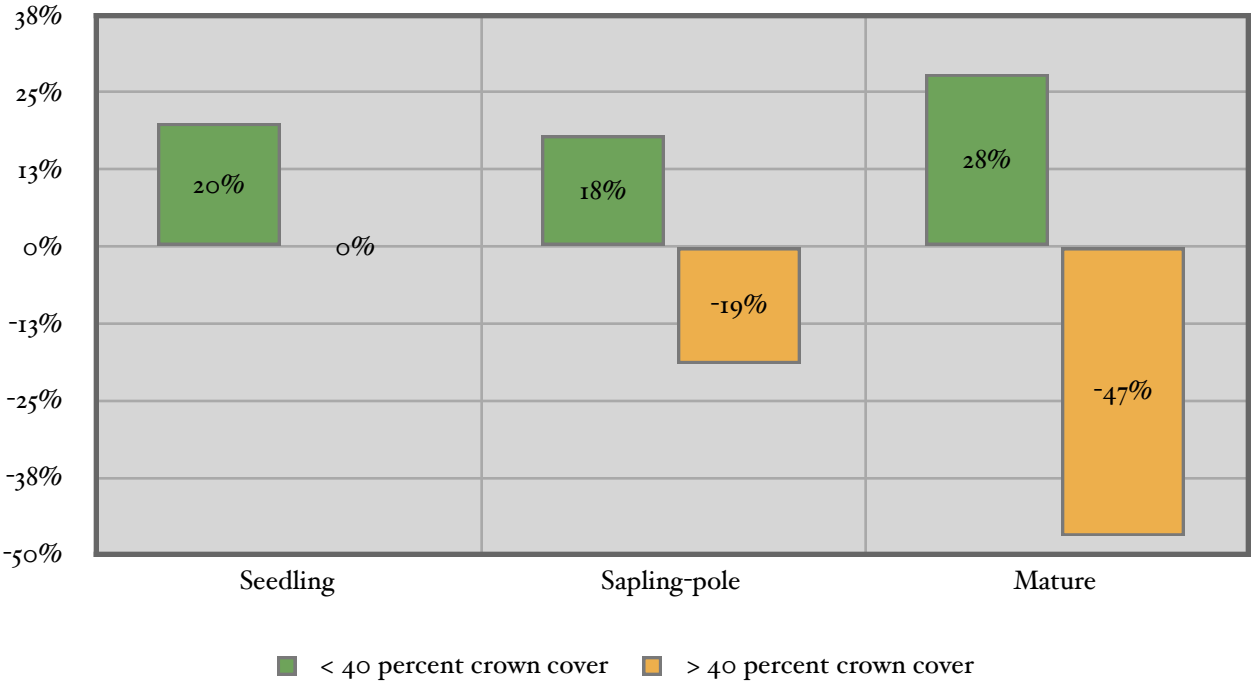
Currently 96 percent of the mixed conifer treatment areas have a crown cover greater than 40 percent and there are no new stands (seedlings) that have been recently established (see Table 12). Following the implementation of the proposed treatments, up to 20 percent of the mixed conifer area would be opened up and new regeneration encouraged and only about 30 percent of the area would have a crown cover greater than 40 percent. The result of these proposed treatments would be to increase the age and spatial diversity of the mixed conifer stands within the treatment areas.

Table 12. Fire Hazard Rating for Montane Zone Mixed Conifer – Alternative B

Crown Cover	Seedling		Sapling-Pole		Mature	
	Percentage	Hazard Rating	Percentage	Hazard Rating	Percentage	Hazard Rating
< 40	20	Low	20	Moderate	30	Moderate
> 40	0	Low	15	High	15	Very High

Changes in the mixed conifer structural stages under Alternative B (Proposed Action) would reduce the fire hazard of the East-Central Wet Mountains Project Area. These changes include a reduction in the highest fire hazard category (greater than 40 percent crown cover mature stage) of 47 percent (Figure 22). There would also be a reduction in the greater than 40 percent crown cover sapling-pole stage by 19 percent (Figure 22). The seedling category would increase by 20 percent. The result of these proposed treatments would be to increase the age and spatial diversity of the mixed conifer stands within the treatment areas. The effects of treatment would be to decrease the potential for crown fire generation. Simultaneously there would be an increase in age and spatial diversity of stand structures across the landscape. Following treatment, those stands currently in Condition Class II and III would move toward the historical Condition Class I.

Figure 22. Percentage Changes in Structural Stages of Mixed Conifer Associated with Alternative B (Proposed Action)



Fuelbreaks

Up to 2,000 acres of forest would be treated to create fuelbreaks under the Alternative B (Proposed Action). These fuelbreaks would be located in areas where other vegetation treatments are not prescribed. Some of these treatments could be within the subalpine zone. 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 fuel breaks 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 management efforts may be more effective.

Fuelbreaks would be created and maintained at strategic locations throughout the East-Central Wet Mountains 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. The activities required to construct a fuelbreak would vary depending on the existing conditions, but would likely include thinning and prescribed fire. These activities would create and maintain open conditions.

The effects of these fuelbreaks would be similar to those discussed above for the mixed conifer and ponderosa pine treatments. Like 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. These open forest conditions are not typical of what would have developed within the spruce fir communities of the subalpine zone under historic conditions. These forests historically developed under a disturbance regime of infrequent high severity fires. These fuelbreaks may result in uncharacteristic conditions

within these stand types. However, only a small fraction of the subalpine zone would be affected, less than one percent of the subalpine forest would be treated within these fuelbreaks.

Alternative B (Proposed Action) - Cumulative Effects

The effects of vegetation treatments under Alternative B (Proposed Action), combined with the effects of other actions that have occurred in the East-Central Wet Mountains Project Area, would create cumulative impacts on fire hazard ratings within the East-Central Wet Mountains Project Area. The cumulative effects on the changes in forest vegetation are described in *Forest Vegetation Alternative A (No Action) - Cumulative Effects.* The proposed treatments under this alternative would alter overstory canopies, understories, and surface and ladder fuels that would contribute to a lowering of fire hazard ratings. The reduction of fire hazard could contribute to less erratic fire behavior resulting in more effective fire suppression actions, increased firefighter safety, and less damage to natural resources. Additionally, this alternative would begin moving the vegetative conditions away from current Condition Classes II and III toward the historical vegetative conditions (Condition Class I). Further actions associated with the East-Central Wet Mountains Project Area (Custer and Pueblo County CWPPs) would contribute toward additional reduction of fire hazard. Alternative B (Proposed Action) may increase disturbances from forest management activities in the short-term, but realize positive cumulative effects to people and the environment from wildfire hazard reduction and related fire management activities in the long-term.

3.2.3 Air Quality Affected Environment

Maintaining currently high air quality standards is important to the East-Central Wet Mountains Project Area. Wildfires cause temporary and unscheduled increases in pollutants, particularly emissions of particulate matter, measured as PM 10 (particles less than 10 microns in size). Additionally there are potential impacts that would result from any proposed management activities in the East-Central Wet Mountains Project Area. The proposed management activities are analyzed to evaluate air quality impacts because of their potential effect upon all populations, especially the young and elderly, and those with respiratory health problems. The fundamental impact from the proposed management activities would be short-term degradation caused by smoke emissions from the prescribed burn program. To a much lesser extent, impacts from equipment use produce dust and vehicle emissions but are much smaller in comparison to the magnitude of emissions produced from prescribed fire projects.

The East-Central Wet Mountains Project Area is considered to have “very good” air quality. Although in distant proximity to Pueblo, an urban area, the airshed has remained within attainment of air quality standards. Human activities such as motorized recreation within this area are limited and do not produce a high impact to the air quality of the East-Central Wet Mountains Project Area.

Attainment of air quality standards is based on seven recognized pollutants that are measured and judged against the standards. The seven pollutants are: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), lead, sulfur dioxide, PM 10 and PM 2.5. Of these pollutants, there are five that are of primary concern in the East-Central Wet Mountains Project Area. These are the particulates PM10 and PM 2.5, O_3, CO, and NO_2. Wildfires, prescribed fires, wood stoves and fireplaces produce smoke that contain both PM 10 and PM 2.5

particulate matter of various levels. Other important pollutants are the emissions of CO caused by automotive (mobile) and recreational activities found throughout the East-Central Wet Mountains Project Area. Air pollutants are emitted by both stationary and mobile sources. Stationary sources include factories, power plants, and agricultural burning. Stationary sources are not found in the East-Central Wet Mountains Project Area but are found to the east and primarily in lower flat areas of the western plains land and in urban settings. Mobile sources of pollution include automobiles, trucks, buses, and various types of recreational vehicles.

Large contributors of PM 10 pollutants include open burning of materials in residential areas as well as wood burning stoves and diesel-powered engines. Another source of PM10 includes wildfires. Wildfires, both natural and human-caused, are usually seasonal in nature. Heavy concentrations of PM10 and 2.5 particulates are generated from these wildfires and in particular during large, multiple day fire events. Smoke is also generated during prescribed fires (broadcast and/or pile burning) but to a much lesser extent. Prescribed fires are used to promote sustainability of ecosystems through fuels reduction within the forest. Prescribed burns are usually 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. The proposed activities in the East-Central Wet Mountains Project Area could affect the air quality of the local area as well as downwind communities. Dust and smoke that may be generated from these activities do contribute pollutants to the local airshed but are temporary and transient.

3.2.4 Air Quality Environmental Consequences

Effects Common to All Alternatives

All equipment exhaust and dust emissions associated with both alternatives are much less than emissions produced by prescribed fire applications. Emissions from all sources would be addressed by mitigation measures and evaluated at the time of on-site project plan preparation. However, prescribed fire activities would have some short-term effects on air quality.

Alternative A (No Action) - 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 would occur in the East-Central Wet Mountains Project Area. Forested areas in the East-Central Wet Mountains Project Area would add volume and structure to the fuel matrix. Air quality for the East-Central Wet Mountains Project Area would remain in good condition. However, as wildfires increase in size and fire intensity increases, negative impacts would occur from increased smoke production. There would be a high probability that air quality would measurably change; air quality effects would be significant in the short-term (24-hours in duration); air quality impacts would be noticeable regionally. The effects on human health and air quality related values are expected to be significant during a wildfire event.

Alternative A (No Action) - Cumulative Effects

Alternative A 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 of not undertaking actions to reduce wildland fuel accumulations would result in fire hazard and that risk increasing as fuel accumulations build above current levels. In the long-term, greater effects to people and the environment from wildfire and fire suppression activities would occur. There would be a high probability that air quality would measurably change. Air quality impacts would be noticeable regionally. The effects on human health and air quality related values are expected to be significant during wildfire events.

Alternative B (Proposed Action) - Direct and Indirect Effects

Aspen Treatment Areas

The direct effects of treating up to 5,300 acres of aspen on air quality would be minor air quality effects from equipment exhaust and dust emissions associated with mechanical treatment and travel on roads. Emissions from these sources would be addressed by design features (see *2.4 Design Features)* and evaluated at the time of on-site project plan preparation. 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. No air quality mitigating measures would be necessary regarding these activities in aspen.

Ponderosa Pine Treatment Areas (Dry and Mesic)

The direct effects of treating up to 4,300 acres of ponderosa pine on air quality would be minor 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. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of treating these ponderosa pine forests would result from 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 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 these types of fires would generate much less smoke than wildfires. However, if fire is suppressed and no other means is used to maintain open conditions, stands would eventually grow back to the denser conditions that exist today and there is a potential that air quality would be negatively affected.

Mixed Conifer Treatment Areas

The direct effects of treating up to 4,000 acres of mixed conifer forest within the montane zone on air quality would be minor 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. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of treating the mixed conifer forest within the montane zone would result from more open stand conditions in treated areas that would encourage the development of understory grasses and shrubs. These stand conditions would benefit air quality in the long-term because wildfires burning through these areas would be smaller and less intense, therefore, generating less smoke.

Upland Shrub Communities Treatment Areas

The direct effects of treating up to 2,800 acres in the upland shrub communities on air quality would be to improve the vigor and palatability of plants used as forage for wildlife species and to create fuel breaks. These treatment areas would function as fuel breaks in the WUI. Minor air quality effects would result from equipment exhausts 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. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of treating the upland shrub communities would result in the improvement of vigor and palatability of plants used as forage for wildlife species and continuation of fuel breaks. The treatment area would need periodic maintenance to retain their effectiveness as fuel breaks, with prescribed fire used as a natural ecological process to restore upland shrub communities outside of the WUI. These stand conditions would benefit air quality in the long-term because wildfires burning through these areas would be smaller and less intense, therefore, generating less smoke.

Piñon-Juniper Treatment Areas

The direct effects of treating up to 400 acres of decadent piñon-juniper on air quality would be minor 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. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of treating these piñon-juniper areas would result in creating open stand conditions in these 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 since these types of fires would generate much less smoke then that of wildfires. However, if fire is suppressed and no other means are used to maintain open conditions, stands would eventually grow back to the denser conditions that exist today and there is a potential that air quality would be negatively affected.

Fuelbreaks

The direct effects of creating up to 2,000 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. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. There would be a low probability that air quality would be expected to measurably change.

The indirect effects of these fuelbreaks would be to decrease wildfire extent and intensity. Air quality would not change, or expected changes would be at or below the level of detection for the activities proposed. There would be a low probability that air quality would be expected to measurably change. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. The resulting air quality would not be affected in the long-term.

Alternative B (Proposed Action) - Cumulative Effects

Alternative B would address National, Agency, Forest, or local direction for reducing wildland fuel accumulations beyond existing forest management activities in the short-term. The proposed treatments under this alternative would alter overstory canopies, understories, and surface and ladder fuels that contribute to a lowering of 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, and less damage to natural resources. The cumulative effects from undertaking actions to reduce wildland fuel accumulations would result in fire hazard and risk decreasing, as fuel accumulations would be addressed. There would be a low probability that air quality would be expected to measurably change as a result of implementing the proposed actions. Air quality effects would be local and less than 24-hours in duration. Air quality mitigating measures may be needed and would likely be successful. In the long term, effects on human health and air quality related values are not expected to be significant. The proposed actions under Alternative B (Proposed Action) in combination with more recent and future foreseeable vegetation treatments in surrounding areas would not have a cumulative effect on air quality because the smoke generating activities would be coordinated.

3.3 Watershed/Soils

This section is divided into two; watershed, and soils. The discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Watershed/Soils Specialist Report (JW Associates 2010d).

3.3.1 Watershed Affected Environment

Watershed boundaries were developed used the existing national network of delineated watersheds (Federal Geographic Data Committee 2004). Sixth-level (12-digit) watersheds, typically 16-63 square miles or 10,000-40,000 acres, were used to characterize and frame this analyses for the East-Central Wet Mountains Project Area. There 12 sixth-level watersheds in the East-Central Wet Mountains Project Area (Table 13 and Figure 23). The total watershed area is greater than the East-Central Wet Mountains Project Area because portions of the watersheds are located outside of the East-Central Wet Mountains Project Area boundaries (Table 13 and Figure 16). The East-Central Wet Mountains Project Area covers approximately 111,627 acres and the Vegetation Treatment Areas cover approximately 18,800 acres. The total watershed area for the 12 watersheds is 276,870 acres.

The North Saint Charles River watershed has no vegetation treatments proposed within its boundaries and was removed from further analysis. In addition, several watersheds have one percent or less of their watershed areas proposed for vegetation treatments. The 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. These watersheds are;

- Hardscrabble Creek
- Muddy Creek
- Upper Greenhorn Creek

The remaining eight watersheds identified in Table 13 are carried forward in this analysis.

Table 13. East-Central Wet Mountains Project Area Watersheds

Sixth-level Watershed	Hydrologic Unit Code (HUC)	Water Supply?	Watershed Area (acres)	Watershed Area in East-Central Wet Mountains Project Area (acres)	Watershed Area in East-Central Wet Mountains Project Area (%)
North Hardscrabble Creek	110200020601	No	33,530	11,334	33.8%
South Hardscrabble Creek	110200020602	No	18,703	10,676	57.1%
Hardscrabble Creek	110200020603	No	25,240	5,047	20.0%
Saint Charles River Headwaters	110200020701	No	35,091	26,478	75.5%
Middle Creek	110200020702	Yes	19,605	17,662	90.1%
Squirrel Creek	110200020703	Yes	12,533	8,823	70.4%
North Creek	110200020704	Yes	13,342	11,753	88.1%
North Saint Charles River	110200020705	No	24,392	24	0.1%
Upper Greenhorn Creek	11020002080l	Yes	20,035	3,253	16.2%
Muddy Creek	110200020802	Yes	25,003	4,697	18.8%
Red Creek	110200021001	No	30,616	11,138	36.4%
Peck Creek	110200021102	No	18,782	760	4.0%
Totals			276,870	111,645	40.3%

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.

Ruggedness

Watershed steepness or ruggedness is an indicator of the relative sensitivity to debris flows following wildfires (Cannon and Reneau 2000). The more rugged the watershed, the higher its sensitivity to generating debris flows following wildfire.

Melton (1957) defines ruggedness, R, as;

$$R = H_b A_b^{-0.5}$$

Where A_b is basin area and H_b is basin height measured from the point of highest elevation along the watershed divide to the outlet.

Table 14 displays the ruggedness ratings for selected East-Central Wet Mountains watersheds. The hazard rankings displayed in Table 14 are used as a comparison between these selected watersheds only. The hazard ranking categories were used in the prioritization and are numbered one though five, with one being the lowest ranking and five being the highest. The hazard rankings provide a broader context for the ruggedness analysis.

Figure 23. East-Central Wet Mountains Project Area Watersheds

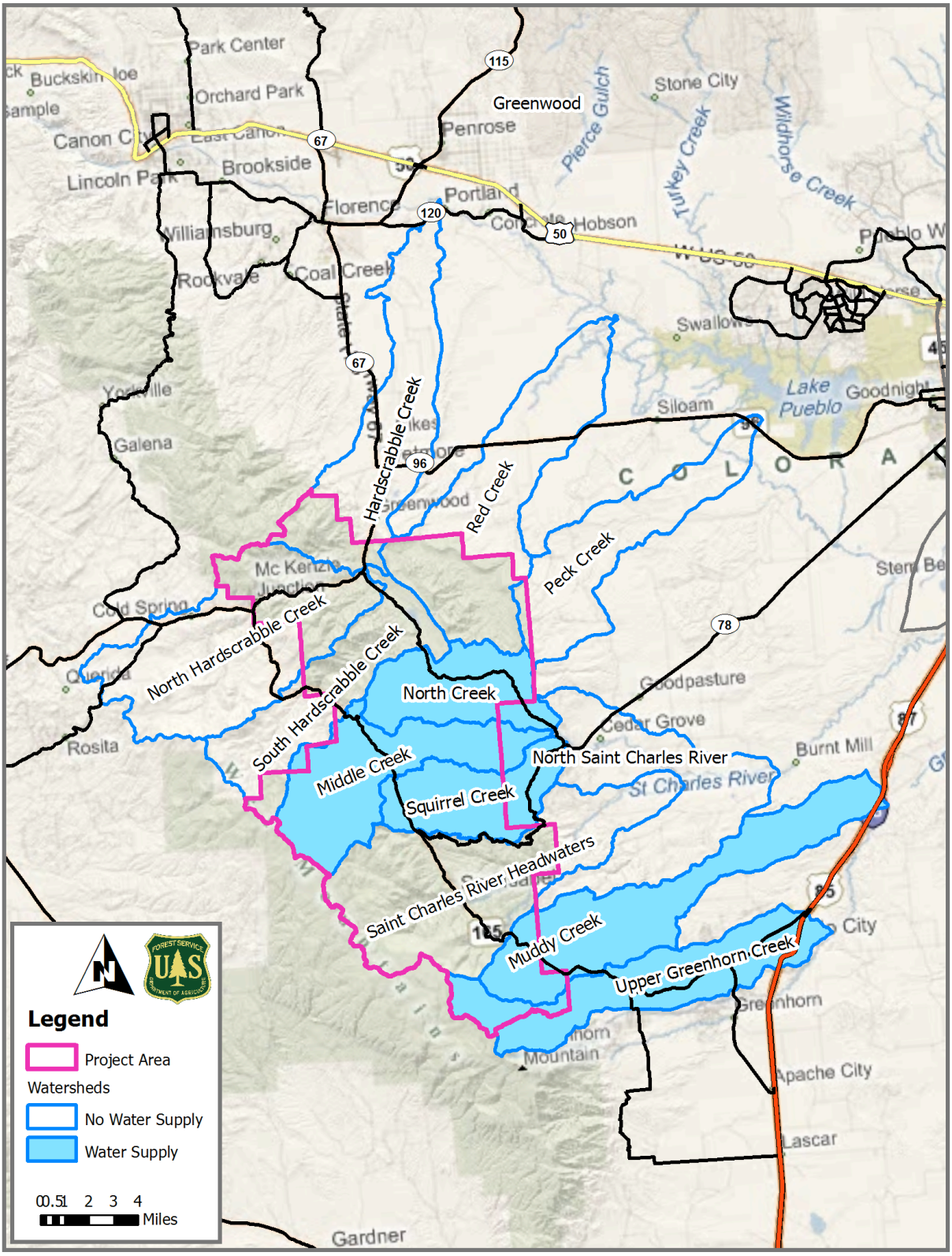


Table 14. East-Central Wet Mountains Watershed Ruggedness Rating

Sixth-level Watershed	Maximum Elevation	Minimum Elevation	Elevation Difference	Ruggedness	Hazard Rating
North Hardscrabble Creek	10,883	6,713	4,170	0.1091	2
South Hardscrabble Creek	11,434	6,713	4,721	0.1654	4
Saint Charles River Headwaters	11,506	5,692	5,814	0.1487	3
Middle Creek	10,932	6,220	4,712	0.1612	4
Squirrel Creek	10,925	6,152	4,773	0.2043	5
North Creek	10,144	6,220	3,924	0.1628	4
Red Creek	7,923	4,911	3,012	0.0825	1
Peck Creek	7,559	4,902	2,657	0.0929	1

Road Density

Roads can convert subsurface runoff to surface runoff and then route the surface runoff to stream channels, increasing peakflows (Megan and Kidd 1972, Ice 1985, and Swanson et al. 1987). Therefore, watersheds with higher road densities have a higher sensitivity to increases in peak flows following wildfires. Road density in miles of road per square mile of watershed area was used as an indicator of flooding risk.

Table 15 displays the road density ratings for selected East-Central Wet Mountains watersheds. Overall, road densities are quite low. The highest road densities are generally outside of forested areas and therefore create fewer concerns for increased peak flows following fires.

Table 15. East-Central Wet Mountains Watershed Road Density[9]

Sixth-level Watershed	Roads (miles)	Watershed Area (sq.mi.)	Road Density (mi./sq.mi.)
North Hardscrabble Creek	16.3	52.39	0.31
South Hardscrabble Creek	16.8	29.22	0.57
Saint Charles River Headwaters	46.0	54.83	0.84
Middle Creek	35.7	30.63	1.16
Squirrel Creek	13.5	19.58	0.69
North Creek	14.1	20.85	0.68
Red Creek	47.3	47.84	0.99
Peck Creek	46.1	29.35	1.57
Totals	235.7	284.69	0.83

[9] The road lengths in developed areas outside of the forest are likely not accurate.

North Hardscrabble Creek Existing Conditions

The North Hardscrabble Creek watershed is the second largest watershed (33,530 acres) in the East-Central Wet Mountains Project Area (Table 13). It is one of two headwaters streams that join to form Hardscrabble Creek that flows into the Arkansas River above Pueblo Reservoir. This watershed contains a number of named tributaries to South Hardscrabble Creek including; Middle Hardscrabble Creek, Smith Creek, South Fork Hardscrabble Creek, Silver Park Creek and Junkins Park Creek. The watershed starts at approximately 6,700 feet at the confluence with Hardscrabble Creek and ends at over 10,800 feet on the western watershed divide. It has one of the lower ruggedness rating of all the watersheds (Table 14), and therefore has a low relative hazard for debris flows. The road density is very low at <0.4 mi./sq. mi. (Table 15).

South Hardscrabble Creek Existing Conditions

The South Hardscrabble Creek watershed is a smaller watershed (18,703 acres) in the East-Central Wet Mountains Project Area (Table 13). It is one of two headwaters streams that join to form Hardscrabble Creek that flows into the Arkansas River above Pueblo Reservoir. This watershed contains a number of named tributaries to South Hardscrabble Creek including; Cross Creek, Little Froze Creek, and North Deadman Creek. The watershed starts at approximately 6,700 feet at the confluence with Hardscrabble Creek and ends at over 11,400 feet on the western watershed divide. It has a high ruggedness rating (Table 14) and therefore has a high relative hazard for debris flows, compared to the other watersheds. The road density is very low at <0.6 mi./sq. mi. (Table 15).

Saint Charles River Headwaters Existing Conditions

The Saint Charles River Headwaters Creek watershed is a moderate-sized watershed (24,392 acres) in the East-Central Wet Mountains Project Area (Table 13). It is the source of the Saint Charles River that joins the North Fork Saint Charles River flows into the Arkansas River below Pueblo Reservoir. This watershed contains a number of named tributaries to the Saint Charles River including; Little Saint Charles Creek, Willis Creek, Bear Canyon, Beaver Creek, and Amethyst Creek. The watershed starts at approximately 5,700 feet at the confluence with North Fork Saint Charles River and ends at over 11,500 feet on the western watershed divide. It has a moderate ruggedness rating (Table 14), and therefore has a moderate relative hazard for debris flows, compared to the other watersheds. The road density is low at <0.9 mi./sq. mi. (Table 15).

Middle Creek Existing Conditions

The Middle Creek watershed is a moderate-sized watershed (19,605 acres) in the East-Central Wet Mountains Project Area (Table 13). It is one of three headwaters streams that join to form the North Fork Saint Charles River. It supplies water to the Town of Beulah. This watershed contains two named tributaries to Middle Creek; Bigelow Creek, and Ophir Creek. The watershed starts at approximately 6,200 feet at the confluence with North Creek and ends at over 10,900 feet on the western watershed divide. It has a high ruggedness rating (Table 14) and therefore has a high relative hazard for debris flows, compared to the other watersheds. The road density is moderate at <1.2 mi./sq. mi. (Table 15).

Squirrel Creek Existing Conditions

The Squirrel Creek watershed is the smallest watershed (12,533 acres) in the East-Central Wet Mountains Project Area (Table 13). It is one of three headwaters streams that join to form the North Fork Saint Charles River. It supplies water to the Town of Beulah. This watershed contains a number of named tributaries to Squirrel Creek including; South Creek, Dome Rock Canyon, and Davenport Creek. The watershed is very steep, starting at approximately 6,152 feet at the confluence with North Fork Saint Charles River to over 10,925 feet on the western watershed divide. It has the highest ruggedness rating (Table 14) and therefore has the highest relative hazard for debris flows, compared to the other watersheds. The road density is low at <0.7 mi./sq. mi. (Table 15).

North Creek Existing Conditions

The North Creek watershed is the second smallest watershed (13,342 acres) in the East-Central Wet Mountains Project Area (Table 13). It is one of three headwaters streams that join to form the North Fork Saint Charles River. It supplies water to the Town of Beulah. This watershed contains a number of named tributaries to North Creek including; Panther Creek, Cooper Gulch, Yellow Creek, White Creek, Ditch Creek, and Lefthand Fork North Creek. The watershed starts at approximately 6,200 feet at the confluence with Middle Creek and ends at over 10,100 feet on the western watershed divide. It has a high ruggedness rating (Table 14) and therefore has a high relative hazard for debris flows, compared to the other watersheds. The road density is very low at <0.7 mi./sq. mi. (Table 15).

North Creek experienced some flooding and debris flows in a rainfall/runoff event following the Mason Gulch fire. That fire burned only a small portion of this watershed.

Red Creek Existing Conditions

The Red Creek watershed is the third largest watershed (30,616 acres) in the East-Central Wet Mountains Project Area (Table 13). It is tributary to the Arkansas River just above Pueblo Reservoir. Only the upper portion of this watershed is forested and a large portion of the forested area burned in the Mason Gulch fire. This watershed contains a number of named tributaries to Red Creek including; North Red Creek, Mason Gulch, Middle Red Creek, Soda Gulch, South Red Creek, Livesey Gulch, and Bell Gulch. The watershed begins at approximately 4,900 feet at the confluence with the Arkansas River and ends at over 7,900 feet on the western watershed divide. It has the lowest ruggedness rating of all the watersheds (Table 14), and therefore has a low relative hazard for debris flows. The road density is moderate at 1 mi./sq. mi. (Table 15).

Peck Creek Existing Conditions

The Peck Creek watershed is a smaller watershed (18,782 acres) in the East-Central Wet Mountains Project Area (Table 13). Peck Creek and Owl Canyon combine to form Rush Creek that is a tributary to the Arkansas River that flows into Pueblo Reservoir. Only a small portion of this watershed is forested and some of that forested area burned in the Mason Gulch fire. The watershed starts at approximately 4,900 feet at the confluence with Pueblo Reservoir and ends at over 7,600 feet on the western watershed divide. It has one of the lowest ruggedness rating of all the watersheds (Table 14), and therefore has a low relative hazard for debris flows. The road density is moderate at <1.6 mi./sq. mi. (Table 15).

3.3.2 Watershed Environmental Consequences

This section describes the effects of Alternative A (No Action) and Alternative B (Proposed Action) on the watersheds of the East-Central Wet Mountains Project Area. The analysis concentrates on the potential effects of the alternatives on water yield, peak flows, and sediment yield.

Water Yield

Increases in water yields from forest treatments have generally been regarded as a positive effect of forest management. Due to the limited amount of water available, many watershed studies have been conducted to determine how to increase water yield in ponderosa pine forests. MacDonald and Stednick (2003) conducted a recent literature review of water yield studies. That literature review found that water yield increases from timber harvesting are relatively short-lived, lasting on the order of 8-13 years. The magnitude of water yield increases tend to decline following treatments due to revegetation. Sheppard and Battaglia (2002) confirm the results of MacDonald and Stednick and add that the level of treatment needed would be 20-25 percent of the forest to realize and sustain increased water yields. Additional research on the cumulative effects of fuels reduction efforts has concluded that the consensus is that fuel management activities would likely not increase water yield unless more than 20 percent of the basal area in a watershed is removed (Elliot et al. 2010). For this analysis, potential water yield increases will be evaluated by the amount of total basal area removed by watershed.

Peak Flow

Forest management activities have been extensively studied with regard to the effects of timber harvesting and road building on changes in peak flows. The consensus in the literature is that peak flow changes from timber harvesting generally occur during drier seasons (Harr 1979) where the amount of evapotranspiration exceeds available soil moisture. During the summer and fall, the trees are generally transpiring soil moisture that is not being recharged by rainfall. When the tree density, and consequently transpiration, is reduced, the soil moisture remains higher and there is a greater potential for runoff from summer or fall storms.

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

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

Higher peak flows could result in changes in channel dynamic equilibrium. If the channel is moved out of dynamic equilibrium, the integrity of pools and riffles may be compromised and fish habitat quality could decrease. 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.

Sediment Yield

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

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

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

Fuel Management WEPP (FuME WEPP) is one in a series of the USDA Forest Service's Internet-based computer programs based on the Agricultural Research Service's Water Erosion Prediction Project (WEPP) model. FuME WEPP is designed to predict runoff and sediment yield from fuels management activities. It compares background conditions to hillslope sedimentation from fuels management activities and wildfire. It was used to compare the changes in sediment yield from prescribed fire, thinning, use of roads and wildfire to the background conditions.

Forests generally have very low erosion rates unless they are disturbed. Common disturbances include prescribed and wildfire, and thinning operations. The impact of these operations, however, last only for a short time, perhaps one or two years. After that, the rapid regrowth of vegetation soon covers the surface with plant litter, and potential erosion is quickly reduced. In one study, Robichaud and Brown (1999) reported that

erosion rates dropped from almost 40 Mg ha-1 the first year after a fire to 2.3 Mg ha-1 the second, and 1 Mg ha-1 the third year. The regrowth of vegetation and subsequent increase in canopy and ground cover overshadow any differences due to climate variation among the years. For any one of the given years, however, the potential erosion depends on the climate.

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 East-Central Wet Mountains 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.

Alternative A (No Action) - Cumulative Effects

This section presents the potential cumulative effects of the past, present and future foreseeable actions in the watersheds of the East-Central Wet Mountains Project Area. Under Alternative A, there would be no vegetation treatments on National Forest System (NFS) lands in the East-Central Wet Mountains Project Area.

Limited timber harvesting has occurred within the East-Central Wet Mountains Project Area over the past twenty years. These projects have been limited in scope and have affected only a small portion of the forest stands within the East-Central Wet Mountains Project Area. Currently there is a spruce salvage project that is active just outside of the East-Central Wet Mountains Project Area but there is some salvage planned inside the East-Central Wet Mountains Project Area.

Foreseeable future actions within the East-Central Wet Mountains Project Area include fuel hazard reduction treatments initiated under the Community Wildfire Protection Plans (CWPP) that have been developed for communities within the area. Two Community Wildfire Protection Plans (CWPPs) have been prepared that cover the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects some of which are located within the East-Central Wet Mountains Project Area.

The Pueblo County Community Wildfire Protection Plan (2006) identified the following high priority project:

> The USDA Forest Service would work with the Pueblo County CWPP partners to create shaded fuel breaks approximately 500 feet wide from the centerline of SR 165 on both sides of the highway from Rye to Lake Isabel and along 12-Mile Road (SR 78), where feasible; from Highway 165 to Beulah.

The Custer County Community Wildfire Protection Plan (2007) identified the following high priority projects.

> The USDA Forest Service would work with the Custer County CWPP partners to identify fuel modification projects in the Wet Mountain/San Isabel high-density neighborhood.

Under Alternative A (No Action), there would be no additional vegetation treatments on National Forest lands in the East-Central Wet Mountains Project Area. The potential future treatments would only affect a very small portion of the East-Central Wet Mountains Project Area. Even with these on-going and potential future activities, a large portion of the East-Central Wet Mountains Project Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer.

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 East-Central Wet Mountains Project Area have likely contributed the largest amount of sediment to the streams. Existing road stream crossings and other contributions from roads in the East-Central Wet Mountains Project Area are expected to remain unchanged.

Cumulative impacts from sediment produced by the effects of high intensity wildfires would be expected if a large, intense wildfire burned in the East-Central Wet Mountains Project Area. This alternative would be expected to have the highest number of acres classified at high fire hazard of the alternatives (JW Associates 2010). 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. These types of effects were seen following the Mason Gulch fire, which caused flooding and debris flows in North Creek.

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

Alternative B (Proposed Action) - Direct and Indirect Effects

Under Alternative B (Proposed Action) the design features listed in *2.4 Design Features* would be required. In addition, Best Management Practices (BMPs) in USDA Forest Service Handbook (FSH 2509.25) Watershed Conservation Practices Handbook (JW Associates 2010d) would be implemented.

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. 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.
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 North Hardscrabble Creek is estimated to be 185 acres.

Assuming 50 percent basal area removal (from bullet item 2 above), the basal area removal by watershed would be estimated to be 93 acres, or 50 percent of 185 acres (Table 16).

4. Analysis Areas are the sixth-level watersheds in Table 16.

Water yield increases would not be measurable in any watersheds. This conclusion is based on the estimated basal removal of not more than 20 percent in a watershed (Table 16). 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 16 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 16. Water Yield - Basal Area Removal Analysis by Watershed[10] - Alternative B (Proposed Action)

Watershed Name	Watershed Area (acres)	Dry Ponderosa	Mesic Ponderosa	Mixed Conifer	Totals	Percent of Watershed
North Hardscrabble Creek	33,530	122	93	37	252	1%
South Hardscrabble Creek	18,703	4	8	3	14	0%
Saint Charles River Headwaters	35,091	306	420	168	894	3%
Middle Creek	19,605	11	119	47	177	1%
Squirrel Creek	12,533	48	141	56	246	2%
North Creek	13,342	478	41	17	536	4%
Red Creek	30,616	236	50	20	306	1%
Peck Creek	18,782	145	52	21	218	1%
Totals	182,201	1,351	924	369	2,644	1%

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;

10 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.

- Treatments in aspen and Gambel oak would not create any changes in peak flows because they would quickly resprout.
- Analysis Areas are the sixth-level watersheds in Table 17.

Peak flow increases would not be measurable in any East-Central Wet Mountains Project Area watersheds (Table 17). This conclusion is based on thinning in much less than 40 percent of any watershed (Table 17). The Squirrel Creek watershed is estimated to be at 17 percent of the watershed treated after full implementation of the Alternative B (Proposed Action). Activities in the Squirrel Creek watershed should be staged throughout the 10 years of expected implementation of Alternative B (Proposed Action) to minimize the peak flow increases in that watershed. Elliot and others (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.*"

Table 17. Peak Flow Analysis by Watershed - Alternative B (Proposed Action)

Watershed Name	Watershed Area (acres)	Vegetation Treatment(acres)	Percentage of Watershed	Aspen & Oak Treatment (acres)	Percentage of Watershed wo Aspen & Oak
North Hardscrabble Creek	33,530	1,083	3%	333	2%
South Hardscrabble Creek	18,703	783	4%	652	1%
Saint Charles River Headwaters	35,091	4,302	12%	1,459	8%
Middle Creek	19,605	3,642	19%	2,748	5%
Squirrel Creek	12,533	2,125	17%	509	13%
North Creek	13,342	1,844	14%	789	8%
Red Creek	30,616	1,744	6%	1,100	2%
Peck Creek	18,782	590	3%	222	2%
Totals	182,201	16,113	9%	7,812	5%

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 Squirrel Creek and changes in all other watersheds 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 B (Proposed Action) could result in increases in 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.

Estimated 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. Therefore, the estimates of increased sedimentation are scaled to a watershed basis by the area treated in those watersheds. For example, in the Squirrel Creek watershed the sedimentation increase is the modeled increase times 0.17, because the treatments cover a maximum of 17 percent of the watershed.

The results for the FuME WEPP model are summarized by watershed in Table 18. The results show that the combined effects of thinning and prescribed fire are predicted to be less than one percent increase for all watersheds (Table 18). The modeled effects of thinning include increased road use. The FuME WEPP model also predicts the effects of wildfire intensity reduction that would result from the thinning and prescribed fire treatments. These results are presented only as a combined effect of thinning, prescribed fire, road use and wildfire intensity reduction. These results show a combined sedimentation reduction of between 2 and 13 percent (Table 18).

Table 18. FuME WEPP Increased Sedimentation by Watershed

Watershed Name	Thinning Effects	Prescribed Fire Effects	Combined Thinning & Prescribed Fire Effects	Combined Thinning & Prescribed Fire Effects with Wildfire Intensity Reduction
North Hardscrabble Creek	0.1%	0.1%	0.1%	-2.3%
South Hardscrabble Creek	0.1%	0.1%	0.1%	-3.0%
Saint Charles River Headwaters	0.2%	0.2%	0.4%	-8.7%
Middle Creek	0.3%	0.3%	0.7%	-13.1%
Squirrel Creek	0.3%	0.3%	0.6%	-12.0%
North Creek	0.2%	0.2%	0.4%	-7.3%
Red Creek	0.1%	0.1%	0.2%	-4.0%
Peck Creek	0.1%	0.1%	0.1%	-2.2%

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 recent 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 East-Central Wet Mountains 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.

Riparian areas serve as filters for sediment generated upslope. Stream buffers have been shown to be very effective in moderating cumulative watershed effects (Thomas et al. 1993 and Elliot et al. 2010). The Soil and Water Quality Protection features (see *2.4 Design Features*) include a 100-foot buffer that would minimize the chances of erosion from upland areas reaching streams.

With the full implementation of the BMPs (JW Associates 2010d) and the design features listed in *2.4 Design Features*, 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 East-Central Wet Mountains Project Area.

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 East-Central Wet Mountains Project Area.

Foreseeable future actions within the East-Central Wet Mountains Project Area include fuel hazard reduction treatments initiated under the Community Wildfire Protection Plans (CWPP) that have been developed for communities within the area. Two Community Wildfire Protection Plans (CWPPs) have been prepared that cover the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects some of which are located within the East-Central Wet Mountains Project Area.

The amount of vegetation treatments associated with the foreseeable future actions has not been determined, but they would likely be much smaller in size than the treatments proposed under Alternative B (Proposed Action). Cumulative effects on water yield, peak flows, and sediment yields would therefore not exceed the thresholds used for analysis in the above sections. The cumulative effects on water yield would be similar to the direct and indirect effects.

The reduction in wildfire hazard in the water supply watersheds for the Town of Beulah; North, Squirrel and Middle Creeks, would be substantial. Vegetation treatments would cover between 14 to 19 percent of those watersheds (Table 17). However, due to the large blocks of these watersheds that would remain untreated due to the presence of roadless areas, there would still be a concern for adverse effects from soil erosion, flooding, and debris flows following wildfires. Evidence of those concerns is the adverse effects of the Mason Gulch fire on North Creek.

The past, present and future foreseeable actions would not have adverse cumulative effects on water yield, peak flows, sediment yield or soil productivity. These actions have had a cumulative effect on the forest vegetation that has resulted in high wildfire hazards that would be reduced in these watersheds as a result of Alternative B (Proposed Action).

3.3.3 Soils Affected Environment

The geology in the East-Central Wet Mountains Project Area includes sedimentary sandstones from the Tertiary, Cretaceous, and Jurassic Ages and granites of the Precambrian Age. Landforms are primarily mountain slopes, but also include floodplains, valley slopes, and some plateaus, mesas, and benches. Most of the soils are rocky, ranging from less than 15 percent to above 60 percent. The surface soils range from sandy loams with around 45 percent gravels or stones to loams with about 25 percent gravels. Coarse fragments in the soils within the East-Central Wet Mountains Project Area average 40 percent.

Erosion processes in the area are dominated by overland flow in the lower elevations (7,000 to 8,500 ft.) where livestock grazing has removed much of the ground cover. This type of use has historically compromised streambank stability, and in some areas where these channels have not fully recovered, still contribute to sedimentation. Dominant processes from the lower montane to alpine environments include sheet and rill

erosion, as well as overland flow. Stream channel scour occurs in subwatersheds throughout the area. Organic matter ranges from less than one percent to 4 percent in the majority of the area with a small percentage of land mass comprised of riparian areas with higher amounts of organic matter.

3.3.4 Soils Environmental Consequences

The analysis of the effects of the proposed actions on soils focuses on compliance USDA Forest Service Handbook (FSH 2509.25) Watershed Conservation Practices Handbook. 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 A (No Action) - Direct and Indirect Effects

Alternative A (No Action) would have no direct short-term effect on the soils of the East-Central Wet Mountains 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. Effects from catastrophic wildfires would include increased erosion and loss of organic matter.

Alternative A (No Action) - Cumulative Effects

The potential cumulative effects of the past, present and future foreseeable actions on soils include recent and on-going vegetation treatments on private lands within the East-Central Wet Mountains Project Area. Under Alternative A, there would be no vegetation treatments on National Forest System (NFS) lands in the East-Central Wet Mountains Project Area. No cumulative effects on soils would be realized because there is no activity on soils on National Forest System lands.

Alternative B (Proposed Action) - Direct and Indirect Effects

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. Designated skid trails would minimize the extent of soil disturbance and 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 (*2.4 Design Features*).

With the full implementation of the BMPs (JW Associates 2010d), the protection features listed in *2.4 Design Features*, 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 East-Central Wet Mountains 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 B (Proposed Action) - Cumulative Effects

The potential cumulative effects of the past, present and future foreseeable actions on soils include fuel hazard reduction treatments initiated under the two CWPPs that cover portions of the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects, some of which are located within the East-Central Wet Mountains Project Area. The activities on National Forest System lands would be evaluated to determine if the activity areas would be adjacent to those on other ownerships. If they would be adjacent then the amount of soil disturbance should be carefully planned to keep the activity area under the Forest Plan standard of 15 percent of the activity area. The cumulative 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 East-Central Wet Mountains 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.

3.4 Wildlife

Wildlife is divided into three sections; Management Indicator Species (MIS), Federal Listed Species and Regional Forester's Sensitive Species. The environmental consequences section for federal listed and sensitive species is combined. The discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Management Indicator Species Specialist Report (JW Associates 2011a) and East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Wildlife/ Fisheries Biological Assessment/Biological Evaluation (JW Associates 2011b).

3.4.1 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 Code of Federal Regulations (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 (Table 19). If an MIS or its habitat was not found in the East-Central Wet Mountains Project Area, it was not identified for further analysis. The rationale for dismissing the other MIS species from further consideration is presented in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Management Indicator Species Specialist Report (JW Associates 2010e).

Table 19. Evaluation and Description of Pike and San Isabel National Forest MIS and Habitats[11]

MIS Species	Status	Suitable Habitat Present?	Documented or expected to be present?	Rationale
Abert's Squirrel *(Sciurus abertsi)*	MIS	Yes	Yes	Occurs in late succession ponderosa pine; Abert's squirrel is ecologically dependent on ponderosa pine with open understory for both nesting sites and food, and therefore generally limited to open montane forests.
American Elk *(Cervus elaphus)*	MIS	Yes	Yes	Preferred habitat varies widely and includes 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.
Brook Trout *(Salvelinus fontinalis)*	MIS	Yes	Yes	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. Brook trout have a strong association with beaver ponds and tend to hold along undercuts, submerged brush piles, and beaver lodges and dams.
Greenback cutthroat trout *(Oncorhynchus clarki stomias)*	TES MIS	Yes	Yes	Preferred habitat typically consists of clear, swift-flowing mountain streams with cover such as overhanging banks and vegetation; this species is also known to occur in lakes. Existing greenback populations are restricted to small, remote, high-elevation streams and lakes where populations often have been protected by natural and human-made fish movement barriers.

Abert's Squirrel - Natural History and Distribution

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, 2003). Target feed trees represent less than 10 percent of the trees in stands populated by Abert's squirrel along the Colorado Front Range, and they are chemically and physiologically different from trees not used (Allred and Gaud 1994). Tree chemistry also may affect nest-site selection. On the PSICC, surveys show approximately 92 percent of nests were in a tree group with 75 percent having 3 or more interlocking canopy trees. Hypogenous fungi (underground fruiting fungi which grows on the roots of ponderosa pine) are an important part of their diet, and bone and antlers are often gnawed for their mineral content (Pederson et al. 1987).

Long-term trends in Abert's squirrel populations have not been measured or monitored, but they can be deduced based on known changes to ponderosa pine habitat. Squirrel populations in Colorado were undoubtedly more abundant 150 years ago before ponderosa pine forests were subjected to logging, grazing,

11 MIS = Management Indicator Species; TES = federally threatened or endangered status

and fire suppression. Squirrel abundance and habitat capability varied spatially, depending on local forest conditions. Their 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.

Current Abert's squirrel population trend estimates for Colorado suggests stable or increasing abundance. The Natural Diversity Information Source (NDIS) database states that the species is fairly common in both El Paso and Teller Counties (NDIS 2010). Extensions of the known range have occurred in recent years in southwest and western Colorado (Davis and Bissell 1989). Population dynamics are poorly known (Fitzgerald et al. 1994). Population estimates range from 12 to 30 animals per square kilometer in the Black Forest of El Paso County, and from 82 to 114 per square kilometer near Boulder. Population estimates contain spatial and temporal variation, which are attributed to normal cyclic variations in annual biomass production of pine seeds (Patton 1985, Pederson et al. 1987).

Elevated mountain pine beetle (*Dendroctonus ponderosae*) populations in Colorado in recent years have resulted in ponderosa pine mortality. Direct effects on Abert's squirrel populations on the PSICC or in Colorado have not been quantified. In areas inhabited by Abert's squirrels that have experienced high mortality of mature ponderosa pine, squirrel populations could remain the same or decrease depending on squirrel densities prior to the pine beetle attack and the extent of ponderosa pine mortality. Given the recent pine beetle outbreak and resulting ponderosa pine mortality, squirrel populations on the PSICC will likely decline and range expansion will subside or retract until quality habitat for the species stabilizes (USDA Forest Service 2009). Other range-wide threats to Abert's habitat include forestry treatments that reduce acreage of mature ponderosa pine, as well as uncharacteristically large and severe wildfires in ponderosa pine. Abert's squirrels are considered a small game species in Colorado and hunting is permitted with a valid hunting license (USDA Forest Service 2009).

Table 20 displays an estimate of Abert's squirrel habitat at several different scales. There are approximately 15,400 acres of ponderosa pine in the East-Central Wet Mountains Project Area. It should be noted that not all of these acres are likely to provide suitable habitat for the squirrel. If 10 percent of the trees are assumed to be chemically suitable for Abert's, an unknown, but presumably many fewer acres of suitable habitat exist in the East-Central Wet Mountains Project Area.

Table 20. Approximate Acres of Potential Abert's Squirrel Habitat[12]

Habitat Quality	East-Central Wet Mountains Project Area	San Carlos Ranger District	San Isabel National Forest
High	5,400	12,200	31,100
Moderate	6,000	11,300	22,143
Forage	4,000	7,900	20,800
Totals	15,400	31,400	74,043

12 Source: USDA Forest Service 2010a.
*All habitat structural stages are for ponderosa pine dry and mesic habitats only. High quality = mature greater than 40 percent crown cover; Moderate quality = mature less than 40 percent crown cover; Forage = Sapling/Pole.
All values are rounded to nearest 1,000 acres.

American Elk - Natural History and Distribution

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 early 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. Based on Roderick and Milner (1991), either cover or forage may be limiting to elk, particularly on winter ranges or calving habitats. However, Cook et al. (1998) found no significant, positive effect of thermal cover on elk condition, and in fact found that "*dense cover provided a costly energetic environment, resulting in significantly greater overwinter mass loss, fat catabolism and (in 1 winter) mortality*". In light of the Cook et al. findings, and due to the history of fire suppression and resultant decrease in forest openings, forage is likely to be the limiting factor in the East-Central Wet Mountains Project Area. Open road densities greater than 1.5 miles per square mile of habitat on summer range or 1.0 mile per square mile of habitat on winter range are also considered a limiting factor due to direct factors such as death of elk by road collisions and indirect factors such as habitat fragmentation and disturbance of habitat (Rodrick and Milner 1991).

The CDOW annually monitors elk at the data analysis unit (DAU) scale to assess changes in population trends. A DAU is an area that an elk population uses throughout the year and is comprised of one or more game management units. All DAUs in the Forest are currently above the CDOW's defined long-term objectives. The East-Central Wet Mountains Project Area is located primarily within DAU E-28. Elk populations in the E-28 DAU are being managed from a slight over-population in the mid-1990's down to a sustainable herd level (Abel and Vitt 2005). The CDOW recommendation is to manage this DAU for an elk population within the range of 1,400-1,600 animals to maintain its quality harvest, population stability, and coexistence with agricultural interests in the available habitat (Abel and Vitt 2005). The population was estimated at around 1,600 animals in 2005 (Abel and Vitt 2005).

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.

The structure, composition, and landscape pattern of vegetation used by elk on the Pike and San Isabel National Forests, particularly the lower montane zone, has been substantially altered from its pre-European conditions by cumulative human impacts. Before logging, grazing, and fire suppression, ponderosa pine stands along Colorado Front Range were less dense, more open, and less vulnerable to diseases, insects, and large,

intense wildfires (Foster Wheeler Environmental Corporation 1999). Additional factors that affect elk activity and population size include disturbance from human activities such as recreation, roads, and hazardous fuels reduction. The 1984 Plan (USDA Forest Service 1984) provides some specific treatment guidance in big game management areas (Management Area 5B) that is unique from other habitat prescriptions.

The East-Central Wet Mountains Project Area represents approximately 21 percent of the production area, 20 percent of summer concentration area, 9 percent of winter range, 2 percent of severe winter range, and 5 percent of summer range (NDIS 2010) in the San Isabel National Forest (Table 21).

Table 21. Acres of Elk Summer and Winter Range[13]

MIS Species (Elk) Habitat Type	Acres of Potential Elk Habitat on National Forest Lands		
	East-Central Wet Mountains Project Area	San Carlos Ranger District	San Isabel National Forest
Winter Range	86,700	207,600	968,100
Summer Concentration Area	28,700	104,200	145,600
Severe Winter Range	3,400	45,700	200,400
Summer Range	111,700	409,400	2,364,500
Production Area	71,200	132,000	328,000
Migration Area	0	600	32,800

Brook Trout - Natural History and Distribution

Brook trout were selected as an MIS because: 1) the public has a high concern for this species and its habitat; and 2) the public 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 2005a).

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 CDOW, 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 (USFWS 1998). 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 cutthroat trout populations need to be protected from the superior competitor non-native trout species, their populations are kept at higher elevations above natural and human-

13 Source: NDIS 2010. All values are rounded to nearest 100 acres

made stream barriers. Brook trout surveys, combined with greenback cutthroat trout population monitoring, provide a more thorough assessment of the relationship between some management activities and issues (USDA Forest Service 2005a). 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 2005b). Introduction of hatchery-reared brook trout from the northeastern US has also affected native populations.

Greenback Cutthroat Trout - Natural History and Distribution

Greenback cutthroat trout are native to the South Platte and Arkansas River basins in central Colorado and perhaps southeastern Wyoming (USFWS 1998). Existing greenback cutthroat trout populations are restricted to small, remote high-elevation streams and lakes where populations often have been protected by natural and human-made fish movement barriers. Greenback cutthroat trout favor relatively clear, cool waters, preying primarily on aquatic and terrestrial invertebrates. Many of these habitats are colder, less productive, and undergo significant flow fluctuations, leading to small, slow-growing trout populations (Young 1995, Harig and Fausch 2002, Coleman and Fausch 2007).

Greenback cutthroat trout populations declined rapidly following immigration and settlement of the Front Range of Colorado in the mid to late 1800s. Pollution from mining, stream dewatering for agriculture, commercial harvest, and introduction of non-native salmonids decimated populations. Greenback cutthroat trout readily hybridize with rainbow trout and cannot coexist with brook trout or brown trout. Introductions and invasions by nonnative trout eliminated greenback cutthroat trout from most of their historical range (Harig et al. 2000). Their decline occurred so rapidly that their distribution was not well known (USFWS 1998). Greenback cutthroat trout were federally listed under the ESA as endangered in 1973 and later downlisted to threatened in 1978. Greenback cutthroat trout recovery is the PSICC fishery program's number one priority, as the bulk of the pure genetic greenback cutthroat trout populations and available habitat occur on the Forest. In accordance with the Forest Plan (USDA Forest Service 1984), the USDA Forest Service has worked closely with the CDOW and USFWS to implement the Greenback Cutthroat Trout Recovery Plan (USFWS 1998), resulting in the reintroduction of the species into 19 miles of stream habitat and 79 acres of lake habitat on the Pike and San Isabel National Forests as of 2005 (USDA Forest Service 2005a). Today, eight populations on the PSICC are afforded protection under the ESA and contribute to recovery and delisting goals and objectives (USDA Forest Service 2009). Recent genetic work by Metcalf et al. (2007), Martin (2008), and Martin et al. (2005), however, suggest that five of these populations consist of either genetically hybridized cutthroat trout or pure strain Colorado River cutthroat trout. As such, these populations are more similar to populations west of the Continental Divide in the Colorado River basin than to greenback cutthroat trout populations in the Arkansas or South Platte rivers. The USFWS has not yet changed the protection status of these populations. Therefore, the PSICC continues to provide the populations full protection status until otherwise directed by USFWS. Continued threats to the species in the East-Central Wet Mountains Project Area include non-native fishes and degradation of riparian and stream habitat by recreational vehicles.

There are no known populations of greenback cutthroat trout within the proposed treatment areas. One watershed in the East-Central Wet Mountains Project Area (Greenhorn Creek) is listed as supporting

greenbacks, however the section of the creek with greenbacks is above the proposed treatment areas. Greenhorn Creek was stocked with greenbacks but the population is not considered stable.

3.4.2 Management Indicator Species Environmental Consequences

For each species, effects analysis is provided on the direct and indirect impacts to: (1) habitats; and (2) each specific species. The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and ending 20 years into the future. The cumulative effects analysis area includes the East-Central Wet Mountains Project Area. The analysis and determinations assume that the features listed in *2.4.3 Fish and Wildlife Protection* would be implemented. The indicators listed below are used to measure impacts of the project on wildlife and fish habitat:

- Pine structural stage diversity (resulting structural stage distributions);
- Aspen communities (acres enhanced);
- Snag retention (number of snags per acre); and
- Water quality effects (changes to water quantity and quality).

Alternative A (No Action) - Direct and Indirect Effects - MIS Habitats

There would be no direct effects of Alternative A (No Action), 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. Over the long term, the proportion of the ponderosa pine cover type in the East-Central Wet Mountains Project Area would be expected to rise as it continues to encroach into existing open areas and riparian and hardwood stands from habitat edges. Early successional habitats would continue to decline as pine stands progress toward later seral stages. This trend would not comply with Forest Plan goals and management direction, since it would not increase wildlife habitat diversity or provide or enhance habitat for MIS. Natural disturbances such as wildfires and mountain pine beetle outbreaks would continue to return portions of the forest in which they occur to early successional stages.

Alternative A (No Action) - Direct and Indirect Effects - MIS Species

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 MIS species.

Abert's Squirrel

Assuming a continuation of fire suppression policies, continued forest succession would lead to the expansion of mature ponderosa pine stands. The availability of open ponderosa pine habitat, however, would continue to decrease as forest understory growth continues and dense canopy continues to develop. Dense late-successional stands would lead to an increased risk of high-severity wildfire. Should a stand-replacing fire occur, it could cause significant adverse effects to Abert's squirrel habitat.

American Elk

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

Brook Trout

Assuming a continuation of fire suppression policies, the extent of late successional pine forest would increase. Dense late-successional stands would lead to an increased risk of high-severity wildfire. Should a stand-replacing fire occur, erosion from burned hillsides could increase sediment loading in East-Central Wet Mountains Project Area streams, leading to a decrease in brook trout habitat as well as resulting in a risk of direct mortality.

Greenback Cutthroat Trout

Continuation of fire-suppression policies would be expected to increase late-successional pine forest. Dense late-successional stands would lead to an increased risk of catastrophic wildfire. In the event of a stand-replacing fire, erosion could increase sediment loading in these streams, which would have an adverse effect on trout habitat.

Alternative A (No Action) - Cumulative Effects

The existing condition of the vegetation within the East-Central Wet Mountains Project Area is largely the result of past and present human activities. The Euro-American settlement of the 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. By the turn of the century much of the original forest vegetation had been altered through mining, timber harvesting, and livestock grazing. 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.

Recent fires within the East-Central Wet Mountains Project Area have resulted in creating large areas of early successional vegetation. The largest of these fires was the 2005 Mason Gulch fire which burned 11,000 acres in the northeast corner of the East-Central Wet Mountains Project Area. This high-intensity fire burned through part of the lower montane vegetation zone and created large openings, leading to extensive erosion.

Limited timber harvesting has occurred within the East-Central Wet Mountains Project Area over the past twenty years. These projects have been limited in scope and have affected only a small portion of the forest stands within the East-Central Wet Mountains Project Area. Currently there is a spruce salvage project that is active just outside of the East-Central Wet Mountains Project Area.

Foreseeable future actions within the East-Central Wet Mountains Project Area include fuel hazard reduction treatments initiated under the Community Wildfire Protection Plans (CWPPs) that have been developed for communities within the area. Two CWPPs have been prepared that cover the East-Central Wet Mountains Project Area. These CWPPs have identified high priority projects, some of which are located within the East-Central Wet Mountains Project Area.

The Pueblo County CWPP (2006) identified the following high priority project:

> The USDA Forest Service would work with the Pueblo County CWPP partners to create shaded fuel breaks approximately 500 feet wide from the centerline of SR 165 on both sides of the highway from Rye to Lake Isabel and along 12-Mile Road (SR 78), where feasible; from Highway 165 to Beulah.

The Custer County CWPP (2007) identified the following high priority projects.

> The USDA Forest Service would work with the Custer County CWPP partners to identify fuel modification projects in the Wet Mountain/San Isabel high-density neighborhood.

Under Alternative A, there would be no additional vegetation treatments on National Forest lands in the East-Central Wet Mountains Project Area. The potential future treatments would only affect a very small proportion of the East-Central Wet Mountains Project Area. Even with these on-going and potential future activities, a large portion of the East-Central Wet Mountains Project Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer.

Cumulatively, the past, present and reasonably foreseeable future actions in the East-Central Wet Mountains Project Area under Alternative A would result in an area dominated by forest stands that are relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire. These risks could also affect MIS species and their habitats.

Alternative A (No Action) - Population Viability

Given the absence of direct, ground-disturbing activities, Alternative A (No Action) would not affect species population trends or overall viability. In the event of a stand-replacing wildfire in the East-Central Wet Mountains Project Area, MIS 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 (No Action) would have no effect on or contribution to meeting Forest Plan objectives for each MIS described.

Alternative B (Proposed Action) - Direct and Indirect Effects - MIS Habitats

In general, there would be short-term impacts on wildlife habitat availability during treatments; however, over the long-term there would be improved quantity, diversity, and quality of habitat, as well as decreased risk of habitat loss due to stand-replacing wildfire. The treatments would create openings within the conifer forest, slightly reducing its acreage in the East-Central Wet Mountains Project Area. There would be an increase in the diversity of understory plants within many pine stands due to reduced forest canopy cover and disturbance caused by thinning and prescribed fire. In addition, cutting of diseased trees may occur in limited sites. These treatments would open up stands and improve forest health. Treatment of aspen stands would remove diseased trees and reduce competition from conifers, thereby improving health and vigor. Disturbance created by prescribed fire would also help stimulate regeneration of the less shade-tolerant plant species within these

stands. Treatments under Alternative B (Proposed Action) would also improve the diversity of structural stages. Alternative B (Proposed Action) would move the East-Central Wet Mountains Project Area closer to historical conditions.

Alternative B (Proposed Action) - Direct and Indirect Effects - MIS Species

Abert's Squirrel

Under Alternative B (Proposed Action), direct impacts include the potential for short-term disturbances or displacement of Abert's squirrels during project implementation activities, and potential removal of Abert's feeding or nesting trees in some circumstances. However, in the majority of circumstances, medium and large ponderosa pine trees would not be removed, as treatments in mature ponderosa pine stands would favor leaving clumps of trees and a stand structure that is more reflective of the historical conditions before the fire-suppression era began. In addition, design features (see *2.4 Design Features)* provide for the protection of trees currently used by Abert's and/or creation of Abert's squirrel nest tree clumps (0.1 acre of 9 to 22 inch dbh ponderosa pine with a basal area of 180 to 220 square feet, if available, and interlocking canopy) average per six acres in ponderosa pine per Forest Plan guidelines (JW Associates 2011a). Although not all trees provide suitable habitat for Abert's squirrels due to the specific tree chemistry requirements for feed trees, basal area and canopy closure of trees in a stand have been significantly related to squirrel density in a number of studies (Ratcliff et al. 1975, Patton et al. 1985, Pederson et al. 1987, Dodd et al. 1998). In addition, States and Gaud (1997) found a reduced abundance of hypogeous fungi used by squirrels in stands with the least basal area. These studies, among others, suggest that the preservation of existing feed trees as well clusters of interlocking trees with high basal areas may limit the impacts of forest treatment (Keith 2003).

Over the long-term, Alternative B (Proposed Action) treatments in dry and mesic ponderosa pine habitat would likely improve Abert's squirrel habitat by opening up the forest understory and by reducing canopy densities that are outside of the historical range of variability. This would reduce competition for light, moisture, and nutrients, thereby accelerating the development of mature and old growth ponderosa pine stands, which are desirable for Abert's squirrel. Abert's squirrel habitat would return to pre-project levels if fires were not allowed to occasionally burn in the area to keep the forested and shrubby areas' canopy covers at low to moderate levels. If naturally ignited fires are allowed to burn in the area, the East-Central Wet Mountains Project Area would likely maintain the quality and quantity of Abert's squirrel habitat that is comparable to the historical range of variability. There is the potential for a slight increase in the number of Abert's squirrels that could be supported over current levels due to increased forage and improved stand structural components. Due to lack of treatments in 2001 roadless areas, the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area.

Habitat for Abert's Squirrels would be managed according to MIS direction in the Forest Plan (USDA Forest Service 1984). Table 22 presents Alternative B (Proposed Action) treatments by habitat quality level. Alternative B (Proposed Action) has the potential to affect high, moderate, or forage suitable ponderosa pine habitat on 3,400 acres of the East-Central Wet Mountains Project Area. There are approximately 74,000 acres of ponderosa pine habitat within the high, moderate, or forage categories for Abert's squirrel on the Forest.

Alternative B (Proposed Action) would therefore affect up to 4.6 percent of this habitat on the Forest. Treatments would probably not result in a measurable change in Abert's population levels. Given the wide distribution and apparent abundance in the region, there are no viability concerns.

Table 22. Potential Abert's Squirrel Habitat Impacted by Alternative B (Proposed Action)[14]

Habitat Quality	Area in East-Central Wet Mountains Project Area (acres)	Area within Dry and Mesic Ponderosa Pine Treatment Area (acres)
High	5,400	1,500
Moderate	6,000	1,400
Forage	4,000	500
Totals	15,400	3,400

American Elk

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. Design Features (See 2.4 Design Features) would limit disturbance to production (calving) areas by limiting disturbance in these areas between May 15 and June 30. Openings of 1 to 40 acres would be created over 20 to 25 percent of the treatment areas to restore historic conditions. 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 East-Central Wet Mountains 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. Elk forage quality and quantity would improve over pre-project levels. Over the longer term, elk forage quality and quantity would return to pre-project levels if fires were not allowed to occasionally burn in the area to keep the forested and shrubby areas' canopy covers at low to moderate levels. If naturally ignited fires were allowed to burn in the area, the East-Central Wet Mountains Project Area would likely maintain the quality and quantity of elk foraging that is comparable to the historical range of variability. Due to lack of treatments in roadless areas, habitat would not be improved and the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area.

The proposed treatment area contains elk summer range, winter range, severe winter range, and production areas, as well as summer concentration areas. Potential elk habitat in the treatment area, however, is minor in

[14] Source: USDA Forest Service 2010. All habitat structural stages are for ponderosa pine habitats only. High quality = USDA Forest Service Region 2 sensitive species 4B, 4C, or 5; Moderate quality = USDA Forest Service Region 2 sensitive species 4A; Forage = USDA Forest Service Region 2 sensitive species 3A, 3B, or 3C. All values are rounded to nearest 1,000 acres.

relation to that available on the San Isabel National Forest overall and the San Carlos Ranger District (Table 23). Up to 16,500 acres of summer range, 13,700 acres of winter range habitat, 12,200 acres of production area, 5,100 acres of summer concentration area and 1,700 acres of severe winter range could be affected by proposed treatments under Alternative B (Proposed Action). Treatments would probably not result in a measurable change in elk populations or trends at the Forest level. Given the wide distribution, abundance, stable or increasing population trend, and game status of elk, there are no viability concerns.

Table 23. Acres of Elk Habitat Impacted by the Proposed Action[15]

Habitat Type	Area in Project Area (acres)	Area in Treatment Area (acres)
Winter Range	86,700	13,700
Summer Range	111,700	16,500
Summer Concentration Area	28,700	5,100
Severe Winter Range	3,400	1,700
Production Area	71,200	12,200

Brook Trout

There would be no direct effects on brook trout or its habitat as a result of Alternative B. Alternative B could result in minor runoff, sedimentation increases, and ash litter due to prescribed fires, as well as ground disturbance and subsequent erosion caused by heavy machinery and vehicles in the East-Central Wet Mountains Project Area. However, design features (see 2.4 Design Features) for riparian areas (*2.4.3 Fish and Wildlife Protection*) are incorporated into the project to ensure that impacts on streams and riparian areas are minimized. Long-term project treatments would reduce the risk of sedimentation into East-Central Wet Mountains Project Area streams from intense wildfire or precipitation; refer to the Greenback cutthroat trout section, below, for details. Treatments would not likely result in a measurable change in brook trout populations or trends. Due to lack of treatments in 2001 roadless areas, the potential for wildfire and disease and/or insect infestation would remain high in some portions of the East-Central Wet Mountains Project Area.

Greenback Cutthroat Trout

There would be no direct or indirect effects on greenback cutthroat trout or its habitat as a result of Alternative B (Proposed Action). There are no known populations of greenback cutthroat trout within the proposed treatment areas. The section of Greenhorn Creek with greenbacks is above the proposed treatment areas. In addition, this population is not considered stable. Any potential impacts to East-Central Wet Mountains Project Area aquatic habitat would be minimized through the implementation of US Forest Service aquatic and riparian guidelines such as the Region 2 Watershed Conservation Practices Handbook. Project design features for riparian areas (see *2.4 Design Features)*, are incorporated into the project to ensure that impacts on streams and riparian areas are minimized. In addition, project design criteria include specific measures for greenback cutthroat trout watersheds.

15 Source: NDIS 2010. All values are rounded to nearest 100 acres.

In the long term, the removal of slash and debris and the opening of the forest canopy in some areas would stimulate new, more vigorous understory growth, and would ultimately enhance soil stability, thereby reducing erosion and sedimentation potential. Furthermore, in the long term, Alternative B (Proposed Action) would reduce the potential for large-scale, stand-replacing fires in the East-Central Wet Mountains Project Area that would likely contribute to major erosional events. Due to lack of treatments in roadless areas, the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area. With successful implementation of the design features (see *2.4 Design Features)*, short-term effects on greenback cutthroat trout habitat are anticipated to be negligible.

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 area on the composition and condition of the forest vegetation within the East-Central Wet Mountains Project Area. The cumulative effects analysis covers a period of time starting with settlement of the area by Euro-Americans and ending 10 years into the future. The cumulative effects analysis area includes all lands within the East-Central Wet Mountains Project Area.

The existing condition of the vegetation within the East-Central Wet Mountains Project Area is largely the result of past and present human activities within the area. Large changes to the forest took place with the settlement of the area in the mid to late 1800s. This period of intensive logging and wildfires was followed by a period of fire suppression and reduced logging. In more recent years, vegetation treatments have been limited in scope and area.

The proposed actions under Alternative B (Proposed Action) in combination with these more recent and future foreseeable vegetation treatments in surrounding areas would have a cumulative effect on the forest structure of the East-Central Wet Mountains Project Area.

The treatment areas proposed for the project account for only 17 percent of the East-Central Wet Mountains Project Area. These treatments would reduce the risk of a wildfire or beetle infestation that could spread to forest stands within the untreated portions of the East-Central Wet Mountains Project Area. The incremental contribution of Alternative B (Proposed Action), enhancement of habitat throughout the East-Central Wet Mountains Project Area, when combined with other past, present, or reasonably foreseeable future actions, would have minor long-term, but generally beneficial cumulative effects on MIS species habitat quality in the area.

However, even with the amount of treatment proposed under Alternative B, there would still be a large area of untreated montane forest within the 2001 inventoried roadless areas. Stands within these areas would still pose an increased risk of widespread damage by wildfire and/or insect and disease infestations.

Alternative B (Proposed Action) - Population Viability

Abert's Squirrel

Alternative B (Proposed Action) treatments would have long-term beneficial effects on Abert's squirrel habitat suitability. Treatments in ponderosa pine habitat would mimic natural succession and disturbance processes

and would create a mosaic of habitat conditions over time. Project design features (*2.4 Design Features*) would provide for the protection of adequate existing and potential squirrel nest tree clumps.

Understory treatments would also improve foraging habitat for the Abert's squirrel. 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 and increase 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 summer and winter range within the East-Central Wet Mountains 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 the potential for a future stand-replacing wildfire in the East-Central Wet Mountains Project Area, which could ultimately have adverse effects on the viability of brook trout locally. Effects to brook trout after implementation of design features (*2.4 Design Features*) 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.

Greenback Cutthroat Trout

As described above, Alternative B (Proposed Action) is intended to reduce the potential for large-scale stand-replacing wildfires in the East-Central Wet Mountains Project Area, thereby decreasing the risk of erosion into greenback cutthroat trout watersheds. There are no known populations of greenback cutthroat trout within the proposed treatment areas. Project design features (*2.4 Design Features*) are incorporated to minimize or prevent adverse effects to trout habitat and populations as a result of treatment activities. In general, Alternative B (Proposed Action) would contribute to meeting Forest Plan objectives for greenback cutthroat trout and to maintaining adequate habitat for populations in the Forest.

3.4.3 Federal Listed Species Affected Environment

This section is a summary of the analysis on federal listed species (endangered, threatened, and proposed) presented in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Wildlife/Fisheries Biological Assessment/Biological Evaluation (JW Associates 2011b). Only those species known or with a potential to occur or be affected by the proposed alternatives are analyzed (Table 24). Excluded species are eliminated from further analysis by meeting one or more of the following conditions:

1. The species does not occur or is not expected to occur in the East-Central Wet Mountains Project Area during the time period activities would occur;
2. The species occurs in habitats that are not present; and/or
3. The East-Central Wet Mountains Project Area is outside of the geographical or elevational range of the species.

Table 24. Federal Listed Threatened, Endangered and Candidate Species Considered for Analysis[16]

MIS Species	Status	Rationale
Greenback cutthroat trout (*Oncorhynchus clarki stomias)*	T, MIS, t	Well-oxygenated headwaters of mountain streams. Restricted to only a few small drainages on the Pike and San Isabel National Forest per recent genetic studies. The headwaters of Greenhorn Creek contains a population of greenbacks but it not considered stable.
Canada lynx (*Lynx canadensis*)	T	Generally occurs in boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth, but also sometimes enters open forest, rocky areas, and tundra to forage for abundant prey. Suitable habitat available in the East-Central Wet Mountains Project Area.
Mexican spotted owl (*Strix occidentalis lucida*)	T	Mixed conifer habitat (Douglas-fir, ponderosa pine, white fir) located in steep, rock-walled canyons. Portion of the East-Central Wet Mountains Project Area contain designated critical habitat or protected habitat.

Greenback cutthroat trout are addressed in the MIS section (*3.4.1 Management Indicator Species Affected Environment* and *3.4.2 Management Indicator Species Environmental Consequences*) above. The rationale for dismissing the other federal listed species from further consideration is presented in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project BA/BE (JW Associates 2011b).

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 (USFWS 2004). In 2004, the USFWS revised its 2001 critical habitat designation to include approximately 8.6 million acres for the Mexican spotted owl (MSO) in portions of its range in the southwest (USFWS 2004). Approximately 51,800 acres within the East-Central Wet Mountains Project Area, and 7,600 acres within the proposed treatment area, have been designated as critical habitat for the MSO. Reviews would be conducted prior to project initiation to confirm the presence of suitable habitat within designated critical habitat in the East-Central Wet Mountains Project Area.

Canada Lynx - Natural History and Distribution

The Canada lynx (*Lynx canadensis*) was listed as a threatened species in portions of the lower 48 states by USFWS on April 24, 2000 (Ruediger et al. 2000). Lynx may have been locally extirpated from Colorado by

16 T = Threatened, E = Endangered, C = Candidate, t = State threatened, MIS = Management Indicator Species

about 1973. Between 1999 and 2007, 218 lynx were released in the San Juan Mountains of southwestern Colorado as part of a reintroduction program. Today, lynx in the Southern Rockies occur at relatively low densities and are found almost exclusively in cool, moist, coniferous forest types where their winter diet is dominated by snowshoe hare (*Lepus americanus*) and to a lesser degree red squirrel (*Tamiasciurus hudsonicus*) and ground squirrels (*Spermophilus spp.*). Lynx in the wet mountain and the surrounding area are found primarily within the subalpine and upper montane forests zones typically from 8,000 to 12,000 feet in elevation, depending on latitude or moisture gradients (Ruediger et al. 2000).

Lynx habitat includes dense spruce-fir, cool-moist mixed conifer (including Douglas-fir and white fir), early seral lodgepole pine, mature lodgepole pine with a developing understory of spruce-fir, and aspen stands in the subalpine zone and timberline. Lynx use caves, rock crevices, banks, and logs for denning. Dry forest types (i.e., ponderosa pine) were mapped as nonhabitat (Wrigley et al. 2007).

Lynx Analysis Units (LAUs) have been developed for the PSICC. LAUs are not intended to depict actual lynx home ranges, but are intended to provide analysis units of the appropriate scale with which to begin the analysis of potential direct and indirect effects of projects or activities on individual lynx, and to monitor habitat changes (Ruediger et al. 2000). A portion of the Wet Mountain LAU for Canada lynx occurs within the East Central Wet Mountains Project Area, including areas designated as denning, wintering, or other suitable habitats. Approximately 94,500 acres of the LAU (or 30 percent of the total LAU acreage) is located within the East-Central Wet Mountains Project Area. Approximately 13,300 acres of the LAU (4.2 percent of the total LAU acreage) are located in within the treatment area. It should be noted that not all portions of the LAU may provide suitable habitat for lynx. Lynx habitat types within the treatment area, East-Central Wet Mountains Project Area and Wet Mountain LAU, as well as within the District and Forest, are shown in Table 25.

Additional habitat classifications of significance to Canada lynx include designated critical habitat as defined by the USFWS and lynx linkage areas, which provides landscape connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas where blocks of lynx habitat are separated by intervening areas of non-lynx habitat such as basins, valleys, agricultural lands, or where lynx habitat naturally narrows between blocks. Currently, there is no designated or proposed critical habitat for the Canada lynx in Colorado (USFWS 2010). Additionally, there are no lynx linkage areas in the East-Central Wet Mountains Project Area.

Table 25. Canada Lynx Habitat Summary[17]

Habitat Type	Proposed Treatment Area	East-Central Wet Mountains Project Area	Total Wet Mountain LAU	Wet Mountain LAU (NFS only)	San Carlos Ranger District	San Isabel National Forest
Denning	1,283	17,287	30,945	30,945	82,870	101,469
Other	1,644	6179	41,220	17,219	30,451	34,775
Winter	4,861	25,510	51,932	51,801	104,874	113,768
Unsuitable	0	535	1,205	1,205	1,414	1,414
Non-habitat or Unknown	5,500	44,971	189,524	97,518	152,721	174,848
Totals	13,288	94,482	314,826	198,688	372,330	426,274

The Southern Rockies Lynx Amendment (SRLA) was signed in October 2008. The SRLA decision amends eight Forest Plans in Colorado and Wyoming, including the PSICC Forest Plan. This decision supersedes the 2000 Lynx Conservation Assessment Strategy (LCAS) in the SRLA area (USDA 2008). The LCAS remains a valuable reference for lynx biology, behavior, and recent research. This report will consider both the SRLA management direction and factors affecting lynx, as well as recommended conservation measures identified in the LCAS (pertinent SRLA and LCAS guidelines can be found in Appendix B).

Approximately 87.2 percent of the proposed treatment area (16,393 acres) is located within the 1.5-mile WUI buffer. The Wet Mountain LAU and WUI area overlap on approximately 12,388 acres or 65.9 percent of the proposed treatment area; an additional 900 acres in treatment area are non-WUI but are still within the Wet Mountain LAU. The SRLA decision exempts fuels treatment projects in the WUI from vegetation management standards including VEG S1, S2, S5, and S6 (see Appendix B) on up to 3 percent of lynx habitat by national forest, as well as allowing other exceptions including additional forest thinning (up to 1 percent by LAU) within lynx habitat (USDA 2008). It is, however, recommended that fuels treatments in the WUI should be designed considering these standards. This ensures that lynx are considered in project design and also underscores that, in many cases, these projects can be designed to reduce hazardous fuels while still providing for lynx needs (USDA 2008). Fuels treatments within the non-WUI areas are not exempt from any vegetation management standards.

---

17 Sources: US Forest Service, 2010, US Forest Service 2009
Note that treatment area, East-Central Wet Mountains Project Area and LAU acreages have been updated using the GMUG NF's model, 2010.
Other – Other habitat components, not specific to denning or winter habitat, are present.
Unsuitable - Areas within identified/mapped lynx habitat that are in early successional stages as a result of recent fires or vegetation management, in which the vegetation has not developed sufficiently to support snowshoe hare populations during all seasons. Management-created openings would likely include clearcut and seed tree harvest units, and might include shelterwood and commercially-thinned stands depending on unit size and remaining stand composition and structure. (Ruediger et al. 2000)
Non-Habitat or Unknown – No data or no suitable habitat present.

Field Reconnaissance

A lynx was seen in the East-Central Wet Mountains Project Area (crossing the road/stopping to groom) near Bigelow Divide in November 2010 by FS personnel. No lynx have been sited and no known denning sites have been documented for lynx in the East-Central Wet Mountains Project Area or vicinity, but there is individual radio-collar lynx location data from February 1999 to February 2005 documenting lynx in the Sangre de Cristo Mountains, Spanish Peaks, and Wet Mountains (Wrigley et al. 2007).

Mexican Spotted Owl - Natural History and Distribution

The range of the MSO extends from Mexico into the southwest states of Arizona, New Mexico, Texas, Colorado and Utah. Historical records for the MSO in Colorado are very rare, and the historical distribution is very difficult to infer (Foster Wheeler Environmental Corporation 1999). This species was listed by the USFWS in 1993. In 2004, the revised designated critical habitat was released, including 8.6 million acres on federal lands in Arizona, New Mexico, Colorado, and Utah (USFWS 2004). The East-Central Wet Mountains Project Area contains approximately 34,000 acres of designated critical habitat within critical habitat unit SRM-C-1b. This critical habitat unit encompasses portions of Pueblo, Custer, Huerfano, and Fremont counties. Within this larger area, critical habitat is limited to areas that meet the definition of protected and restricted habitat. It should be noted that there are some areas within the critical habitat boundaries that do not and cannot support the primary constituent elements and are, by definition, not considered to be critical habitat, even though they are within the identified mapped boundaries (USFWS 2001).

Protected habitat, as defined in the 1995 Recovery Plan, refers to Protected Activity Centers (PACs) and all other areas that are in mixed conifer and pine-oak types with slope greater than 40 percent where timber harvest has not occurred in the past 20 years, as well as administratively reserved lands. Protected habitat receives the highest level of protection under the recovery plan (USFWS 1995). Protected habitat guidelines are intended to protect all occupied nesting and roosting habitat areas, as well as all unoccupied steep slopes and reserved lands (USFWS 1995). PACs are at least 600 acres in size and include the best possible MSO habitat with the nest or roost site as near to the center as possible (USFWS 2001). PACs includes approximately 75 percent of the foraging area of an owl, and management activities are restricted or banned in PACs (USFWS 2001). There are portions of three PACs in the East-Central Wet Mountains Project Area; the St. Charles River, Fourmile Creek and Smith Creek PACs. Project design features (see *2.4 Design Features)* do not allow for treatment in PACs.

Due to the mixed-conifer vegetation type and steep slopes in the East-Central Wet Mountains Project Area, 11,801 acres in the East-Central Wet Mountains Project Area and 1,137 acres in the treatment area meet the definition of protected area outside of PACs. Due to project design features (see *2.4 Design Features)*, which exclude areas with slope over 35 percent from mechanical thinning and harvest treatments that utilize heavy equipment or machinery, the actions within this area will be minimal. Additional conservation measures for protected areas are included in protected habitat guidelines and are applicable to all proposed treatments in the East-Central Wet Mountains Project Area, as stated in the project design features (see *2.4 Design Features)*.

Restricted habitat, as defined in the 1995 Recovery Plan, refers to potential nesting and roosting habitat in unoccupied areas. Restricted habitat areas include ponderosa pine, Gambel oak and mixed-conifer forests, as

well as riparian environments. In restricted habitat areas, the landscape should be managed to sustain or promote nesting habitat that is well distributed spatially. The proposed treatment area contains approximately 4,978 acres of restricted habitat. The objective of the restricted habitat guidelines is to manage the landscape in order to maintain and create replacement MSO habitat where appropriate while providing a diversity of stand conditions and stand sizes across the landscape, to minimize threats to the MSO, to retain and enhance important but difficult-to-replace habitat elements, and to provide management flexibility. The restricted habitat guidelines are applicable to all proposed treatments in the East-Central Wet Mountains Project Area. These guidelines are included in the project design features (see *2.4 Design Features)*.

Total acres for critical, protected, and restricted habitat types in the East-Central Wet Mountains Project Area, the District, and the Forest is shown in Table 26. It should be noted that critical habitat overlaps with both restricted and protected habitat in different portions of the treatment area.

Table 26. Mexican Spotted Owl Habitat Summary[18]

Habitat Type	Proposed Treatment Area (acres)	Project Area (acres)	San Isabel National Forest (acres)
PACs	0	4,694	4,983
Protected Habitat outside of PACs	1,137	11,801	88,534
Restricted Habitat	11,089	71,440	207,641
Critical Habitat	7,655	51,758	112,016

Forested stands used by Mexican Spotted Owls have certain structural features in common. These structural conditions do not occur evenly throughout the landscape. Nesting and roosting stands exhibit certain identifiable features including high tree basal area, large trees, multi-storied canopy, high canopy cover, and decadence in the form of downed logs and snags (USFWS 1995). Target/Threshold habitat conditions have been developed for restricted habitat to protect appropriate nesting habitat structure where it currently exists and to manage other stands so that they develop the necessary structure over time (USFWS 1995). The USFWS used tree basal area, large tree (greater than 18 inches dbh) density, and tree size-class distribution as the variables to define nesting and roosting target/threshold conditions (Table III.B. 1 in US Forest Service 1995, see Appendix C). The values provided in Table III.B.1 represent targets since they define the desired conditions to be achieved with time and management, and threshold conditions since they define the minimum level that must be maintained for each constituent habitat element. Based on recovery plan guidelines, management activities can occur in stands that exceed these conditions. However, the outcome of such activities cannot lower the stands below the threshold levels unless large-scale ecosystem assessment demonstrates that such conditions occur in a surplus across the landscape (USFWS 1995). Project design features (see *2.4 Design Features)* incorporate Target/Threshold requirements for suitable MSO habitat. Within MSO critical habitat in the East-Central Wet Mountains Project Area, approximately 24,818 acres have been identified as meeting target/threshold conditions.

[18] Source: USDA Forest Service 2009

MSO have been located on the Pikes Peak, South Platte, and San Carlos Ranger Districts on the PSICC. Historical records occur throughout most of the Front Range. MSO are residents of old-growth or mature forests that contain complex structural components – uneven aged stands, high canopy closure, multi-storied levels, high tree density (USFWS 1995). Nesting habitat is typically in rocky canyons or forested mountains below 9,500 feet with high canopy closure, high stand density, and a multilayered canopy resulting from an uneven-aged stand (Kingery 1998). All nests in Colorado found to date occur on cliff ledges or in caves along canyon walls. These include both sheer, slick rock canyons with scattered patches of Douglas-fir, and steep canyons with exposed bedrock cliffs, with various tiers of exposed rock at various heights. The primary constituent elements for canyon habitat include one or more of the following attributes – cooler and often more humid conditions than the surrounding area; clumps or stringers (rows) of trees, or canyon walls containing crevices, ledges, or caves; a high percent of dead litter and woody debris; and riparian or woody vegetation. Foraging habitat generally has bigger logs, higher canopy closure, and greater densities of trees and snags than random sites (USFWS 1995). Mated pairs of owls defend a breeding territory at least during the nesting season (March through August). Dispersal from the nest area usually occurs from mid-September to early October. MSO breed sporadically, and not all birds nest every year. Local conditions, particularly for the prey base, may govern nesting success (USFWS 1995).

Field Reconnaissance

MSO surveys using US Forest Service protocols have been conducted in drainages with potential MSO habitat for two years (4 times per drainage each year) throughout the East-Central Wet Mountains Project Area and vicinity with no positive results (Torretta 2010). A pair of MSO was observed in the St. Charles River PAC in 2004, but no nests are known in the PAC. MSO detections in the San Carlos Ranger District are: Oak Creek (June 2006); Fourmile Creek (2000); Smith Creek (1991); and South Apache Creek (1990). Surveys near Turkey Creek (2004 and 2006); Maes Creek (2004); and Custer Creek (2004) did not detect any MSO. CNHP data also indicates an elemental occurrence of this species in the vicinity of Hardscrabble Mountain near Beulah.

3.4.4 Sensitive Species Affected Environment

This section is a summary of the analysis on USDA Forest Service Region 2 sensitive species (SS) presented in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Wildlife/Fisheries Biological Assessment/Biological Evaluation (JW Associates 2011b). Sensitive species are those animal 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; and/or
- Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5).

Region 2 developed a list of sensitive species that became effective December 1, 2003, and was revised in 2007. The Pike and San Isabel National Forest has since reviewed the Regional Sensitive Species List and identified species that occur, are suspected of occurring, or have habitat present in the Forest. Region 2 sensitive species with the potential to occur in the Pike and San Isabel National Forest were reviewed for consideration in this analysis. Only those sensitive species known or with a potential to occur or be affected by the proposed alternatives were fullv analvzed (Table 27).

Table 27. Sensitive Species Considered for Analysis

R2 Sensitive Species	Suitable Habitat	Present	Rationale
American peregrine falcon *(Falco peregrinus anatum)*	Yes	Yes	Open habitat exists with cliffs present. Refer to effects analysis.
American three-toed woodpecker *(Picoides tridactylus)*	Yes		Species occurs almost exclusively in mature spruce stands. Refer to effects analysis.
Black Swift (*Cypseloides niger*)	Yes	Yes	Species nests on precipitous cliffs near or behind high waterfalls. There are no Breeding Bird Survey (BBS) observations in the East-Central Wet Mountains Project Area (Sauer et al. 2008, 2001). Refer to effects analysis.
Boreal owl (Aegolius funereus*)*	Yes		Habitat includes mature spruce-fir or spruce-fir/lodgepole pine with meadows. Refer to effects analysis
Brewer's Sparrow (*Spizella breweri)*	Yes		East-Central Wet Mountains Project Area lacks preferred sagebrush habitat Brewer's Sparrow may utilize upland-scrub and piñon-juniper habitat within the area. Refer to effects analysis.
Flammulated owl *(Otus flammeolus)*	Yes	Yes	Habitat includes old growth or mature ponderosa pine and ponderosa-Douglas-fir forests, often mixed with mature aspen; pure aspen; and old growth piñon-juniper woodlands. Refer to effects analysis.
Lewis's woodpecker *(Melanerpes lewis)*	Yes	Yes	Habitat includes lowland and foothill riparian forests, agricultural areas, open burned areas with large snags, oak and cottonwood forests, and open, park-like ponderosa pine forests.
Northern goshawk *(Accipiter gentilis)*	Yes	Yes	Species nests primarily in dense, mature coniferous forests, and forages in a variety of forested areas and small openings. Refer to effects analysis
Olive-sided Flycatcher (*Contopus cooperi*)	Yes		Habitat includes mature spruce-fir and Douglas-fir forests. Species is closely associated with montane-coniferous forests with bogs and meadows. Refer to effects analysis.
American hog-nosed skunk (*Conepatus leuconotus*)	Yes		Habitat includes grasslands and foothills. Species prefers partly wooded brushy, rocky areas, particularly areas with oak brush and piñon-juniper woodlands. Refer to effects analysis.
Fringed myotis *(Myotis thysanodes pahasapensis)*	Yes		Species is found at higher elevations in spruce habitat and mixed ponderosa pine, spruce and aspen habitat; roosts in a variety of structures including caves, mines, tunnels, snags, and buildings.
Rocky Mountain bighorn sheep *(Picoides dorsalis)*	Yes	Yes	Habitat includes cliffs, rock outcrops, and nearby meadows. Refer to effects analysis.
Townsend's big-eared bat *(Plecotus townsendii)*	Yes		Species forages on insects in a variety of habitats, including forested and wet areas, and requires suitable roots in a variety of structures including caves, mines, or rock ledges and overhangs. Refer to effects analysis.
North American Wolverine *(Gulo gulo)*	Yes		Habitat includes alpine, spruce-fir in remote areas with limited disturbance. Refer to effects analysis.
Northern leopard frog *(Rana pipiens)*	Yes		Habitat includes wet meadows and the banks and shallows of marshes, ponds, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams, and irrigation ditches. Elevation range extends up to 11,000 feet in southern Colorado.

Species are eliminated from further analysis by meeting one or more of the following conditions:

1. The species does not occur or is not expected to occur in the East-Central Wet Mountains Project Area during the time period activities would occur;
2. The species occurs in habitats that are not present; and/or
3. The East-Central Wet Mountains Project Area is outside of the geographical or elevational range of the species.

The rationale for dismissing the other sensitive species from further consideration is presented in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project BA/BE (JW Associates 2011b).

American Peregrine Falcon - Natural History and Distribution

The Peregrine Falcon 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. Numbers 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, USFWS 2006). Current threats to the species include the decline in habitat quality, particularly in riparian areas, and human disturbance of nest sites during recreational activities. Breeding pairs nest on cliff ledges typically 200 feet or higher, typically in foothill and mountain cliffs from 4,500 to 9,000 in elevation. Foraging habitat consists primarily of 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). Active eyries (nest sites) are known in the San Isabel and the Pike National Forests. (Wrigley et al. 2007). National Diversity Information Source (NDIS) data indicates that this species is known to occur in Huerfanco, Custer and Pueblo Counties, but the distribution is unknown. Suitable habitat is available in the East-Central Wet Mountains Project Area. Peregrine Falcons have observed in the East-Central Wet Mountains Project Area, including in the St. Charles River drainage in 2009 and 2010 near the intersection of the San Carlos Trail crosses the St. Charles River (R. Torretta personal communication, 2010).

American Three-toed Woodpecker - Natural History and Distribution

The main range of the three-toed woodpecker extends through the Rocky Mountains and laterally across Canada to northern New England (Leonard 2001). This woodpecker is considered a rare year-round resident that is widely distributed throughout the coniferous forests of the northern and western portions of North America (Andrews and Righter 1992). The three-toed woodpecker is considered a rare summer and winter resident at elevations from approximately 8,000 to 11,000 feet, and a very rare winter resident between 5,000 and 8,000 feet (Andrews and Righter 1992). The species is a primary cavity nester. This woodpecker is associated with snag abundance and insect outbreaks from disease or fire. History of fire suppression has led to fewer large-scale burned areas but has also lead to highly favorable conditions for infestations of the wood-boring insects that this species primarily feeds upon. Seventy-five percent of their diet consists of wood-boring beetles, and in Colorado their abundance correlates with the abundance of the spruce bark beetle (Ehrlich et al. 1988). Late-successional spruce-fir forest represents the core breeding and feeding habitat for the species

(Wiggins 2004a). Where insect populations are high, it may also occur in ponderosa pine, Douglas-fir and lodgepole pine forest (Andrews and Righter 1992). Three-toed woodpeckers nest mainly in snags but will use live trees, especially those with heart rot. The most important snags are 12 to 16 inches dbh, 20 to 40 feet tall, and have bark still present (Nicholoff 2003). Optimal habitat includes areas with 42 to 52 snags per 100 acres, occurring in clumps (Nicholoff 2003). Threats to the species include incompatible forestry practices, deforestation, and fire-suppression activities. NDIS data indicates that the species is known to occur but is rare in Huerfano and Custer Counties (NDIS 2010). Three-toed woodpeckers have not been documented in the East-Central Wet Mountains Project Area. Potential habitat for the three-toed woodpecker occurs in the East-Central Wet Mountains Project Area, particularly in recently burned areas. Additional habitat may exist in spruce-fir forest found on about 16 percent of the East-Central Wet Mountains Project Area and other conifer types, if insect levels are adequate.

Black Swift - Natural History and Distribution

Swifts invariably nest on vertical or precipitous cliffs or rock faces near or behind high waterfalls, or in dripping caves. Other than the above requirement, they inhabit a variety of landscapes, from seacoasts to the Rocky Mountains. Black Swifts spend most of the daylight hours pursuing aerial insects, often ranging far from nesting areas in search of the abundant but patchy preferred food resources. Foraging birds range at high elevations widely (over most montane and adjacent lowland habitats), and the adults typically return to feed the young in the evening. They sometimes cruise over the summits of 14,000 foot peaks and over croplands or deserts 25 miles from nesting colonies. The slow developing nestlings fledge much later (45-49 days) than most other swift species and are still on the nest well into September (Kingery 1998, Andrews and Righter 1992). Black Swift nesting has been observed in the Wet Mountains (Torretta and Vallederas 2006), and a known colony is located in the St. Charles River below the San Carlos Trail's crossing with the St. Charles River.

Boreal Owl - Natural History and Distribution

The Boreal Owl is a non-migratory species that has been observed as a resident in west-central Colorado and throughout the higher ranges of most of the state (Andrews and Righter 1992). Boreal Owls are associated with mature spruce-fir forests, but can also be found in lodgepole pine, mixed conifer, Douglas-fir, and aspen interspersed with meadows (Udvardy 1977, Andrews and Righter 1992). The species inhabits coniferous woodlands occurring in the higher mountain areas statewide, from 9,500 to 11,500 feet in elevation (Andrews and Righter 1992). Nesting habitat includes mature spruce-fir adjacent to open meadows that provide prey species, especially voles. Nesting habitat typically includes a relatively high density of large trees (10 inches dbh and larger), open understory, and multilayered canopy (Hayward 1997). Boreal Owls may use younger tree stands for foraging during the non-breeding season. Home ranges cover as much as 2,200 acres but can overlap extensively. Only a small area around the nest is defended during the breeding season. This species is a secondary cavity nester that utilizes deserted woodpecker holes or natural cavities in snags with at least 15-inch dbh (Harrison 1979). Nesting and breeding activity most likely occurs from mid-February to late April, and eggs are laid from April to June (Udvardy 1977). Threats to this species include changes in forest structure that influence prey populations, especially red-backed vole. Human disturbance and noise disturbance do not appear to be important factors in nest loss or owl movement (Hayward 1997). Boreal Owls have been

documented on the PSICC. A Boreal Owl call was heard in the Spanish Peaks area by Forest Service personnel during owl surveys (Torretta and Bressan 2006). Boreal Owls may occur in the East-Central Wet Mountains Project Area. Potential habitat exists in spruce-fir, which occur on around 16 percent of the East-Central Wet Mountains Project Area, as well as in mature mixed conifer forest.

Brewer's Sparrow - Natural History and Distribution

This species is sagebrush obligate that is often the most abundant songbird in sagebrush shrubsteppe habitats. This assessment focuses on the *S. b. breweri* subspecies, which is found in US Forest Service Region 2. Brewer's Sparrow is considered globally "secure" by the Natural Heritage Program because of its wide distribution across North America. However, according to the BBS, Brewer's Sparrow populations have declined by over 50 percent during the past 25 years. Brewer's Sparrow populations within the states of US Forest Service Region 2 have exhibited similar long-term declines; in fact, declines in Colorado and Nebraska have outpaced national trends. In South Dakota and Kansas, the species is considered "imperiled" by the states' natural heritage programs. The Brewer's Sparrow is listed as a priority species in the Colorado and Wyoming Partners in Flight bird conservation plans. It is also listed as a species of special concern by the USFWS (Holmes and Johnson 2005). The Colorado Breeding Bird Atlas shows confirmed breeding evidence for the Brewer's Sparrow in Lake County (Kingery 1998).The Analysis Area does not have Brewer's Sparrow obligate habitat type (sagebrush), but does contain some of the other habitat types they are known to occur in shrubby openings in Piñon-juniper, mountain mahogany [*Cercocarpus spp*.] woodlands, and large shrubby parklands within conifer forests.

Flammulated Owl - Natural History and Distribution

Flammulated Owls are associated with mature to old growth ponderosa pine and Douglas-fir forests along the Rocky Mountains. They have also been observed in aspen stands (Reynolds and Linkhart 1992). Occupied territories are often on south-facing slopes and ridges. They are obligate cavity nesters and depend on flickers and other woodpeckers for creating nesting cavities. Their habitats have declined as a result of fire suppression and the resulting closure of understories (Foster Wheeler Environmental Corporation 1999). The species is almost entirely insectivorous, capturing insects on the ground, on vegetation, and in flight (Ehrlich et al. 1988). The Flammulated Owl breeds in mountain ranges from Central America, north through the western US and into southern British Columbia. It winters from Mexico into Central America (Sibley 2000). NDIS records show that this species is known to occur but is rarely found in Huerfano, Custer and Pueblo Counties (NDIS 2010). The Colorado Breeding Bird Atlas shows confirmed breeding across the western half of the state. Studies by Linkhart (2001) at Manitou Experiment Station in the Pikes Peak Ranger District of the Pike-San Isabel National Forest have determined that habitat quality is determined by two primary factors – a) cavity-tree availability, in territories that had a mean of 1.5 cavity trees/acre; and b) forest type and structure, as productivity was positively correlated with territory area in ponderosa pine/Douglas-fir forests and with greater crown cover and large tree diameter (13 to 19 inches dbh). Use of the late-successional stage ponderosa pine/Douglas-fir forests likely involves habitat composition and structure and high prey availability. Older forests typically contain an abundance of snags and lightning-damaged trees with cavities for nesting. In addition, old ponderosa pine forests typically form open stands with well-developed grass and shrub understories that support arthropods used by fledged owlets and molting adults in late summer. Various Forest

Service personnel have documented Flammulated Owls visually and audibly on the PSICC over the years, most recently in 2006 (Javernick and Torretta 2006). The East-Central Wet Mountains Project Area contains potentially suitable habitat for Flammulated Owls in mature ponderosa pine forest found in the majority of ponderosa pine habitat with greater canopy cover, covering 40 percent of dry ponderosa pine habitat and 50 percent of mesic ponderosa pine habitat in the East-Central Wet Mountains Project Area. The species is expected to occur in the East-Central Wet Mountains Project Area.

Lewis's Woodpecker - Natural History and Distribution

Lewis' Woodpecker is a year-round resident of the foothills of southern Colorado and 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. Lewis' Woodpeckers typically excavate nest cavities in soft ponderosa pine or cottonwood snags, although they will also reuse cavities made by other woodpecker species. They nest in large snags ranging from 12 to 45 inches dbh (Anderson 2003). Lewis' Woodpeckers feed almost exclusively on emergent insects and specialize in flycatching in open habitats. These include open pine forests, burned areas, riparian and rural cottonwoods, and Piñon-juniper woodlands (Andrews and Righter 1992). Risks to Lewis' Woodpeckers include activities that reduce open or old-growth ponderosa pine forests and snags, for example, fire suppression and clearcutting (Anderson 2003). The current distribution of this species may have changed due to lack of open ponderosa pine stands (NDIS 2010). NDIS lists this species as known to occur and uncommon in Huerfano, Pueblo, and Custer. Data from the Colorado Breeding Bird Atlas (Kingery 1998) show this species typically breeding in riparian habitats, using cottonwoods to nest. The East-Central Wet Mountains Project Area contains some suitable habitat in open, mature ponderosa pine forests (less than 40 percent canopy cover) which occur on approximately 45 percent of the dry and 33 percent of the mesic ponderosa pine habitat type in the East-Central Wet Mountains Project Area. CNHP noted two elemental occurrences of the species in the vicinity of Rye and Beulah. The species is expected to occur in the East-Central Wet Mountains Project Area.

Northern Goshawk - Natural History and Distribution

The first records of the Northern Goshawk distribution in the Front Range date back to 1873. 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 historical and current logging operations. Birds are known to be sensitive to disturbance during the nesting season (Richarson and Miller 1997). The Northern Goshawk populations appear to be currently declining (Foster Wheeler Environmental Corporation 1999).

Northern Goshawks inhabit mixed hardwood and coniferous forests in temperate and boreal regions from 7,500 to 11,000 feet in elevation; however, they are occasionally found below 7,000 feet in winter and during migration. Limited information suggests that the Northern Goshawk is a partial migrant, usually moving less than 300 miles (Kennedy 2003). Typical nest areas for Northern Goshawks in the northern Rocky Mountains 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). These stands most often have

high (60-90 percent) canopy closure with little understory. Territories are also frequently associated with small openings, typically less than 1 acre (Fitzgerald et al. 1994).

Post-fledging family area and the foraging area typically include a diversity of forest types and conditions including stands of young, mid-aged, mature, and late-successional trees (Reynolds et al. 1992). Prey varies but may include red squirrels (*Tamiasciurus hudsonicus)*, least chipmunk (*Neotamias minimus*), rabbits, robins (*Turdus migratorius*), juncos (*Junco* sps.), and northern flying squirrels (*Glaucomys sabrinus*) (Erickson 1987). Snags, downed logs, and woody debris are also important components of the post-fledging family area and foraging habitat. Typically, two-three snags per acre are desired in the ponderosa pine forest type for Northern Goshawks (Reynolds et al. 1992. Nicholoff 2003,DeBlander 2002.) DeBlander (2002) Downed logs and woody debris are also an important component of Northern Goshawk habitat. Recommendations include three-five large downed logs per acre (at least eight feet long) in ponderosa pine habitats (Reynolds et al. 1992, Nicholoff 2003). There are no known historical goshawk nesting territories in the project vicinity. Multi-year surveys for goshawks in the East-Central Wet Mountains Project Area and vicinity have not detected any Northern Goshawks (Torretta 2010). Potential habitat for the Northern Goshawk occurs across the East-Central Wet Mountains Project Area particularly in both ponderosa pine and mixed conifer (including limber pine and Douglas-fir) habitats of later successional stages with closed canopy (greater than 40 percent crown cover).

Olive-sided Flycatcher - Natural History and Distribution

This flycatcher is a breeding mountain resident between 7,000 and 11,000 feet elevation (Jones 1998). It is associated with the mature spruce/fir forest, particularly if there are large conifers, bogs, and meadows present (Kingery 1998), and preferring areas with abundant snags (Ehrlich et al. 1988). This flycatcher is classified as a passive searcher who forages primarily by sallying, which is concentrating on prey available via aerial attack. They have a broad range of preferences in habitat structures. They prefer to nest high up in the conifers where their larger body size is well hidden, but they normally forage from dead perches where the visibility of flying insects is better and aerial maneuvers are easier (Eckhardt 1979). Olive-sided Flycatchers have been documented in the Newlin Creek drainage in the Wet Mountains, north of the East-Central Wet Mountains Project Area (Torretta 2005).

American Hog-nosed Skunk - Natural History and Distribution

Little information exists on the life history or ecology of hog-nosed skunk. Hog-nosed skunks are omnivorous and consume insects, small mammals and reptiles, fruits, berries, and nuts. Hog-nosed skunks are primarily a mammal of Mexico and the southwestern US, with records from southeastern Colorado marking the northern extreme of the species' range. Fitzgerald et al. (1994) identifies the hog-nosed skunk's habitat to be that of rocky canyon country in Piñon-juniper woodlands and montane shrublands of the southwest; it has also been reported in desert and grassland environments. Colorado records are associated with oakbrush and Piñon-juniper woodland in the southeastern portion of the state. Hog-nosed skunks use rocky ledges, caves, abandoned mines, abandoned burrows, woodrat nests, and similar sites for denning. Threats to the species include degradation, fragmentation, and loss of habitat; interspecific interactions with striped skunks; and grazing (Honeycutt and Dragoo 1995). No hog-nosed skunk populations are known to occur within the East-Central Wet Mountains Project Area based on US Forest Service data. CNHP indicated one elemental

occurrence in the East-Central Wet Mountains Project Area. Suitable habitat for the animal does occur within the East-Central Wet Mountains Project Area, particularly in Gambel oak habitat and open dry ponderosa pine forest in lower elevations.

Fringed Myotis - Natural History and Distribution

The status and occurrence of the fringed myotis are not well known in Colorado. Fitzgerald et al. (1994) found that this species is 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 Piñon-juniper and ponderosa pine habitats. It typically forages over watercourses (US Forest Service 1984). Studies in New Mexico found this species roosting in ponderosa pine snags and live ponderosa pine trees with long vertical cracks (Chung-MacCoubrey 1996). These roosts were found in isolated ponderosa pine stands in the drainage bottoms of Piñon-juniper woodlands or at the interface of the ponderosa pine and Piñon-juniper habitats. Snags are also important for roost sites; density of 8 large snags per acre appears to be suitable habitat (Keinath 2004). NDIS data indicate that this species is known to occur but rare in both El Paso and Teller counties (NDIS 2010). Potential habitat for the fringe-tailed myotis occurs in the East-Central Wet Mountains Project Area and they are likely to occur. The species has been documented on the Forest, but the occurrence in the East-Central Wet Mountains Project Area is not known. The East-Central Wet Mountains Project Area may provide foraging and roosting habitat for this species.

Rocky Mountain Bighorn Sheep - Natural History and Distribution

The range of Rocky Mountain bighorn sheep includes southern British Columbia and southwest Alberta, south to southeast California, Arizona, and New Mexico (Whitaker 1980). Rocky Mountain bighorn sheep inhabit alpine meadows, foothills, cliffs, and rock outcrops (Luce et al. 1999, Clark and Stromberg 1987). Their diet includes a variety of grasses, forbs, and browse (Luce et al. 1999). Summer habitat is typically at elevations of 9,000 to 10,000 feet, while winter range is located in south-facing slopes at elevations of about 7,000 feet (Beecham and Collins 2007). Their current distribution is confined to scattered populations in open or semi-open terrain characterized by a mix of steep or gentle slopes, broken cliffs, rock outcrops, and canyons and their adjacent river benches and mesa tops. Slope steepness appears to be a significant feature of bighorn sheep habitat. They use slopes of 36 to 80 percent in Montana and Colorado, while avoiding slopes less than 20 percent (Beecham and Collins 2007). Bighorn sheep are primarily animals of open habitats, such as alpine meadows, open grasslands, shrubsteppe, talus slopes, rock outcrops, and cliffs; in some places, however, they may use areas of deciduous and conifer forests, especially where openings may have been created by clear-cuts or fire (Beecham and Collins 2007). Densely forested areas provide little forage and poor visibility and are rarely used by bighorn sheep (Beecham and Collins 2007). Merwin (2000) noted that bighorn sheep often selected areas with good visibility within suitable distance of water and escape terrain. Open forests, however, are used in some areas for foraging and thermal cover (Beecham and Collins 2007).

CDOW has mapped habitat areas used by bighorn sheep in the state. According to NDIS data, bighorn sheep are known to occur in all three counties and are rare in Pueblo County, fairly common in Custer County and common in Huerfano County (NDIS 2010). The East-Central Wet Mountains Project Area contains bighorn sheep summer range (14,325 acres), winter range (6,698 acres), severe winter range (519 acres), and production

(lambing) habitat (354 acres) (NDIS 2010). The majority of the planning area falls within Game Management Unit S35, known as the Greenhorns population. Population estimates for this population were 70 animals 2007 and 2008 and 85 animals in 2009.

Threats to the long-term viability of bighorn sheep include diseases transmitted by domestic livestock, the lack of connectivity and loss of genetic variability due to habitat fragmentation, habitat loss, increased human disturbance, competition with domestic livestock, and predation on small, isolated herds. Available sheep habitat in the East-Central Wet Mountains Project Area is decreasing because of vegetation in advanced succession; increases in Gambel oak habitat and the succession of Piñon-juniper forests have decreased the amount of available forage and visibility, and are thought to be a major factor limiting the distribution of sheep (CDOW 2005).

Townsend's Big-eared Bat - Natural History and Distribution

Townsend's big-eared bat is a western species occupying semi-desert shrublands, Piñon-juniper woodlands, and open montane forests. It is frequently associated with caves and abandoned mines for day roosts, hibernacula, or nursery colonies where females root 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). Harvey et al. (1999) shows 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).

An additional threat is disease. White-nose syndrome is a fungal disease that has killed more than one million bats during the past four years. Infected bats may arouse from hibernation to attempt to deal with the fungal infection and in doing so prematurely burn up their fat stores and starve. White-nose syndrome has not been confirmed in Colorado; however, researchers have recently reported this fungus nearly 300 miles away in northwest Oklahoma and recent cave closures have been enacted to prevent the spread of this disease (CDOW 2010).

One subspecies of Townsends big-eared bat, *Plecotus townsendii pallescens*, occurs over most of the western two-thirds of Colorado and extreme southeastern Colorado to elevations of about 9,500 feet (Fitzgerald et al. 1994). According to NDIS data, this species is likely to occur in Huerfano, Custer and Pueblo Counties, but its abundance level is unknown (NDIS 2010). Foraging habitat is present throughout the East-Central Wet Mountains Project Area.

North American Wolverine - Natural History and Distribution

The wolverine is a scavenging predator and depends on a diverse ungulate population with a high turnover rate. Wolverines can be found in mature and intermediate timbered areas around natural openings, including cliffs, slides, basins, and meadows. Even under optimal habitat conditions, wolverines have low natural densities. They have extremely large home ranges, covering up to 160 square miles in their constant search for

carrion. Their habitat use varies seasonally; in summer they favor cooler subalpine and alpine areas. Habitat fragmentation and human disturbance are factors limiting the availability of suitable habitat. In 2008, the USFWS found that the petition to list the North American wolverine that occurs in the contiguous US was not warranted; the USFWS continues to seek new information on biology, ecology and status. In June 2009, a male wolverine, tracked via GPS-satellite collar, was confirmed in the north central part of Colorado – the first confirmed siting in the state since 1911 (CDOW 2009). CNHP data indicates a historical elemental occurrence of a wolverine near Greenhorn Peak. Wolverines are currently considered extirpated from Huerfano, Custer and Pueblo Counties (NDIS 2010). It is unlikely that wolverines occur within the East-Central Wet Mountains Project Area.

Northern Leopard Frog - Habitat and Natural History

Northern leopard frogs are found in the northern US and Canada, with additional populations in the higher elevations of the Rocky Mountains (Smith and Keinath 2007). The northern leopard frog occurs in a wide variety of habitats including creeks, lakes, ephemeral wetlands, and ponds (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). This species probably breeds in May or June, depending on elevation (Smith and Keinath 2007). Emergent vegetation is important in providing protective cover in ponds and lakes that contain predatory fish (Smith and Keinath 2007). After maturing, sub-adult frogs migrate to suitable feeding sites that are usually adjacent uplands. These dispersal movements may be along riparian corridors or upslope areas. 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). Northern leopard frogs overwinter submerged in permanent water that does not freeze solid (Smith and Keinath 2007). 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. No known leopard frog breeding sites are within the East-Central Wet Mountains Project Area, although suitable habitat exists in riparian corridors.

3.4.5 Federal Listed & Sensitive Species Environmental Consequences

For each species, alternatives analysis is provided on the direct and indirect impacts to: (1) habitats; and (2) each species. Cumulative impacts are bounded by the East Central Wet Mountain East-Central Wet Mountains Project Area, are considered to encompass a period of 20 years, and address species viability. The analysis and determinations assume that the features listed in *2.4 Design Features* would be implemented. The indicators listed below are used to measure impacts of the project on wildlife and fish habitat:

- Pine structural stage diversity (resulting structural stage distributions);
- Aspen communities (acres enhanced);
- Snag retention (number of snags per acre); and
- Water quality effects (changes to water quantity and quality).

Alternative A (No Action) - Direct and Indirect Effects

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. Over the long term, the proportion of the ponderosa pine cover type in the East-Central Wet Mountains Project Area would be expected to rise, as this species continues to encroach into existing open areas, riparian area edges, and in mixed aspen and conifer stands. Early successional habitats would continue to decline as pine stands progress toward later seral stages, which would reduce habitat diversity and not move the forest towards historical conditions. Natural disturbances, such as wildfire, would continue to return portions of the forest in which they occur to early successional stages. Effects for important ecosystems in the East-Central Wet Mountains Project Area, as well as the species that may be affected, are described in Table 28.

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.

Canada Lynx

Continuation of fire suppression policies would be expected to increase late successional forest. Dense late-successional stands would lead to an increased risk of insect infestation and wildfire. Lynx habitat consists of high-elevation spruce/fir and lodgepole pine forests and may include some mesic mixed-conifer forests. Generally, these areas have not been affected to any large degree by fire suppression, in contrast to lower-elevation and drier forests with shorter fire return intervals. However, some stands may be susceptible to extreme fire behavior because of high incidences of insect- and disease-caused tree mortality or the amount of tree limbs that provide ladder fuels. Should a stand-replacing fire occur, lynx habitat could be removed by converting habitat to an unsuitable condition until regeneration occurs, which would develop into a seeding/sapling stage in approximately 15-20 years. In the absence of a stand-replacing fire, this alternative is likely to produce an increase in late-successional forest habitat, but is not likely to move habitat towards mature multi-storied stands or improve snowshoe hare habitat.

Mexican Spotted Owl

Continuation of fire-suppression policies would be expected to increase both spruce habitat and late-successional pine forest. As stated in the 1995 Recovery Plan, the greatest threats to the MSO and its habitat are catastrophic fire and the continued use of even-aged timber management. Alternative A (No Action) would perpetuate forest succession and hazardous fuel accumulation in the East-Central Wet Mountains Project Area. Dense late-successional stands would lead to an increased risk of insect infestation and wildfire. Should a stand-replacing fire occur, critical habitat, protected habitat or restricted habitat could be removed. In the absence of a stand-replacing fire, this alternative is likely to produce an increase in late-successional forest habitat, but is not likely to move habitat towards Target/Threshold conditions as defined in the 1995 Recovery Plan.

Table 28. Alternative A – Direct and Indirect Effects to Federal Listed and Sensitive Species Habitat

Habitat	Direct Effects	Indirect Effects	Species Affected
Upland Scrublands	None	In the absence of active management, Gambel oak, the primary species in this habitat, would continue to increase in density and height. This habitat would have a continued risk of wildfire.	Brewer's Sparrow Lewis' Woodpecker American hog-nosed skunk Rocky Mountain bighorn sheep Fringed myotis Townsend's big-eared bat
Piñon-Juniper	None	In the absence of active management, this cover type would continue to encroach in to adjacent grasslands reducing the amount of forage available to wildlife and increasing the risk of crown fires.	Brewer's Sparrow American hog-nosed skunk Fringed myotis Townsend's big-eared bat
Aspen	None	In the absence of active management, conifer encroachment would continue to encroach on aspen stands from the edges of stands and reduce areas dominated by aspen should no fires occur in the area . Health and vigor of aspen stands would continue to decline.	Flammulated Owl Northern Goshawk American hog-nosed skunk
Dry and Mesic Ponderosa Pine	None	In the absence of active management, additional dense, late-successional stands with closed canopy would develop. The number of snags is likely to increase with forest succession. These stands would have an increased wildfire and insect infestation risk returning areas to earlier successional stages.	American Three-toed Woodpecker Flammulated Owl Lewis' Woodpecker Northern Goshawk Fringed myotis Townsend's big-eared bat
Mixed Conifer	None	In the absence of active management, additional dense, late-successional stands with high levels of understory trees would develop. The number of snags is likely to increase with forest succession. These stands would have an increased risk of insect infestation and wildfire risk, returning areas to earlier successional stages.	American Three-toed Woodpecker Boreal Owl Flammulated Owl Mexican Spotted Owl Northern Goshawk Olive-sided Flycatcher Fringed myotis and Townsend's big-eared bat North American Wolverine
Riparian/ Aquatic	None	Water quality would continue to be influenced by ongoing federal/non-federal activities. Drought may continue to reduce stream flows and connectivity.	Black Swift (waterfall areas) Olive-sided Flycatcher Lewis' Woodpecker Northern leopard frog Greenback cutthroat trout

Mexican Spotted Owl Critical Habitat

Mexican Spotted Owl critical habitat impacts under Alternative A would be similar to those described for Mexican Spotted Owl above.

American Peregrine Falcon

Peregrine Falcons are dependent on coniferous forest and riparian foraging habitat adjacent to cliffs. Due to the variety of habitat utilized for foraging, Alternative A (No Action) is not likely to have a significant impact on foraging habitat. Assuming a continuation of fire-suppression policies, late-successional mixed-conifer forest would be expected to increase. Fire suppression will likely favor mixed-conifer forests over pine forests due to the higher shade tolerance of Douglas-fir and White fir as compared to ponderosa pine.. Dense late-successional stands would lead to an increased risk of wildfire. Should a catastrophic wildfire occur, nesting and foraging habitat could be reduced.

American Three-toed Woodpecker

Three-toed woodpeckers are associated primarily with spruce habitat's available snags and can also be found in late-successional pine forests and riparian areas. Assuming a continuation of fire-suppression policies, late-successional spruce and pine forest would be expected to increase. Dense late-successional stands would lead to an increased risk of insect infestation and wildfire. Recently burned areas provide optimal habitat for three-toed woodpeckers in other locations, and burning could provide enhanced habitat. However, current conditions promote high-intensity wildfire and may not promote the optimal conditions for the species. In the absence of stand-replacing fire, this alternative is likely to produce an increase in available habitat for the three-toed woodpecker.

Black Swift

Black Swifts are associated with cliffs near waterfalls. Due to the wide range of habitats utilized for foraging, continued forest succession under Alternative A is not likely to impact this species. However, current conditions promote high-intensity wildfire which, should it occur, could have short term impacts on the species by altering local water flow, and by affecting (either positively or negatively) the availability of flying insects in the area (Wiggens 2004b).

Boreal Owl

Boreal Owls are associated with mature coniferous forest, particularly spruce-fir forests and lodgepole pine, interspersed with meadows (NDIS 2010). Nesting habitat includes mature spruce-fir adjacent to open meadows that provide prey species, especially voles. Nesting habitat typically includes a relatively high density of large trees (10 inches dbh and larger), open understory, and multi-layered canopy (Hayward 1997). The Boreal Owl is a secondary cavity nester that utilizes deserted woodpecker holes or natural cavities in snags with at least 15 inches dbh (Harrison 1979). Under Alternative A (No Action), snags are expected to increase with increased forest density. As forest succession continues, an increase in mature forests is anticipated. Wildfire and insect outbreaks would continue to return some areas of the forest to early successional stages. In the absence of a stand-replacing fire, habitat for the Boreal Owl is expected to increase.

Brewer's sparrow

The Brewer's Sparrow can be found in upland scrubland habitat and Piñon-juniper habitat. Long-term impacts under Alternative A (No Action) would include an increased density of scrub and juniper habitat and less grassland habitat, potentially reducing foraging habitat as forest succession continues. The risk of crown fire in scrubland habitat is also increased in this alternative. There is expected to be minimal impact to Brewer's Sparrow habitat under this alternative due to the limited amount of preferred habitat in the East-Central Wet Mountains Project Area.

Flammulated Owl

The Flammulated Owl utilizes ponderosa pine, aspen, and mixed-conifer forests in later successional stages. Under this alternative, the continuation of fire-suppression policies is expected to maintain forest succession, leading to an increase in later successional stage acreage. Snags are expected to increase with increased forest density. There are increased risks from high-intensity wildfire with this alternative, which could return areas of the forest in which they occur to early successional stages. In the absence of a stand-replacing fire, habitat for the Flammulated Owl is expected to increase.

Lewis' Woodpecker

Lewis' Woodpecker depends upon open, mature forests with canopy cover less than 40 percent and open old growth stands, oak woodlands, and riparian areas, as well as the availability of snags. Under this alternative, snag availability would likely increase and should not be a limiting factor. Continued forest succession would likely lead to a reduction in open, mature stands. There are increased risks from high-intensity wildfire and mountain pine beetle outbreaks with this alternative, which could return areas of the forest in which they occur to early successional stages. In the absence of a stand-replacing fire, available habitat for Lewis' Woodpecker is likely to decrease under this alternative.

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 may decrease as forest openings are reduced due to mixed-conifer 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. Overall, in the absence of a stand-replacing fire, nesting habitat is likely to increase, while the diversity of foraging habitat would decrease under this alternative.

Olive-sided Flycatcher

This flycatcher is associated with the mature spruce/fir forest, particularly if there are large conifers, bogs, and meadows present and abundant snags. The continuation of forest succession and fire suppression in this alternative may increase the number of large conifers, but is likely to decrease meadow openings. 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 this species.

American Hog-nosed Skunk

This species is typically found in montane shrublands such as the Gambel oak habitat found in portions of the East-Central Wet Mountains Project Area. Long-term impacts under Alternative A (No Action) would include a reduction in foraging habitat as forest succession continues. The risk of crown fire in Gambel oak is also increased in this alternative. Habitat quantity and quality for hog-nosed skunk are expected to decrease under this alternative.

Fringed Myotis and Townsend's Big-eared Bat

These bat species rely on the availability of 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 decreasing hardwood habitats in riparian areas. Roosting habitat in snags is likely to increase with forest succession and the absence of active management. 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 a high-intensity fire, the diversity of foraging habitat is likely to decrease, and roosting habitat would likely increase under this alternative.

Rocky Mountain Bighorn Sheep

Bighorn sheep depend on open areas for high visibility and access to escape cover for foraging. Long-term impacts under Alternative A (No Action) would include a reduction in foraging habitat as forest succession continues. Thermal cover for winter habitat would increase under this alternative with forest succession, but this habitat is not a limiting factor in the East-Central Wet Mountains Project Area.

North American Wolverine

Under Alternative A (No Action), the ungulate prey population may decrease with decreased forage availability as forest succession continues. Human disturbance and habitat fragmentation would continue to limit suitable habitat for wolverine under Alternative A (No Action).

Northern Leopard Frog

Under Alternative A (No Action), water quality would continue to be negatively impacted by existing sources of pollution and sedimentation. Predation threats from non-native fishes would also continue to negatively impact leopard frogs. The likelihood of high-intensity fire increases under this alternative. Should a high-intensity fire occur, water quality and riparian habitat would likely be negatively affected due to reduction of cover and increased erosion and sedimentation. In the absence of major wildfire activity, the effects of Alternative A are likely to be minimal due to the relative stability of conditions and absence of new stressors.

Alternative A (No Action) - Cumulative Effects

Under Alternative A (No Action), there would be no additional vegetation treatments on NFS lands in the East-Central Wet Mountains Project Area. However, there is a proposed blowdown salvage/timber sale in the planning process in the Greenhorn Mountains, which is in the Wet Mountains LAU. While the recent and on-going vegetation treatments on private lands within the East-Central Wet Mountains Project Area, as discussed above, would help to reduce stand densities and create a more diverse landscape, NFS lands account for more than 80 percent of the East-Central Wet Mountains Project Area. Without any treatments on these lands, a large portion of the East-Central Wet Mountains Project Area would be characterized by relatively dense stands of ponderosa pine and mixed conifer habitat. As described for the ESA definition above, MSO restricted habitat would not move towards target conditions, and multi-storied diverse snowshoe hare and lynx habitat would not be increased. The increased risk of intense wildfire could negatively impact all species by reducing habitat quantity or quality and by increasing the likelihood of erosion into greenback cutthroat trout streams. For FS sensitive species, cumulative impacts of Alternative A (No Action) will vary by species. In general, there is likely to be an increase in nesting, roosting and denning habitat in the absence of wildfire as forest succession continues. Foraging habitat is likely to decrease as open areas are decreased. The cumulative effect of the past, present, and reasonably foreseeable future actions on the condition of the forest vegetation in the East-Central Wet Mountains Project Area under Alternative A (No Action) would be an area dominated by forest stands that are generally healthy at the stand scale, but are relatively homogenous in age and structure and increasingly at risk to insects, disease, and wildfire.

Alternative B (Proposed Action) - Direct and Indirect Effects

Alternative B (Proposed Action) is designed to move the forest towards historical forest conditions and reduce wildfire hazards, while improving the health of ponderosa pine and Douglas-fir dominated forest types. In general, there would be short-term impacts to wildlife habitat availability during treatments; however, over the long term, there would be improved quantity, diversity, and quality of habitat, as there would be a decreased risk of habitat loss due to stand-replacing wildfire. As a result of treatment, conifer forest would be slightly reduced in the East-Central Wet Mountains Project Area. There would be an increase in the diversity of understory plants within many conifer stands due to reduced forest canopy cover and disturbance caused by thinning and prescribed fire. In addition, cutting of diseased trees may occur in limited sites. Such treatments would open up these stands and reduce the risk of disease spread. Treatment of aspen stands would remove diseased trees and reduce conifer competition, thereby improving aspen health and vigor. Disturbance created by prescribed fire would also help stimulate the regeneration of the less shade-tolerant plant species within these stands. Treatments would also improve the diversity in structural stages bringing the East-Central Wet Mountains Project Area closer to historical conditions. It should be noted that no treatments would occur in 2001 roadless areas, and thus no change in structural stage, wildfire, or disease risk would occur for these areas. Effects on habitats are provided in Table 29. Relevant Forest Plan standards, objectives, and specific design features (see *2.4 Design Features)* would be applied to mitigate impacts in the East-Central Wet Mountains Project Area.

Table 29. Alternative B – Direct and Indirect Effects to Federal Listed and Sensitive Species Habitat

Habitat	Direct Effects	Indirect Effects	Species Potentially Impacted
Piñon-Juniper	Removal of Piñon-juniper, conversion to grasslands.	Stimulation of grass, forbs, and other ground cover and reduced crown fire risk; reduce encroachment into meadow habitat.	Brewer's Sparrow American hog-nosed skunk Fringed myotis Townsend's big-eared bat
Aspen	Removal of competing conifers and cutting of aspen to encourage new growth. Removal of diseased aspen to propagate new suckers.	Improved health and vigor of aspen stands. Create a new cohort of aspen trees.	Flammulated Owl Northern Goshawk American hog-nosed skunk
Dry 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 catastrophic fire.	American Three-toed Woodpecker Flammulated Owl Lewis' Woodpecker Northern Goshawk Fringed myotis Townsend's big-eared bat
Mesic 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 catastrophic fire.	American Three-toed Woodpecker Flammulated Owl Lewis' Woodpecker Northern Goshawk Fringed myotis Townsend's big-eared bat
Mixed Conifer	Opening up of canopy. Creation of forest openings of 1 to 40 acres by thinning and prescribed burn.	Movement towards historical forest conditions. Decreased likelihood of catastrophic fire.	American Three-toed Woodpecker Boreal Owl Flammulated Owl Mexican Spotted Owl Northern Goshawk Olive-sided Flycatcher Fringed myotis and Townsend's big-eared bat North American wolverine
Riparian/Aquatic	Potential for short-term impacts to aquatic habitat from sedimentation during treatment activities.	Decreased likelihood of catastrophic fire and the resultant bank erosion and sedimentation.	Black Swift (waterfall areas) Olive-sided Flycatcher Lewis' Woodpecker Northern leopard frog Greenback cutthroat trout

Canada Lynx

Lynx require a mosaic of forest conditions including early successional forest for hunting and later successional forests for denning (Koehler and Brittell 1990). Alternative B would result in some indirect, short-term, minor, impacts on lynx habitat within the analysis area, including the temporary conversion of habitat to unsuitable conditions due to patchcuts and incidental loss of habitat due to treatment activities. However, small openings (1.5 acres and smaller) would create good lynx winter foraging habitat in 10-15 years as trees reach a sufficient height to allow for snowshoe hare winter feeding (Ruediger et al. 2000).

Implementation of treatments under Alternative B would be scheduled over a period of approximately 10 years. The acreage treated per year would vary both in quantity and by vegetation type and would utilize adaptive management to meet project objectives. Details for direct and indirect impacts are discussed below.

Disturbance/Displacement – Project-related activities may have minor, direct, adverse effects on lynx and lynx habitat such as displacement or disturbance for foraging and travel passage due to smoke from prescribed fire and noise from project related vehicular traffic and equipment, should lynx be in the area during project implementation activities. Research suggests that such impacts are not likely to be significant (Ruediger et al. 2000).

Habitat Conversion – The acres of lynx potential denning, winter foraging, and "other" habitat within the LAU are only likely to change in areas that receive incidental damage due to harvest activities and in areas that are turned into openings as a result of implementing this project. Incidental damage to habitat (due to mechanical trampling and ground disturbance of the seedling/sapling sized trees) from harvest/salvage activities would convert approximately 15 percent of the non-patchcut treated areas into unsuitable lynx habitat. Under Alternative B, approximately 1,300 acres of conifers within lynx habitat and 3,600 acres of Aspen within lynx habitat would be converted to unsuitable habitat due to patchcuts, and additional 700 acres of conifer and 700 acres of aspen acres outside of patch-cuts would be converted due to incidental harvest activities (Table 30). Patchcut openings would be limited to less than 1.5 acres in primary lynx conifer habitat. Lynx winter foraging habitat in isolated patches would therefore be lost for approximately 15-20 years until the patchcut area regeneration trees meet snowshoe hare winter habitat requirements (-6-10 feet) while "other" habitat would only be lost for about one year or growing season when snowshoe hare summer forage becomes available, as small shrubs and forbs are sufficient to support this habitat (Koehler and Brittell 1990). Denning habitat would be lost for 100+ years until a mature overstory develops and large woody material re-establishes at the site. Prescribed burning in some or all the openings could very likely enhance the regeneration beyond cutting or clearing the small diameter trees alone.

Table 30. Alternative B - Potential Lynx Habitat Changes in the Wet Mountain LAU[19]

Habitat Description	Wet Mtns LAU -All Ownerships	Wet Mtns LAU - NFS Lands		Treatment Area	Post-treatment NFS Lands changes	Post-treatment NFS Lands Lynx Habitat	
	(acres)	(acres)	% LAU	(acres)	(acres)	(acres)	%
Winter Foraging	51,932	51,801	26.1%	4,861	-795	51,006	25.7%
Denning	30,945	30,945	15.6%	1,283	-395	30,550	15.4%
Other[10]	41,220	17,219	8.7%	1,644	-2,038	15,181	7.6%
Unsuitable[11]	1,205	1,205	0.6%	0	3,228	4,433	2.2%
Non habitat	189,524	97,518	49.1%	5,500	-	-	-
LAU total	**314,826**	**198,688**	**100.0%**	**13,288**	-	-	-

Mixed Conifer patchcuts would generally be located in areas that have marginal to poor horizontal cover for snowshoe hare. In the mid to longer term (2-30 years), the small openings should create the young, dense coniferous or coniferous-deciduous forests that can provide habitat to support some of highest densities of snowshoe hares (Ruediger et al. 2000). Koehler and Aubrey (1994) stated that frequent, small scale disturbances are expected to provide the best lynx habitat at southern latitudes.

Aspen treatments would focus on conifer removal in aspen, daylight thinning around individual aspen trees, and areas where aspen is in decline, following Veg S5 standards. In addition, Aspen treatments will focus on creating irregular shaped units; creating mosaics of variable densities as well as harvested and unharvested areas (see *2.4 Design Features)*). Approximately 4,300 acres of aspen within Lynx habitat would be converted to unsuitable habitat in early successional stages in the short term. While patchcuts treatments in aspen would lead to some openings larger than the 1.5 acres, the impacts on Lynx would be minimized by these criteria. Ruediger et al. (2000) states that aspen (especially younger stands, which would be created by some of the patchcuts) may substantially contribute to prey productivity. In addition, pure aspen stands represent secondary habitat for lynx (USDA 2008).

In summary, over the long term, the mechanical and harvest treatments would result in clumps of uneven-aged trees and shrubs in mixed conifer habitat in a mosaic pattern throughout the East-Central Wet Mountains Project Area and would, therefore, have beneficial effects on lynx and/or lynx habitat overall. Small patchcuts in conifer habitat would ensure a variety of successional stages throughout the analysis area, including late-successional areas for denning habitat and early- to mid-successional areas for foraging habitat. Treatments in Aspen would result in larger openings which may not represent ideal Lynx habitat; however, treatments would create more sustainable aspen colonies in the long term. Prescribed fire use would stimulate the understory and browse development necessary for supporting prey populations.

[19] Acres converted include approximate acres of patch cut treatment as well as 15 percent additional loss due to skid trail, equipment and other incidental harvest activities. Actual acres converted are likely to be less due to habitat constraints and adaptive management.

Habitat Fragmentation – Patchcutting would cause some habitat fragmentation since the patchcuts (~1,400 acres total; less than 1.5 acres each in conifer habitat) scattered throughout the lynx habitat would convert a forested area to a clearcut opening. However, these openings in conifer habitat would be representative of those expected to be created by the fire regimes of the local area. As stated previously, some openings in pure aspen stands may be larger, but these stands are not likely to represent primary lynx habitat and the focus would be on areas where aspen are in decline or diseased. Aspen habitat would therefore benefit in the long term from treatment. Impacts on lynx would be minimized by use of design features (see *2.4 Design Features)*.

Habitat Modification/Degradation – Patchcutting is discussed in detail above under habitat conversion. Additional acres in the East-Central Wet Mountains Project Area may receive thinning treatments. Thinning would be conducted in a mosaic fashion to the greatest extent reasonable to mimic natural disturbances. While some lynx habitat types thinned would have a reduction in canopy cover, thinning treatment is not likely to convert or degrade one lynx habitat type to another and would not result in creation of additional unsuitable habitat. The proposed project would remove a limited number of trees greater than 18 inches dbh since it is desirable to provide for mature forest stands in the area, especially where the tree sizes and stand conditions are currently at or close to the desired conditions. No trees greater than 24 inches dbh would be cut or removed from the East-Central Wet Mountains Project Area.

As discussed, in the habitat conversion section above, and as shown in Table 30, some short-term degradation of lynx habitat may occur in the denning, winter, and "other" habitat affected. It should be noted in the treatment area, approximately 12,388 acres of the Wet Mountain LAU falls within the WUI and 900 acres outside of the WUI. In total 3,288 acres of the LAU within the treatment area are located within the WUI. Consequently, there would be up to 3,288 acres of degradation of lynx habitat within a WUI area. This type of habitat degradation would count towards the maximum of 3 percent (24,785 acres) of the available Pike-San Isabel National Forests lynx habitat that can incur adverse habitat modification treatments due to WUI fuels reduction projects (Forest Service 2008). It should be noted that the acres of degraded lynx habitat are estimates only and actual numbers are likely to be less due to on the ground habitat conditions which would be assessed at project implementation.

In summary, impacts from the proposed project activities may have minor adverse effects on Canada Lynx habitat in the short term but would likely benefit lynx and lynx habitat in the long term. The proposed project's activities are not likely to cause the LAU to fall below the minimum habitat requirements or exceed the disturbance thresholds provided in the SRLA. Overall, the habitat and fuels reduction objectives of the proposed project are consistent with the objectives, standards, and guidelines for fuels management identified in the 2008 SRLA (USDA 2008) and MSO Recovery Plan (USFWS 1995). Treatments that fall under exemptions and exceptions to the SRLA standards are detailed below in Table 31. The project would meet vegetation objectives, standards and guidelines based on a combination of proposed action and specific design features (see *2.4 Design Features)*.

In the long term, (10-20 years) the treatments proposed under Alternative B, including prescribed fire, would generally result in a variety of stand age classes and multi-story stand attributes that would maintain lynx and snowshoe hare habitat over time. In the short term, treatments would leave some areas undisturbed altogether and therefore suitable for winter snowshoe hare habitat in the short term. Project design features (see *2.4*

Design Features) limit patchcut openings in lynx habitat (spruce-fir and cool-moist mixed conifer) to 1.5 acres or less in order to mimic natural disturbance (Veg O1, O2) as well as focus management on areas that presently have poorly developed understories (Veg O4). Prescribed fire would also be utilized as a tool to restore historical conditions and improve lynx habitat in the long term (Veg 03). Based on these criteria in place, the proposed action would meet Veg O1, O2, O3 and O4.

At maximum, the acres converted by the project are estimated to result in 3 percent of the LAU moving into stand initiation stage for the short term (10-15 years), including lands within the WUI (see Table 30). When lands within the WUI are excluded, it is estimated that less than 200 acres of the LAU would be converted to unsuitable habitat at project completion; therefore the project is well within the 30 percent stand initiation limits for stand initiation stage in the LAU as set in VEG S1 and the 15 percent limit set for a ten year period in Veg S2.

In addition, project design features (see *2.4 Design Features)* provide guidelines for treatment in lynx habitat that would sustain snowshoe hare habitat over time while reducing hazardous fuels, therefore providing long term benefit to lynx habitat, in keeping with exception 4 for VEG S5 for all 417 acres that may be treated in the East-Central Wet Mountains Project Area (Table 31) In addition, aspen treatments would be conducted only for conifer removal in aspen, or daylight thinning around individual aspen trees, or where aspen is in decline following exception 3 for aspen habitat treated. In addition to the exceptions stated above, the VEG S5 exception states that precommercial thinning may occur only provided that: The additional precommercial thinning does not exceed one percent of the lynx habitat in any LAU, that the project is designed to maintain lynx habitat connectivity and provide snowshoe hare habitat over the long term; and that the snowshoe hare response is monitored. The 417 potential treatment acres outside of the WUI fulfill all these requirements.

Table 31. Project Level Reporting of Exemptions and/or Exceptions for Wet Mountains LAU at LAU scale

Item	Acres
Acres of Treatment within WUIs under Exemptions to VEG S1, S2, S5, and S6	S1: 0 S2: 0 S5: Up to 3,288 acres S6: Up to 3,288 acres
Acres of Treatment under Exceptions 1-4 to VEG S5 and 1-3 to VEG S6 (specify which exception(s) used) outside of WUI	Exception 4 to VEG S5: Up to 417 acres
Acres of Treatment under Exception 5 of VEG S5 (1% of lynx habitat/Forest) outside of WUI	Up to 417 acres
Acres of Treatment under Exception 4 to VEG S6 (acres)1 Outside of WUI	Up to 417 acres

Veg S6 applies to multi-story mature or late successional conifer forests. Alternative B treatments and effects would result in a variety of stand age classes and multi-story stand attributes that would maintain lynx and snowshoe hare habitat in conifer forest over time. As previously discussed, project design features (see *2.4 Design Features)* would limit cutting in conifer lynx habitat to 1.5 acre openings (VEG S6). Due to limited stand level information on dense horizontal cover, all 415 acres within the treatment area outside of the WUI are assumed to have the potential to fall under exception 4 to VEG S6 which allows for harvest in mature forest when uneven aged practices are employed, actual acres impacted are likely to be less.

Finally, Standard VEG G10 stipulates that fuels treatments in the WUI be designed considering Standards VEG S1, S2, S5, and S6. In keeping with VEG G10, patchcuts would be designed and/or conducted in such a manner as to mimic natural disturbance and habitat conditions to the extent practical and feasible (see Appendix A).

Overall, the long-term effects would be beneficial to lynx and its preferred prey as a result of the regeneration of understory, aspen, meadow, and shrub vegetation types necessary for preferred prey cover and browse; uneven-aged forest structure would provide important lynx denning and foraging habitat characteristics; and diminished risk of stand-replacing wildfire. While some aspen treatments would result in openings larger than 1.5 acres, impacts on lynx are likely to be minimal as described previously. Due to lack of treatments in 2001 roadless areas, the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area.

Mexican Spotted Owl

No MSOs have been recorded or observed in the East-Central Wet Mountains Project Area. Four drainages (Greenhorn Creek, Huckleberry Creek, Middle Muddy Creek, and the Camp Jackson drainage) were surveyed for MSO (four times each) in 2009 and 2010. The East-Central Wet Mountains proposed treatment area contains protected areas outside of PACs, and restricted habitat, as defined by the 1995 Mexican Spotted Owl Recovery Plan. Direct and indirect impacts on MSO are discussed in detail below.

Disturbance/Displacement – The proposed fuels treatment could cause some disturbance/displacement to MSO due to noise, smoke, and vegetation changes if they were in the area during the time of project implementation. However, it is unlikely that any of the disturbances would cause a reduction in MSO productivity, viability, or longevity due lack of evidence of MSOs nesting or roosting in the East-Central Wet Mountains Project Area. Any proposed treatment areas in drainages with suitable MSO nesting habitat would be surveyed for two consecutive years (4 surveys each year) before proposed project activities begin in that drainage. Due to these measures, the possibility of direct injury, mortality, or disturbance of individual MSOs as a result of the action alternative would be minimized.

Habitat Conversion - No treatments are proposed in MSO PACs. There would be limited treatment activities in MSO protected habitat. The majority of MSO protected habitat in the East-Central Wet Mountains Project Area is excluded from mechanical thinning and harvest treatments that utilize heavy equipment or machinery because of the slope constraints of prohibiting harvesting equipment on slopes greater than 35 percent unless the contractor can demonstrate the ability to remove logs without environmental damage, such as excessive soil disturbance as discussed in Section 2, Project Description. MSO

habitat-protection measures, including survey requirements, are incorporated into the project design features (see *2.4 Design Features)* for fish and wildlife. Specifically, all MSO protected habitat areas would be excluded from all treatments, except prescribed fire and hand thinning activities. Pre-fire mechanical preparation may occur through hand thinning operations if site conditions permit, but would not exceed the 9-inch dbh criteria as specified in the 1995 MSO Recovery Plan guidelines (USFWS 1995). Impacts on protected habitat are therefore expected to be minimal.

More extensive levels of treatments are proposed in MSO restricted habitat, with potential for adverse impacts to MSO habitat. Potentially all the 4,978 acres of MSO restricted habitat in the East-Central Wet Mountains Project Area could be affected by this proposed project; however, it is not likely that every acre would have some type of treatment applied and only a portion of this habitat is likely to be converted so that it is no longer suitable for MSO or is not moving towards target/threshold conditions. On the ground estimates for habitat change are difficult to predict due to lack of detailed information for all East-Central Wet Mountains Project Area stands and flexibility in project design to allow for response to on the ground conditions. Estimates for acres impacted are discussed in more detail for mixed conifer habitat below. Actual acres impacted would be determined by on the ground site conditions and adaptive management. Current acres of stands in target/threshold condition as defined in the MSO recovery plan (Appendix C) and the maximum potential acres impacted are included in Table 32, below. Project design features (see *2.4 Design Features)* dictate that no stand that meets threshold conditions can 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 on larger landscape level.

Table 32. MSO Acres Potentially impacted by the Alternative B (Proposed Action)

MSO Habitat Type	Total Area on San Isabel National Forest (acres)	Potential MSO Habitat Affected (acres)	Percent of Total MSO Habitat on San Isabel National Forest Affected
Restricted Target Habitat	207,641	11,089	5.3%
Protected Habitat outside of PACs	88,534	1,137	1.3%

Project design features (see *2.4 Design Features)* would promote the management of uneven-aged systems and retention of large trees. Trees over 24-inches dbh would be retained unless they are a threat to human safety or property. In addition, all trees and snags over 18-inches dbh would be retained unless removal is necessary to remove the risk of catastrophic wildfire in MSO habitat. Habitat measures for portions of the lynx habitat will also provide protection for MSO; openings in cool-moist mixed conifer habitat (1,510 acres or 20 percent of the MSO critical habitat area) would be limited to 1.5 acres due to design features (see *2.4 Design Features)* to protect Canada Lynx. The maximum potential acres impacted in mixed conifer forest are included in Table 33, below.

Table 33. MSO Acres in Mixed Conifer Forest Potentially Impacted by Alternative B (Proposed Action)

MSO Habitat Type	Existing MSO Mixed Conifer Habitat in Project Treatment Area (acres)	Potential MSO Mixed Conifer Habitat Affected (acres)
Restricted Target Habitat	3,808	762
Protected Habitat	847	169

In restricted habitat, there could be some short-term (0-2 years) reduction in MSO prey base in areas that have been patchcut or burned until grasses, forbs, shrubs, and trees return. Canopy cover in the patchcut areas would be 0 percent canopy cover until regeneration seedlings reach heights sufficient to contribute to the canopy. In the short to mid term (1-10 years), opening up of densely stocked stands, whether in the patchcut openings or the thinned stands, would likely provide for additional production of grasses and forbs, which would provide greater quantities of food for MSO prey species such as mice, voles, rats, etc.

Canopy closure for forested areas treated would be reduced in treated areas to differing percents (0percent in patchcut and clearcut areas to ~15-25 percent in ponderosa pine areas to ~25-50 percent in mixed-conifer areas) depending upon the vegetation type and treatment area. It is assumed that patchcuts greater than 0.25 acres would convert mixed conifer forest in MSO restricted and protected habitat to less than 40 percent canopy cover, thus rendering these areas unsuitable MSO habitat. These patchcuts would cover approximately 20 percent of mixed conifer treatment areas. In the East-Central Wet Mountains Project Area there is approximately 847 acres and 3,808 acres of MSO protected and restricted habitat, respectively, in mixed conifer forest. Therefore it can be estimated that up to 169 acres and 762 acres of mixed conifer forest in MSO protected and restricted habitat, respectively, may become unsuitable for MSO. Actual acres treated would be determined by on the ground site conditions. Residual stand basal areas would range from 60 to 100 square feet per acre. For other habitat types, changes in canopy cover and basal area may also occur. Ponderosa pine post-treatment stands would be composed primarily of mature trees with patches of immature trees scattered throughout the area, as well as many openings. In the forested areas, canopy closure would average 25 to 30 percent. Residual basal stand acreage is estimated at 30-100 square feet per acre. As stated previously, openings for mixed conifer in MSO critical habitat would be limited to 1.5 acres or less for a portion of the critical habitat area (20 percent) due to project design features (see *2.4 Design Features)* for Lynx, thus promoting uneven-aged stand conditions and providing potential foraging habitat for MSOs in these areas in the mid to long term. For the remaining 450 acres of habitat, openings would average 1-10 acres and may exceed conditions suited for MSO habitat. Aspen treatment would focus on restoring the health and vigor of the existing aspen stands, and expand their extent and increase the diversity of stand ages within the area. In the short term, openings in aspen habitat may exceed conditions suitable for MSO habitat, but would result in improved aspen health for the long term.

Other habitat elements including snags and course woody debris would be impacted in the short to mid term by project activities. Snags may be lost from project related activities while others would likely be recruited from prescribed burning activities. Likewise, course woody debris may be lost in prescribed burns but created

in thinning treatments. Project design features (see *2.4 Design Features)* would dictate post-treatment course woody debris and snag quantity.

Over the mid to long term (5-50 years), MSO restricted target/threshold habitat that is thinned/burned should generally improve as the vegetative structure would develop more of the primary constituent elements desired by MSOs including high basal area, large diameter trees; moderate-high canopy closure; wide range of tree sizes; as well as recruit snags, and large woody material. Treatments including understory thinning and small patchcuts in conifer habitat should increase the potential for current areas to develop into a mature-to old-growth stand structure and by removing some of the competition for light, moisture, and nutrients to the residual trees. Likewise, thinning treatments would reduce the catastrophic wildfire. Openings of greater than 1.5 acres in a small portion of the East-Central Wet Mountains Project Area and in aspen habitat are not likely to significantly alter MSO habitat. The proposed treatment is therefore in alignment with the MSO Recovery Plan (USFWS 1995) which recommends thinning from below and/or the use of prescribed or prescribed natural fires to reduce the primary existing threat to MSO habitat (i.e., catastrophic wildfire).

Habitat Fragmentation – This project would cause some habitat fragmentation since the patchcuts scattered throughout the MSO restricted habitat would be converted from a forested canopy to a clearcut opening. However, these openings would be representative of those expected to be created by the fire regimes of the local area within the majority of MSO suitable habitat.

In summary, while Alternative B (Proposed Action) would reduce forest cover in the short term, treatments would move stand conditions towards target levels in the long term as well as reduce the risk of catastrophic wildfire for the short and long term. Due to lack of treatments in 2001 Roadless Areas, the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area. Although treatment activities may temporarily convert some suitable habitat areas to unsuitable nesting or roosting habitat, the overall result would generally mimic natural processes and would introduce additional diversity into the forest structure, as well as move stands towards target stand conditions identified in the MSO Recovery Plan (USFWS 1995).

It is determined that due to lack of documented MSO utilization of the East-Central Wet Mountains Project Area, minimal treatment in MSO protected habitat, and the long term benefits derived from treatments, the proposed treatment may affect but is not likely to adversely affect the MSO.

Mexican Spotted Owl Critical Habitat

The East-Central Wet Mountains Project Area is within the critical habitat boundary and includes both protected and restricted habitat. Prior to project implementation, US Forest Service biologists, in coordination with USFWS, would review proposed sites to determine if they provide suitable MSO habitat, and to determine appropriate mitigation measures and survey requirements if potential habitat is present.

As discussed for MSO above, treatment activities would temporarily convert some suitable habitat areas in restricted habitat to unsuitable nesting or roosting habitat, resulting in impacts to critical habitat. Based on this analysis it is determined that short term impacts are likely to adversely impact Mexican Spotted Owl critical habitat. Over the long term, treatments would move forest structure towards historical conditions,

reduce the likelihood of catastrophic wildfire, and promote the habitat features essential for the conservation of the MSO.

Peregrine Falcon

Direct effects on the Peregrine Falcon would include the small potential for displacement of individuals during thinning and prescribed burn treatment activities, particularly from smoke and noise disturbance. Indirect effects on this species are likely minimal, as thinning and burning would not affect cliff nesting habitat. Should active eyries be encountered, work in the area would stop until the US Forest Service biologist determined the necessary mitigation measures. In addition, design features (see *2.4 Design Features)* would provide recommended timing limitations for disturbance around active eyries. Over the long term, foraging habitat would likely increase as forest canopy cover decreased and forest openings increased under Alternative B (Proposed Action).

American Three-toed Woodpecker

Direct effects on the three-toed woodpecker would include the small potential for individual mortality due to tree felling. The three-toed woodpecker could be negatively impacted by management activities in spruce-fir habitat. Some snags may be lost due to timber harvest activities. However snag-retention for wildlife habitat would be ensured through the use of specific design features (see *2.4 Design Features)*. Prescribed burning may create new snags suitable for use by three-toed woodpeckers, which could offset some of the negative effects on them due to loss of habitat in some areas from other project activities Overall, spruce-dominated stands and snags would be preserved if design features (see *2.4 Design Features)* are followed.

Black Swift

Black Swifts are associated with cliffs near waterfalls. Proposed treatments would not impact nesting habitat. There is limited potential for individual disturbance due to treatment activities should a swift pass though the treatment area. Due to the wide range of habitats utilized for foraging, forestry treatments are not likely to impact foraging habitat for this species in the long term.

Boreal Owl

Direct effects on the Boreal Owl would include limited potential for individual mortality due to tree felling or other treatments. Indirect impacts include changes to mature coniferous forest and aspen habitat conditions. Boreal Owls are associated with mature conifer forest, particularly spruce-fir forests near open meadows. Overall, the acreage of spruce under Alternative B (Proposed Action) could be reduced slightly, particularly in ecotones where pine and spruce come together. Boreal Owls may also utilize mixed conifer forest. In Alternative B (Proposed Action), up to 4,000 acres of mixed conifer forest are proposed for treatment. Proposed treatments would create more open stand conditions, reducing mature habitat with crown cover over 40 percent. In Alternative B (Proposed Action), meadows adjacent to conifer habitat, which are used for foraging, are likely to increase. Thinning and prescribed burning would create openings from 1 to 40 acres in size, with most less than 10 acres. This treatment would increase potential foraging habitat in the long term.

Boreal Owls depend on snags for nesting. Some snags may be lost due to harvest activities. Prescribed burning may create new snags in some of the Boreal Owl habitat treated, which could offset some of the negative

effects of snags being lost due to harvest activities. However, snag-retention for wildlife habitat would be ensured through the use of specific design features (see *2.4 Design Features)*. Overall, long-term impacts on Boreal Owl may include a slight reduction of nesting habitat and an increase in foraging habitat for this species.

Brewers Sparrow

Brewer's Sparrow can be found in upland scrubland habitat and Piñon-juniper habitat. Direct impacts include the limited potential for individual mortality, disturbance, or displacement due to treatments. Indirect effects would likely be positive due to treatments in upland shrub habitat on up to 2,800 acres. These treatments would be conducted to thin or remove Gambel oak and stimulate grass and other ground cover, thereby enhancing foraging habitat for the sparrow in the long term.

Flammulated Owl

Direct effects on 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. 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 habitat modification. The mature mixed conifer habitat would become less dense in treated areas in the East-Central Wet Mountains Project Area. However, these more open conditions would reduce the extent and intensity of a potential catastrophic fire in mature mixed conifer habitat. Changes in the distribution and size of snags (potential nest trees) would also be important. Some reductions in snags may occur under Alternative B (Proposed Action) due to project activities, including prescribed fire. Prescribed fire treatments could create new snags as well as destroy others having potential beneficial and/or detrimental effects on Flammulated Owls. However, East-Central Wet Mountains Project Area design features (see *2.4 Design Features)* require retention of 8 snags per acre on average. Overall, long-term impacts on 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 catastrophic fire in this habitat type. Due to lack of treatments in 2001 Roadless Areas, the potential for wildfire and disease and/or insect infestation would still remain high in some portions of the East-Central Wet Mountains Project Area.

Lewis' Woodpecker

Direct effects on Lewis' Woodpecker would include the limited potential for individual mortality due to tree felling and other treatments. Indirect effects include long term increases in preferred habitat of open canopy mature pine as a result of thinning and use of prescribed fire. Under Alternative B (Proposed Action), suitable habitat in mature structural stage ponderosa pine habitat with open canopy (less than 40 percent crown cover) is likely to increase for both the dry and mesic forest types in the long term. Changes in the distribution and size of snags (potential nest trees) could also be important. Some reductions in snags may occur under Alternative B (Proposed Action) due to project activities, including prescribed fire. Prescribed fire treatments could create new snags as well as destroy others having potential beneficial and/or detrimental effects on Lewis' Woodpeckers. However, project design features (see *2.4 Design Features)* require retention of a minimum 8 snags per acre on average.

Northern Goshawk

No goshawk nests have been detected in the East-Central Wet Mountains Project Area; however, suitable habitat does exist. Direct impacts on Northern Goshawks include the limited potential for loss of unknown active nests due to tree felling or prescribed fire. Due to snow conditions and limited early spring access in the East-Central Wet Mountains Project Area before May 1, it is unlikely that project activities would occur during the early part of Northern Goshawk breeding season The most likely direct effects on goshawks would be disturbance by project activities. Two years of pre-treatment surveys (two surveys per year) would be conducted for Northern Goshawk nests in any proposed treatment areas that have suitable goshawk habitat. Should active Northern Goshawk nests be discovered, work would stop until a US Forest Service biologist determines what potential impacts and mitigation measures would be required.

Other long-term indirect effects include a reduction in potential Northern Goshawk habitat. Moderately dense mature forest habitat (mature greater than 40 percent crown cover) contributes nesting and some foraging habitat. This habitat type would likely decrease in the East-Central Wet Mountains Project Area for ponderosa pine and mixed conifer forests in the long term (JW Associates 2010). The impact on the overall habitat available in the Forest, however, would be minor. Although Northern Goshawks are not cavity-dependent species, they depend on cavity nesters that may use snags as prey. Under this alternative, some snags could be lost during management activities. However, project design features (see *2.4 Design Features)* require retention of 8 snags per acre on average.

Olive-sided Flycatcher

This flycatcher is associated with the mature spruce-fir forest, particularly when there are large conifers, bogs, and meadows present and abundant snags. Direct effects on the flycatcher would include limited potential for individual mortality due to tree felling or other treatments. Indirect impacts include habitat changes in mature conifer forest, particularly spruce-fir forests near open meadows. While spruce-fir forest is not particularly targeted for treatment, the acreage of spruce under Alternative B (Proposed Action) could be reduced slightly, particularly in ecotones where pine and spruce live together. In Alternative B (Proposed Action), meadows adjacent to conifer habitat, which are used for foraging, are likely to increase. Thinning and prescribed burning would create openings from 1 to 40 acres in size, with most less than 10 acres. This treatment would increase potential foraging habitat in the long term. Olive-sided Flycatchers utilize snags. Some snags may be lost due to harvest activities. Prescribed fire treatments could create new snags as well as destroy others having potential beneficial and/or detrimental effects on Olive-sided Flycatchers. However snag-retention for wildlife habitat would be ensured through the use of specific design features (see *2.4 Design Features)*. Overall, long-term impacts to Olive-sided Flycatcher may include a negligible reduction of nesting habitat and an increase in foraging habitat for this species.

Common Hog-nosed Skunk

Direct impacts on hog-nosed skunk would include the limited potential for individual mortality, disturbance, or displacement due to treatments. Indirect effects would likely be positive due to treatments in upland shrub habitat on up to 2,800 acres. These treatments would be conducted to thin or remove Gambel oak and stimulate grass and other ground cover, thereby enhancing habitat for the hog-nosed skunk in the long term.

Fringed Myotis and Townsend's Big-eared Bat

Direct impacts on bats would include the limited potential for individual mortality, disturbance, or displacement due to tree felling and other treatments. Indirect impacts would include loss of habitat due to the reduction of suitable roost snags if they are removed due to safety concerns. The effects of management activities on snags would be mitigated by design features (see *2.4 Design Features)*, which would provide for a minimum number and size of snags to be retained. Prescribed fire treatments could create new snags as well as destroy others having potential beneficial and/or detrimental effects on bats.

Foraging habitat for bats would most likely improve under Alternative B (Proposed Action) through opening of pine stands.

Due to limited surveys, the use of the East-Central Wet Mountains Project Area as hibernacula or maternity roosting sites is not known. No hibernacula or roosting sites have been discovered, but suitable habitat may exist. Should any sites be discovered in the East-Central Wet Mountains Project Area, US Forest Service biologists would be notified and work in the area would be stopped until the appropriate mitigation is determined.

Rocky Mountain Bighorn Sheep

Direct impacts on bighorn sheep would include the limited potential for disturbance during treatments in the East-Central Wet Mountains Project Area. Indirect effects would most likely be positive, as treatments in upland scrub habitat in up to 2,800 acres in the East-Central Wet Mountains Project Area would enhance habitat for bighorn sheep. These treatments would increase forage availability and decrease the height of oak, allowing for better horizontal visibility so that sheep could more easily view and avoid approaching predators. In addition, treatments in meadows would restore and maintain meadow areas that are at risk from encroachment by conifers. 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.

North American Wolverine

Due to the likely local extirpation of the North American wolverine, no direct impacts are anticipated from Alternative B (Proposed Action). Indirect impacts include habitat changes to potential habitat in coniferous forest and changes that would impact habitat for ungulate prey species. Due to the large habitat size, lack of denning habitat (high elevation snow-covered steep slopes) present in East-Central Wet Mountains Project Area, and variety of habitat used by this species, Alternative B (Proposed Action) is not likely to impact the wolverine.

Northern Leopard Frog

Potential direct effects on northern leopard frog include individual mortality of eggs, larvae, and adult frogs due to treatments or stream crossings in riparian areas. No new system roads are proposed for construction. If temporary roads or stream crossings are required, construction could negatively impact leopard frogs by displacing or compacting soils and removing or disturbing ground litter. Reductions in downed woody material due to prescribed burning activities would also negatively impact leopard frogs by reducing cover. Effects

would be minimized by use of Forest Plan standards and guidelines for riparian areas that would be met in the East-Central Wet Mountains Project Area through the use specific design features (see *2.4 Design Features)*.

Alternative B (Proposed Action) - Cumulative Effects

Hazardous fuels-reduction treatments have been completed and are being planned on state and other public lands within the mixed conifer forests throughout the East-Central Wet Mountains Project Area. These are intended to reduce the risk of catastrophic fires, particularly as a result of several CWPPs that have been developed for communities within the area. These include the Pueblo and Custer County CWPPs. These treatments would be primarily within the WUI and treat areas at lower elevations, most likely within the ponderosa pine, Gambel oak, and Douglas-fir cover types. These treatments may have short-term cumulative impacts on threatened and endangered species by disturbing animals and fragmenting habitat. Long-term impacts would be positive, as the extent and intensity of catastrophic fires would be reduced.

Future non-federal activities reasonably likely to occur include continued sub-dividing and development of private land in the LAU as well as road construction, timber harvesting, thinning, prescribed burning, grazing, both motorized and non-motorized recreational activities. Most of the above activities are currently causing effects, as described in above in *Existing Condition*s.

Past and present activities include: road construction, special use permit communication sites and easements, utility easements, grazing, mining, land conversion of rural areas, residential development, wildland fires, fire suppression activities, hunting, fishing, special forest products gathering, horseback riding, ATV riding, snowmobiling, cross-country skiing, hiking, biking, etc. It is reasonable to expect that most or all of these activities will continue in the future. Limited timber harvesting has occurred within the East-Central Wet Mountains Project Area over the past twenty years. These projects have been limited in scope and have affected only a small proportion of the forest stands within the East-Central Wet Mountains Project Area. Currently there are several proposed future federal projects in the Wet Mountains LAU. Specifically they are the Locke Mtn. Fuels Reduction Project, the Twelve Mile Fuels Reduction Project, and the Greenhorn Blowdown Salvage/Timber Sale. In addition, there is a spruce salvage/timber sale project (Deerlick Salvage/ Timber Sale) that is active just outside of the East-Central Wet Mountains Project Area.

The treatment areas specifically proposed for the East-Central Wet Mountains project represent about 17 percent of the entire East-Central Wet Mountains Project Area. The overall cumulative effect of Alternative B (Proposed Action) and other potential future fuel reduction treatments would be to reduce impacts on threatened and endangered species and their habitat in the East-Central Wet Mountains 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 East-Central Wet Mountains Project Area to historical levels. See the species-specific discussions under the Cumulative Effects under ESA Definition, above. Even with the amount of treatment proposed under Alternative B, there would still be a large area of untreated montane forest within the 2001 inventoried roadless areas. Stands within these areas would still pose an increased risk of widespread damage by wildfire and/or insect and disease infestations.

Canada Lynx

Activities on non-federal lands within the LAU could have adverse effects on lynx if they were to cause a loss of lynx habitat, such as habitat conversion or loss of early seral habitat due to fire suppression. Loss of habitat or habitat fragmentation can cause decreased productivity and recruitment rates and increased mortality rates by reducing habitat effectiveness (e.g. reduction in prey densities, changes in lynx dispersal and mobility, and genetic interchange between lynx populations), and consequently, a decreased ability for the habitat to support viable numbers of lynx. The proposed activity is not expected to have detectable cumulative effects on Canada lynx. For the most part, development in areas adjacent to the analysis area is expected to occur at fairly low densities and proposed actions are limited in scope. The majority of lynx habitat in the Wet Mountain LAU is on federal lands; the respective federal agencies are actively involved in managing and protecting its habitat. Actions proposed by non- federal entities on these lands would be administered by the responsible federal agency and would likely be permitted or authorized only if certain protection criteria or conservation measures were implemented. As such, non-federal actions are likely to result in only minor cumulative effects to lynx habitat and preferred prey populations. Given that the amount of suitable lynx habitat within the treatment area is relatively low compared to suitable habitat within the Wet Mountain LAU overall, potential cumulative effects as a result of proposed treatments under Alternative B are anticipated to be negligible at the LAU scale.

Mexican Spotted Owl

As stated in the 1995 MSO Recovery Plan, the greatest threat to the MSO and its habitat is catastrophic fire and the continued use of even-aged timber management. Hazardous fuels-reduction treatments on non-federal lands would reduce the extent and intensity of catastrophic fires, resulting in long-term beneficial cumulative effects on the MSO and its preferred habitat. Potential benefits would vary from minor to moderate, depending on the known occurrences of the species in or near the proposed treatment areas and/or the presence of protected, restricted, or critical habitat. The preferred habitat for MSO is typically characterized by steep, rocky slopes that are unsuitable for residential or other developed uses. As such, developed uses are unlikely to contribute to cumulative effects to the MSO or its preferred habitat.

Mexican Spotted Owl Critical Habitat

Mexican Spotted Owl critical habitat cumulative impacts are similar to those discussed for Mexican Spotted Owl, above.

USDA Forest Service Sensitive Species

The direct and indirect effects of Alternative B (Proposed Action), combined with the past, present, and reasonably foreseeable future actions, are likely to impact habitat for sensitive species to some degree, as described under the cumulative impacts discussion for threatened, endangered, and proposed species, in Section 6.2.2, above. Short-term impacts on sensitive species due to reasonably foreseeable future activities are likely to include disturbance and habitat fragmentation. Overall, fuels reduction treatments on private and other public lands would reduce the extent and intensity of catastrophic wildfire in the area and return the forested area, particularly in the montane zone, closer to historical conditions. In addition to forestry activities, development and recreation are likely to continue in the area as discussed under the affected environment

Species Determinations

Canada Lynx

Alternative A (No Action) would have no effect. Alternative B (Proposed Action) is likely to adversely affect the Canada lynx.

Mexican Spotted Owl

Alternative A (No Action) would have no effect. Alternative B (Proposed Action) is likely to adversely affect the MSO.

Mexican Spotted Owl Critical Habitat

Alternative A (No Action) would have no effect. Alternative B (Proposed Action) is likely to adversely affect MSO critical habitat.

Greenback Cutthroat Trout

Alternative A (No Action) may affect, but is not likely to adversely affect greenback cutthroat trout. Alternative B (Proposed Action) may affect, but is not likely to adversely affect greenback cutthroat trout.

3.5 Recreation/Visuals

Recreation/Visuals is divided into two sections; Recreation and Visual Resources. The discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Recreation Specialist Report (JW Associates 2010e) and the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Visuals Specialist Report (JW Associates 2010f).

3.5.1 Recreation Affected Environment

The East-Central Wet Mountains Project Area is located within the San Carlos Ranger District of the Pike-San Isabel National Forest. Communities within and around the East-Central Wet Mountains Project Area include Wetmore, Lake Isabel, Rye, and Beulah. The primary public access routes to and within the East-Central Wet Mountains Project Area include the following:

- State Highway 96 – provides access from Florence (via Highway 67) to the northern portions of the East-Central Wet Mountains Project Area. The portion of highway that bisects the East-Central Wet Mountains Project Area is the federal and state designated Frontier Pathways Scenic Byway.
- County Highway 386 – traverses the East-Central Wet Mountains Project Area in an easterly westerly direction, connecting Highway 387 to Highway 165.
- County Highway 387 –traverses the East-Central Wet Mountains Project Area in a northerly-southerly direction, on the eastern side of the East-Central Wet Mountains Project Area.
- State Highway 78 – generally located along the eastern boundary of the East-Central Wet Mountains Project Area, provides access to the central and south-central portions of the East-Central Wet Mountains Project Area from the Pueblo area.

- State Highway 165 – is a federal and state designated scenic byway that traverses the East-Central Wet Mountains Project Area in a northerly southerly direction provides access to the southern portion from the Pueblo area, including the Lake Isabel Recreation Area.

Access to the remainder of the East-Central Wet Mountains 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. Within the East-Central Wet Mountains Project Area, the primary recreational activities include hiking, biking, backcountry and nordic skiing, dispersed camping, hunting, fishing, and off-highway vehicle (OHV) use, snowmobiling, shooting, and sightseeing, among others. The 2006 National Visitor Use Monitoring (NVUM) process estimated that there were approximately 5,809,000 national forest visits to the Pike and San Isabel National Forests during the 2005-2006 sampling timeframe (USDA Forest Service 2009). East-Central Wet Mountains Project Area-specific visitor use estimates are not available in the NVUM results, though recreational use likely is lower than portions of the Forest that are considered urban settings such as the adjacent Lake Isabel Recreation Area. The 2006 NVUM report identifies viewing scenery as the number one activity on the Forest, followed by viewing wildlife, relaxing, driving for pleasure, and hiking/walking.

Developed Recreation

Campgrounds and Rental Cabins

There are many campgrounds and two rental cabins in the East-Central Wet Mountains Project Area. These facilities are summarized below.

- La Vista Campground is a developed campground with hiking, fishing and limited non-motorized boating available nearby. The campground has individual, electric hook-ups making it a favorite of Recreational Vehicle (RV) enthusiasts. At Lake Isabel, non-motorized boating, and fishing are available. St Charles Creek is close to the campground and provides fishing opportunities. Access to motorized and non-motorized trails include trailheads for the Cisneros, St. Charles, and Snowslide trails. This campsite has 19 RV and 10 tent sites, and potable water. RV sites are $19 per night and tent sites are $15 per night. There is a $5 fee for extra vehicles Twenty of the sites must be reserved. The campground is located about 1 mile from the south entrance to Lake Isabel and approximately 1,200 feet from the lake.
- Southside Campground is a developed campground with 8 campsites, all are RV accessible with a spur length of 30 feet. Tight turns prevent vehicles longer than 30 feet in length from safely maneuvering through this campground. Restrooms and trash receptacles are located in this campground. This campground is suitable for RV's, but not desirable for tents. However, there are no RV hookups. There is a $5 fee for extra vehicles. Campsites are close to the lake, but not very private. Nearby activities are the same as for La Vista Campground. The campground is located about one-half mile from the south entrance to Lake Isabel and approximately 300 feet from the lake.
- St. Charles Campground is a developed campground with 15 campsites for RVs and tents. Reservations are required for 10 of the campsites. The campsite is located about one mile from the south entrance to Lake Isabel and three quarters of a mile from the lake.

Other Campgrounds

- Ophir Creek Campground is a developed campsite with 19 RV sites and 12 tent sites. The campground receives heavy use during summer and is available on a first come basis. Activities include hiking, fishing, bicycling, motorcycle and ATV use, as well as fishing in Ophir Creek. During the summer, the site receives heavy use on the weekends and holidays. The fee is $14 per night. A short drive provides access to multiple trailheads. The campground is located on USDA Forest Service Road 361 off of Highway 165, about 6 miles

north of Lake Isabel. This is one of the campgrounds designed by Arthur Carhart and remnants of the some of the old stone fireplaces are still visible.

- Davenport Campground is a developed campground with 12 campsites which are tent sites. Three of the sites include Adirondack shelters. Reservations must be made for three of the sites, all others are available on a first-come basis. Activities and attractions include: hiking, fishing, bicycling, motorcycle and ATV use. There is nearby access to Squirrel Creek, Mace, and Silver Circle multi-use trails. There is also access to Dome Rock and South Creek nonmotorized use trails. The fee is $13 per night and the campsite is located four miles north of Lake Isabel on State Highway 165 and two miles east on USDA Forest Service Road 382. This is one of the campgrounds designed by Arthur Carhart and some of the original features (stone fireplaces, foundation for community shelter) are still visible. The USDA Forest Service with help from many other organizations and volunteer groups completed a multi-year reconstruction project that restored the campground to its original 1920's design.
- Rental Cabin at Lake Isabel - The rental cabin has one bedroom with 3 sets of bunk beds and a fireplace. The cabin can accommodate 6 people, and has a seasonal occupancy rate of approximately 30 percent. There is an electric stove, lights, a refrigerator, and a washer and dryer. There is indoor plumbing but no potable water. The cabin is adjacent to Highway 165 east of Lake Isabel. Outside there is parking for 4 vehicles, a group fire ring, picnic tables, and horseshoe pits. No pets are allowed and the rental fee is $75 per night.
- Mingus Ranch Rental Cabin - This is a two-story cabin that can accommodate 6 people, and has a seasonal occupancy rate of approximately 25 percent. It has electricity but no water. The cabin is located off USDA Forest Service Road 383, about two miles east of Highway 165. No pets are allowed and the rental fee is $50 per night.

Trails

There are approximately 96 miles of recognized, USDA Forest Service "system" trails in the East-Central Wet Mountains Project Area. These trails provide both motorized and non-motorized opportunities. Some of these trails (primarily those referenced in the developed campgrounds discussion) are summarized below (USDA Forest Service 2010b).

- Cisneros Trail (Trail number 1314) – The trail is 10.4 miles long and is rated moderate for hiking. The trail starts at 8,940 and gains 2,280 feet. The Cisneros Trail has two trailhead access points. The first trailhead is located at Lake Isabel at the end of USDA Forest Service Road 376 at the end of the campgrounds. The second trailhead is accessed by traveling for about 12 miles on RF 360, then traveling east on USDA Forest Service Road # 369 for about 9 miles. The trailhead is also accessible from State Highway 69, North of Gardner, by taking USDA Forest Service Road # 634, and then traveling east on USDA Forest Service Road # 369.
- Dome Rock (Trail number 1387) – This multi-use trail is 2.1 miles in length. This trail has two access points for trailheads. The first trailhead can be accessed from the Davenport Campground off USDA Forest Service Road 382. The second access can be made from the Squirrel Creek trailhead.
- North Creek Trail (Trail number 1325) – The trail is about 2.9 miles long. The elevation of the trail starts at 9,200 feet and drops to 7,800 feet. This trail is open for ATV and Motorcycle use. The North Creek Trailhead is located along State Highway 165 near the Bigelow Divide. To access the trail, take USDA Forest Service Road 383 to the end of the road.
- San Carlos Trail (Trail number 1320) – The tail length is 1.6 miles long, and is rated easy for hiking. The trailhead starts at 7,360 feet and gains 800 feet. Motorcycle use is allowed, but not ATV use.
- Second Mace (Trail number 1322) – This is a multi-use trail, and is approximately 5 miles in length, and is located near the old San Isabel ski area. To access the trail, turn northeast off of State Highway 165 on to USDA Forest Service Road 383 and travel about 3 miles to the end of the road.

- Snowslide (Trail number 1318) – This trail is moderate for hiking and is 5.7 miles in length. The elevation starts at 8,720 feet at trailhead and tops out at 11,500 feet for a gain in elevation of 2,780 feet. This motorized trail is open to motorcycles, but not ATV`s. The Snowslide Trail has two access points. The first access point is 8 miles northwest of Rye on State Highway 165 at Lake Isabel Recreation area on USDA Forest Service Road 376. The second access point is located off of USDA Forest Service Road 360, then USDA Forest Service Road 352.
- South Creek (Trail number 1321) – This trail is 7.3 miles long, and trail is marked as hard for hiking. The trailhead is at 6,720 feet and gains 2,900 feet to 9,620 feet. Motorcycle use is allowed but be aware that there are no motorized vehicles allowed in Pueblo Mountain Park at the East end of the trail. South Creek Trailhead is located off State Highway 165 and Road 78. Take USDA Forest Service Road327 to trailhead.
- Squirrel Creek (Trail number 1384) – This a moderate trail approximately 5 miles in length. The east end of the trail is designated for non-motorized use only. To access the trail, take Highway 78 west from Beulah to County Road 215. Then, proceed north of Lake Isabel on State Highway 165, and turn on USDA Forest Service Road 382 to reach the trailhead.
- St. Charles (Trail number 1326) – This trail is for motorized use only and is about 9 miles in length. The Northern trailhead is located off of State Highway 165 about 1 mile south of the Davenport Campground turnoff.

Scenic Touring

The East-Central Wet Mountains Project Area has a number of historical resources than can be viewed from Frontier Pathways, a network of roads that provide for outstanding viewing opportunities. Many of the scenic/historic attractions associated with the Frontier Pathways (a scenic and historic byway) are found in the East-Central Wet Mountains Project Area.

Dispersed Recreation

The San Isabel National Forest, including the East-Central Wet Mountains Project Area, is generally open to dispersed recreational uses, both motorized and non-motorized. Dispersed camping and other day uses are permitted on NFS lands within the East-Central Wet Mountains Project Area. The South Hardscrabble Area provides dispersed recreation and has 12 sites. The North Hardscrabble Area also provides dispersed recreation opportunities. San Carlos Forest Road320 provides access to dispersed recreation areas. Compared to other parts of the CDOW southeastern region, a low to moderate level of big game hunting occurs in the East-Central Wet Mountains Project Area. In addition, there are opportunities for upland game hunting in the portions of the East-Central Wet Mountains Project Area with Gambel's oak. Many of the known dispersed camping locations in the East-Central Wet Mountains Project Area are along forest roads and both system and non-system trails.

Rockclimbing

Hardscrabble Canyon in the northern portion of the East-Central Wet Mountains Project Area contains a mixture of climbing opportunities. Monolithic spires of metamorphic granite soar into the sky with multi-pitch routes awaiting first accents or early repeats. Lover's Leap is over 500 feet tall. John Gill roamed this area. Roadside sport climbing crags provide opportunities for the less adventurous with steep pitches. Classic sport crags in the area include the Titanic and the Bud-Lite Wall. The best sport climbing is located at mile marker 18 on Highway 96 West just west of the town of Wetmore. The sport climbing is on the south side of the road and the multi-pitch climbing is on the north side of the road.

Big game hunting

The East-Central Wet Mountains Project Area coincides with CDOW Game Management Units (GMU) 84. In 2009 the greatest harvest success was for pronghorn antelope during the rifle season at 80 percent. In contrast, muzzle loader hunting for pronghorn showed the lowest success rate at 9 percent. The Mule deer third rifle season showed the highest number of hunters with 334 participants.

3.5.2 Recreation Environmental Consequences

Analysis of potential impacts to recreation resources focus on whether a proposed treatment would prevent access to or create safety hazards in popular recreation areas. Popular recreation areas include trails, day use areas, and camping areas.

Effects Common to All Alternatives

Some level of disturbance to recreation resources would occur under both alternatives. Under Alternative A (No Action), wildfires would continue and would result in views of smoke and of areas with disturbed soil and cut trees that would occur as part of fire suppression efforts. Areas subjected to wildfire would be closed to public access during suppression efforts. Therefore, both alternatives would produce impacts to recreation resources in terms of potential safety hazards and restricted public access during times of wildfires under Alternative A (No Action) or during project implementation under Alternative B (Proposed Action).

Alternative A (No Action) - Direct and Indirect Effects

Under Alternative A (No Action) the continued occurrence of wildfires would affect recreation resources. Direct effects would include visitors being restricted from using certain recreation areas during wildfire suppression. Fire history information (JW Associates 2010b) indicates 90 percent of wildfires are less than 2 acres. These frequent, small fires would not result in permanent loss of public access to developed or dispersed areas or create safety hazards. Indirect effects would include long-term effects that wildfire may have; certain areas that burn may be closed due to the need for watershed rehabilitation or due to continuing safety hazards after suppression activities have been completed. However, these closures would only occur infrequently across the East-Central Wet Mountains Project Area. Both direct and indirect effects would result in less than significant impacts to recreation resources.

Alternative A (No Action) - Cumulative Effects

There are multiple, small projects planned to occur on private lands in the near future as part of the CWPPs. Although the actual acreages or locations are not known, they would likely be relatively small. These foreseeable projects, when considered with the continued occurrences of frequent, small wildfires, would not result in cumulative effects to recreation resources. Effects would not be cumulative because these projects would not affect access or recreational use of national forest lands within the East-Central Wet Mountains Project Area, and because multiple recreation areas and trails are not likely to be affected by wildfire during a particular incident.

Alternative B (Proposed Action) - Direct and Indirect Effects

Alternative B (Proposed Action) has the potential to affect views of visual resources from popular recreation areas and major travelways. Alternative B (Proposed Action) consists of vegetation treatments including thinning, creating openings, prescribed burning, and removing trees on up to 18,800 acres within the East-Central Wet Mountains Project Area. It is expected that the proposed treatments would take ten years to complete to accomplish the initial project objectives.

Given the location of treatment areas, most trails and recreation areas would not be directly affected. There is some overlap with a proposed treatment area and the Lewis Creek trail and the future Middle Hardscrabble trail. Visitors desiring to use these trails when treatments are occurring would need to find other, nearby trails. These direct impacts would be short-term, since the amount of time spent implementing treatments near either trail would only be 3-5 days. Similarly, visitors to the Lake Isabel Recreation Area may be temporarily prevented from accessing a recreation site or trail. Indirect effects would occur if treatment areas affect unknown dispersed recreation areas that may be occasionally used for hunting or climbing. However, these impacts would also be of a short-term nature given the amount of time required to complete treatments in a given area. These potential impacts would be less than significant due to their short-term nature, the availability of other recreation resources nearby, and the implementation of the design features (see *2.4 Design Features)*.

Alternative B (Proposed Action) - Cumulative Effects

Based on information from the Custer and Pueblo County CWPPs, there are multiple, small projects that are planned to occur on private lands in the near future. These foreseeable projects, when considered with the treatments associated with Alternative B (Proposed Action) would not result in cumulative effects to recreation resources. Effects would not be cumulative because these projects would not prevent recreational access or use of national forest lands, and because multiple recreation areas and trails are not likely to be affected by treatment activities in a particular area.

3.5.3 Visuals Affected Environment

Major Travel Routes

The LRMP lists major travel routes as having the most visual sensitivity. The major travelways routes to and within the East-Central Wet Mountains Project Area include the following:

1. State Highway 96 – is a federally and state designated scenic byway that provides access from Florence (via Highway 67) to the northern portions of the East-Central Wet Mountains Project Area
2. County Highway 386 – traverses the East-Central Wet Mountains Project Area in an easterly westerly direction, connecting Highway 387 to Highway 165
3. County Highway 387 –traverses the project in a northerly-southerly direction, on the eastern side of the East-Central Wet Mountains Project Area
4. State Highway 78 – is generally located along the eastern boundary of the East-Central Wet Mountains Project Area, and provides access to the central and south-central portions of the East-Central Wet Mountains Project Area from the Pueblo area

5. State Highway 165 – is a federally and state designated scenic byway that traverses the East-Central Wet Mountains Project Area in a northerly southerly direction and provides access to the southern portion of the East-Central Wet Mountains Project Area from the Pueblo area, include Lake Isabel Recreation Area.

Frontier Pathways is comprised of two Colorado Department of Transportation (CDOT) sections. Highway 96 goes from Westcliffe to Pueblo city limits, and Highway 165 goes from Wetmore to Colorado City at the I-25 junction. According to Nelson et al. (2004) the daily vehicle miles traveled is considered an accurate means of expressing growth in vehicle travel, and was calculated by multiplying road segment length by the average daily traffic counts obtained from CDOT. Both Frontier Pathway segments show steady increases in daily vehicle miles traveled during the analysis period, with the road from Pueblo to Westcliffe showing higher numbers and a higher rate of increase. Frontier Pathways state byway designation occurred in 1994, after which the Highway 96 daily vehicle miles traveled increased steadily between 1994 and 2002. National designation was awarded in 1998, and there are increases in daily vehicle miles traveled on each of this byway's sections from 1999 to 2001. These changes in daily vehicle miles traveled suggest that scenic byway designation may account for some of the increased daily vehicle miles traveled along the above referenced highway segments.

Vegetation Conditions

Vegetation conditions look different across the East-Central Wet Mountains Project Area than they did approximately 100 years ago. Historically, the landscape appearance was altered by wildfire. However, fire suppression has changed vegetation composition as well as stand densities in all the vegetation types where treatments would occur. Figure 24 demonstrates some of the current vegetation conditions in the East-Central Wet Mountains Project Area, showing densely stocked stands as viewed from a middleground distance from Highway 165.

About 30 percent of area to be treated is comprised of aspen. As stated in the LRMP, aspen is important to recreation use. It is an important visual feature in the landscape character of the Rocky Mountains Physiographic Province, and the East-Central Wet Mountains Project Area is no exception. Aspen color and texture contribute to visual character in many ways. These contributions include edge contrast between aspen and conifer stands, aspen islands, and large meadows, and massive textural blocks all occurring in the middle-ground and background distances. In the foreground distance zone, aspen form and texture are important visual features. Color is a dominant element in all distance zones. In the East-Central Wet Mountains Project Area, the objective of vegetation management in aspen would be to restore the health and vigor of the existing aspen stands and expand their extent. Existing stands of aspen are also experiencing Sudden Aspen Decline (SAD), which may be linked to reduced vigor due to the age of the aspen stands. Conifers have encroached upon the area's aspen stands due to fire suppression and the lack of other disturbances across the landscape.

Figure 24. Example of Current Vegetation Conditions in the East-Central Wet Mountains Project Area

3.5.4 Visuals Environmental Consequences

The analysis of visual resources involved examining the effects of vegetation treatment activities when viewed from foreground, middleground, and background distances from visually sensitive areas. For this project, major 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 types and volumes, as well as viewing distance zones. Areas and associated viewer types considered to be potentially sensitive to visual changes include: designated park and recreation areas, major travel routes, and residential areas.

Landscape visibility is important for its scenic quality, aesthetic values, and landscape merits. Sensitive travelways attract a higher percentage of users having high concern for scenic quality, thus increasing the importance of those travelways. This portion of the San Isabel National Forest receives low to moderate levels of visitor use, as evidenced by vehicular traffic counts on Highways 165. Moreover, NVUM visitor surveys conducted across many national forests show sightseeing for pleasure to consistently be one of the most frequently mentioned activities in which visitors to national forests participate.

Given that proposed vegetation treatments would occur in a variety of areas over a ten year period, the analysis is intended to analyze potential visual impacts at a landscape level, rather than in a particular location or

locations. The analysis focuses on potential impacts to visual resources at the landscape level from foreground (0 to 0.5 miles), middleground (greater than 0.5 to 4 miles), and background (greater than 4 miles) distances. Analysis of potential impacts to visual resources focus on whether a proposed treatment would degrade or enhance visual quality in the East-Central Wet Mountains Project Area along major travelways or recreation areas.

Effects Common to All Alternatives

Some level of disturbance to visual resources would occur under both alternatives. Under Alternative A (No Action), wildfires would continue and result in views of smoke and of areas with disturbed soil and cut trees that would occur as part of fire suppression efforts. Alternatives A and B would both produce impacts to scenic resources.

Alternative A (No Action) - Direct and Indirect Effects

Under Alternative A (No Action) the occurrence of wildfires would affect visual resources. Direct effects would include forest visitors viewing smoke from wildfires. They would also see 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 occur because some wildfires would alter the landscape by blackening the soil, burning understory vegetation, and scorching or completely burning trees. These types of effects could be visible for two to five years.

Alternative A (No Action) - Cumulative Effects

Based on information from the Pueblo and Custer CWPPs, there are multiple, small projects that are planned to occur on private lands in the near future. Although the actual acreages or locations are not known, they would likely be relatively small. These foreseeable projects, when considered with the existing conditions would not result in cumulative effects to visual resources.

Under Alternative A (No Action) when wildfires are considered with other past, present, and reasonably foreseeable action, no significant impacts would occur to scenic resources. In addition to the reasonably foreseeable projects referenced above, there would be continued wildfires throughout the East-Central Wet Mountains Project Area. It is assumed that the reasonably foreseeable pattern of wildfires would generally be the same as previous, non-catastrophic wildfires. Wildfires would occur across the landscape, burning relatively small acreages.

Alternative B (Proposed Action) - Direct and Indirect Effects

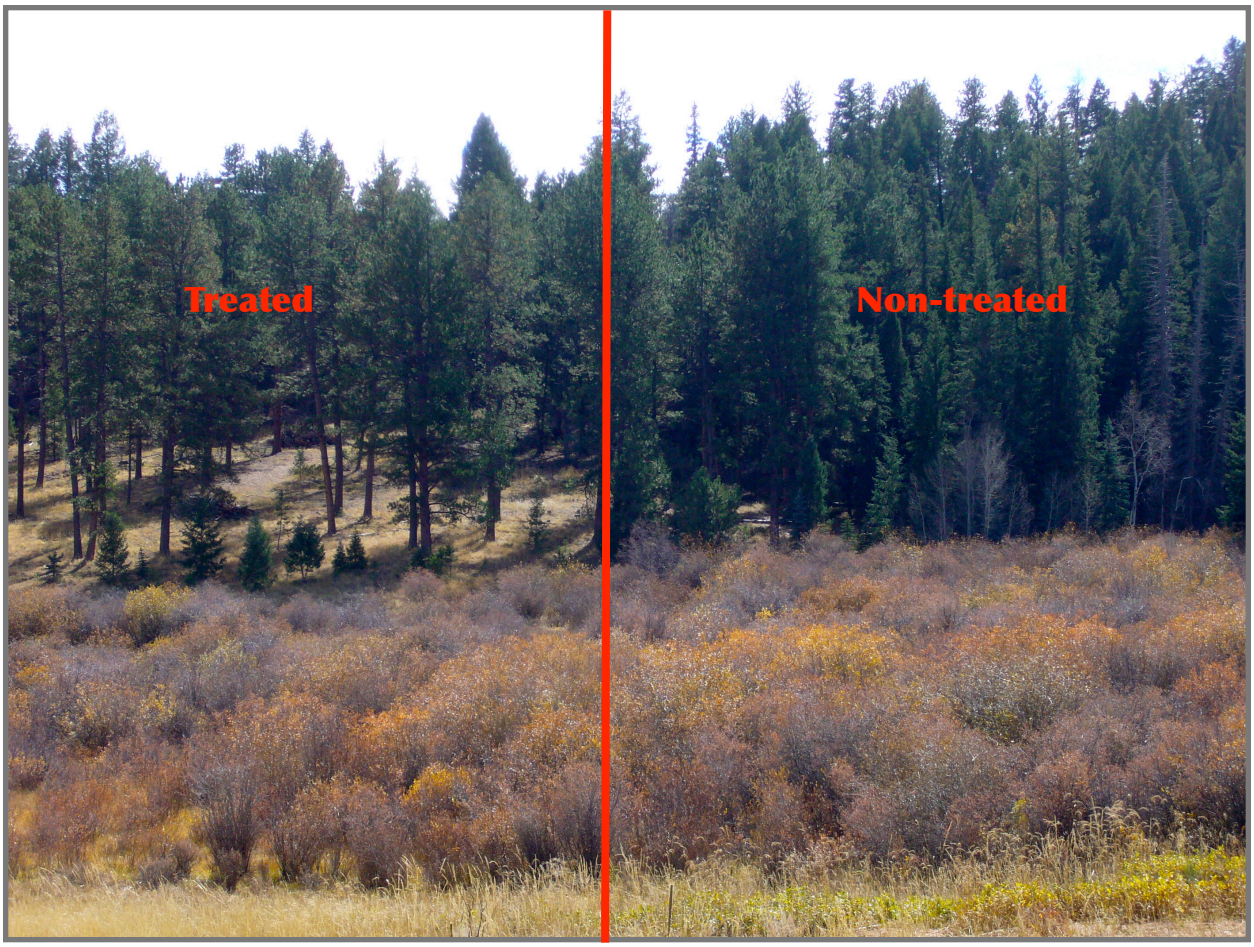
Alternative B (Proposed Action) has the potential to affect views of visual resources from popular recreation areas and major travelways, in particular views from Highway 165 north Lake Isabel. It is expected that the proposed treatments would take ten years to complete to accomplish the initial project objectives. The direct visual effects would include the presence of heavy equipment on sites to be treated, presence of slash, soil disturbance, fugitive dust, and for burning related activities, 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, and broadcast burning would be visible from middleground and background distances.

Most of these effects would be short-term (i.e. the duration of time required to complete a particular treatment in a particular location). These effects would be less than significant with implementation of visuals design features (see *2.4 Design Features)*.

Indirect visual effects would include changes in views of forested landscapes that would be affected over the long-term. Figure 25 depicts two adjacent areas, one with and one without treatment, from a foreground distance. The left side of the photo shows treated conditions and allow 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.

At the landscape level, there would be a more diverse ecological mixture of vegetation types which would improve visual variety and viewing opportunities.

Figure 25. Comparison of Treated and Non-Treated Stands



Alternative B (Proposed Action) - Cumulative Effects

Based on information from the Pueblo and Custer CWPPs, there are multiple, small projects that are planned to occur on private lands in the near future. Although the actual acreages or locations are not known, they would likely be relatively small compared to the treatments associated with Alternative B (Proposed Action). These foreseeable projects, when considered with the treatments in Alternative B (Proposed Action) would not result in cumulative effects to visual resources. The effects would not be cumulative because of the temporary nature of area closures, and because multiple views are not likely to be affected by treatment activities in a particular area. Under Alternative B (Proposed Action), the proposed management actions when considered with other past, present, and reasonably foreseeable actions, would result in no significant impacts to scenic resources.

3.6 Socio-Economics

The socio-economics discussion is summarized from the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Socio-Economics Specialist Report (JW Associates 2010g).

3.6.1 Socio-Economics Affected Environment

Communities in the Project Vicinity

The East-Central Wet Mountains Project Area overlaps with Pueblo and Custer counties. Most of the residents of Pueblo County live in the Pueblo area (Table 34), which borders the East-Central Wet Mountains Project Area. Pueblo is the largest municipality in the county with an estimated population of about 106,000 residents. The city accounts for nearly two-thirds of the county's population of approximately 157,000. Other communities in or near the East-Central Wet Mountains Project Area include: Rye (incorporated), Colorado City, and Beulah (both unincorporated).

Table 34. Socio-demographic Characteristics of City of Pueblo[20]

Characteristic	Number/Proportion
Population	106,130
Median Annual Household Income	$34,814
Proportion of Families below poverty level	21.9%
Proportion of Population self-reported as Caucasian	80.8%
Proportion of Population self-reported as Hispanic or Latino (of any race)	45.9%

20 Source: U.S. Census Bureau, 2006-08 American Community Survey

Pueblo County

Recent Historical Background

Pueblo County was one of the original 17 counties established when the Territory of Colorado was created on February 28, 1861. Spanish land grants dominated the area prior to the arrival of large numbers of miners, loggers, farmers, and ranchers in the mid -1800's. Based on tree core data, there is little doubt that prior to settlement wildland fire played a significant role in creation and perpetuation of native plant communities. However, this influence of wildland fire changed following the arrival of early settlers into the area. The consequences of logging, grazing, and fire suppression have resulted in more or less even-aged stands of mixed conifer, an increased accumulation of forest fuels on the ground, increased tree density in forested areas, and increased trees, brush, and other species in prairie areas.

Socio-economic profile

Pueblo County's population in 2008 was estimated to be 156,737 residents (Table 35). Median household was $42,005, and number one industry in terms of payroll was manufacturing, followed by retail trade.

Table 35. Socioeconomic Profile for Pueblo County[21]

Characteristic	Number/Proportion
Population	156,737
Median Annual Household Income	$42,005
Proportion of Families below poverty level	16.8%
Proportion of Population self-reported as Caucasian	92.9%
Proportion of Population self-reported as Hispanic or Latino (of any race)	39.1%
Top Industries (annual payroll, MM dollars)	
Manufacturing	200,327
Retail Trade	192,953

Community Wildfire Protection Plan

The Healthy Forest Restoration Act (HFRA) of 2003 emphasizes the role of community planning and offers a variety of benefits to communities with a CWPP including matching federal grants for fuel reduction projects. A CWPP requires approval by local governments, fire authorities, and the state forest management agencies in consultation with federal land management agencies. Pueblo County completed a CWPP in 2006. Prior to this time various entities had formed the Beulah Area Wildfire Mitigation Council (BAWMC), which among other things, identified coordinators for neighborhoods in the Beulah area. In 2003, the BAWMC received grant funding. These funds were used to treat a portion of the area, consisting of 52.25 acres on 42 private land parcels.

21 Source: U.S. Census Bureau Factfinder, Economic Sector (2008)

The purpose of this CWPP is to:

1. Identify and prioritize wildland fuel management projects developed by the Core Team,
2. Recommend methods of managing wildland fuels that are acceptable to members of the relevant communities and stakeholders.

The overriding treatment objective is to create defensible space with a forest canopy that would be less likely to support a crown fire. The CWPP also identified values at risk, including personal property, public infrastructure, and resource values. These values are summarized below.

Homes, Businesses, and Essential Infrastructure at Risk

Ranches, small groupings of homes, and freestanding homes are present throughout the CWPP planning area. There are scattered homes located on large 40 acre lots, especially in the western portion of the planning area. The total population for the planning area, according to the 2000 Census is 5,112 residents. Of that total, 650 residents live in the Beulah Valley, 1636 live in Colorado City, and 198 live in Rye. The median home value within the planning area is $137, 622. A variety of businesses, some of which cater to area visitors, as well as churches, and other local businesses are located in Colorado City, Rye and Beulah.

Other Community Values at Risk

Recreational and day use activities (picnicking, fishing, hunting, hiking, mountain biking, etc.) are important to the area's economy. Key recreational areas include Pueblo Mountain Park, Rye Mountain Park, Boy Scout Camp, Girl Scout Camp, YMCA Camp, and Lake Isabel. Highway 165 is a Scenic Byway that has received steadily increasing vehicular traffic since its designation. The Mountain Park Environmental Center and a nearby pavilion are listed on the historic register. The Squirrel Creek Camping Area, the first facility of its type to be designated by the federal government, is of historic significance. Two ranches in the area, 3R and Bears Head (formally the Don K), are considered to be historic, as is a Centennial Farm located in Beulah Valley. Parts of the 3R Ranch are important elk and mule deer wintering grounds and other critical or significant habitats of interest include old aged stand (6 inch diameter or larger) oak brush. This is a very important food source primarily for black bear and turkey. It is important that some stands of this age class of oak remain viable and productive.

Custer County

Recent Historical Background

By the middle of the 19th Century European settlement had begun, and mining began shortly thereafter. The community of Rosita's mining history began in 1863 in Hardscrabble Canyon. The ore that was found contained both gold and silver and the Smith's Mining District was formed. The large cattle herds started to arrive in 1870 with Edwin Beckwith's herd of 1,500 Texas cattle. The first true settlers were a band of colonists from Germany, who came in 1870 by way of Chicago, to make a living in farming. By 1880 there were more than 8,000 residents in Custer County. In 1885, mining began to wane, and the 4,200 citizens that remained shifted their livelihood back to agriculture. The town of Westcliffe—a stop on the Denver & Rio Grande Railroad—began to thrive, and solidified its status as the supply center for local ranchers and farmers. The

Wet Mountains Valley was prime land for growing hay and raising livestock, and by 1880, there were over 13,000 head of cattle at ranches throughout Custer County.

Similar to other Colorado counties, the population of Custer County has fluctuated with "boom and bust" economies. The surge of silver and gold mining activity in the 1870's brought a population to Custer County more than double what currently exists. By 1890, the population decreased as mining claims were played out. Cattle ranching became the main economic activity in the county, and population continued to decline between 1940 and 1970. Between 1970 and 1990, population steadily increased with the growth of tourism and a relatively stable state economy. However, from 1990 to 2000 Custer County grew 82 percent, becoming the fourth fastest growing county in Colorado, with its spectacular natural setting attracting new residents enjoying a strong state and national economy focused on information technology, recreation, tourism and services. The largest surge in population is among affluent individuals aged 45 to 64. Population is expected to continue to grow, although not at rates experienced during the 1990's. These recent population trends and the types of people coming to county increase the likelihood that their personal property will become part of the "values at risk" that are considered in estimating wildfire hazards.

Socio-economic profile

The population of Custer County is estimated at, 3,999 residents and the median household income was $50,660 in 2008 (Table 36). Median income is about 20 percent higher in Custer compared to Pueblo County. The number one industry was construction (not manufacturing as for Pueblo County), followed by retail trade.

Table 36. Socio-economic Profile for Custer County[22]

Characteristic	Number/Proportion
Population	3,999
Median Annual Household Income	$50,660
Proportion of Families below poverty level	11.8%
Proportion of Population self-reported as Caucasian	97%
Proportion of Population self-reported as Hispanic or Latino (of any race)	3.7%
Top Industries (annual payroll, MM dollars)	
Construction	$4,842
Retail Trade	$2,838

Community Wildfire Protection Plan

Custer County also has a CWPP. Specific objectives of the Custer County CWPP are to identify: a.) the WUI of the County where residential areas are at high wildfire risk; b.) critical and high priority projects needed to protect community resources, homes, infrastructure, and delivery systems (such as power lines); c.) projects

22 Source: U.S. Census Bureau Factfinder, Economic Sector (2008)

and procedures to improve the safety of forested lands and subdivisions. Similar to the CWPP for southwestern Pueblo County, this plan was a collaborative multi-agency, multi-stakeholder effort, and had broad community support.

In terms of values at risk, Custer County has similar resource values at risk; recreational, scenic, and wildlife habitat values are at varying degrees of risk depending on their location in the East-Central Wet Mountains Project Area. As stated in the background for Custer County, recent population growth and associated new home construction have added to the values at risk in the personal property category.

Other values at risk are described in the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project Recreation Specialist Report (JW Associates 2010e), Management Indicator Species Specialist Report (JW Associates 2011a) and the Biological Assessment/Biological Evaluation (JW Associates 20111b).

3.6.2 Socio-Economics Environmental Consequences

The analysis includes quantitative and qualitative components, and is largely focused on economic analysis, rather than social analysis. The quantitative portion of the economic analysis was conducted by calculating net present values (NPVs) for costs associated with the Alternative A (No Action) and Alternative B (Proposed Action). Since revenues were not calculated for either alternative the basis for comparison is not NPV per se, but the net difference (or savings) in costs.

Three sets of assumptions were made in the quantitative analysis.

1. The first assumptions are that applicable cost categories and unit cost values would generally be the same as those used in the economic analysis for the Upper South Platte Protection and Restoration Project (USDA Forest Service 2002b), with the exception of costs associated with impacts to hydro-power operations.
2. The second set of assumptions are how many units for a particular resource would be affected under each alternative, such as the miles of streams restored or the number of recreation facilities replaced following a wildfire. Identification of the number of affected units was accomplished based on GIS queries of the area that would be affected by wildfire. The average number of units per acre that could be affected was calculated based on the average number of units per acre for the entire acreage of the East-Central Wet Mountains Project Area.
3. The third set of assumptions pertain to wildfire probabilities. A calculation was made based on the changes in wildfire probability from vegetation treatments. Treated areas were given a 2 percent probability, areas surrounding the treated areas were given a 7 percent probability and untreated areas were given a 10 percent probability. The result is that the probability of a wildfire occurring in the Wet Mountains East-Central Wet Mountains Project Area, in any given year would be 10 percent under Alternative A (No Action), and 6.4 percent under Alternative B (Proposed Action). The probability of a fire occurring on untreated areas was based on the Mean Fire Interval (MFI) of 9.2 years (USDA Forest Service 2002b), or a mean annual probability for a given area of ten percent. The MFI is based on data obtained from Brown et al. (1999). The probability of a fire occurring in relatively open historic landscapes is much lower. It is based on an MFI 50 years (Kaufmann et al. 2001), which equates to a two percent probability for a given area in any year. Finally, the 10,000-acre fire size was based on the average size of one recent large fire (Mason Gulch fire) that occurred in the project vicinity in the last decade.

Additional supporting information on unit cost information, number of units affected, and wildfire probability is found in IW Associates (2010g).

The broadly defined cost categories in the NPV analysis include:

1. Fire suppression
2. Resource damage (multiple categories)
3. Burned area restoration
4. Fuels treatment

Cost information for the above first three cost categories listed above was taken from the Upper South Platte Economic Analysis (USDA Forest Service 2002b) for all cost categories except for hydro-power generation costs, since the Wet Mountains East-Central Wet Mountains Project Area does not contain nor is adjacent to any hydropower generation or municipal water facilities. For timing of costs it was assumed that all treatments were a one time cost and completed at year zero. Wildfire suppression and ancillary costs were averaged over 15- and 30-year time periods and compared. This was done since the probability of a wildfire is expressed on an annual basis and is applied to fire suppression, fire damage, and burned area restoration costs. Since costs from the USDA Forest Service (2002) report are eight to ten years old, an inflation adjustment factor of 1.2 (Sahr 2010) was applied to costs in each category. Treatment costs were based on recent stewardship contract awards for thinning and USDA Forest Service costs for prescribed burning and were assumed to average $500 per acre.

Finally, the East-Central Wet Mountains Project Area includes 18,800 acres that would be treated, and the analysis time period is assumed to be 30 years, because the proposed treatments are expected to be effective for this time period, or longer. The qualitative analysis focused on how well each alternative meets the objectives associated with the Proposed Action.

Effects Common to All Alternatives

Both alternatives would involve costs for fire suppression, resource damage, and burned area restoration in response to wildfires. These costs would occur for fires that would burn in any location within the 111,622-acre East-Central Wet Mountains Project Area in any given year, over a 30-year time period.

Alternative A (No Action) - Direct and Indirect Effects

Alternative A (No Action) would have no treatment costs. Current management actions such as fire patrols, road maintenance, and wildfire suppression would continue, but efforts to treat areas to reduce wildfire hazards would not occur.

Depending on the timing of future wildfires, costs could be a combination of direct (current) and indirect (future) effects. If a wildfire would occur in 2011 the initial costs associated with fire suppression and burned area rehabilitation would be direct effects, while all other costs such as stream restoration would occur later in time and therefore would be indirect effects.

Table 37 is a comparison of the NPV of costs for Alternatives A and B. The differences in costs for each organization type (Private, municipal, and USDA Forest Service) are the savings associated with implementing Alternative B; these savings are listed under the subheading "Net Savings." Under Alternative A (No Action), the NPV of costs for all partners would be approximately $28.21 million for a 30-year analysis period (Table 37).

The largest proportion of these costs would be borne by private landowners, followed by the USDA Forest Service, and then municipal partners (Beulah Water Works District, Pine Drive Water District, YMCA - Camp Jackson, Town of Rye and Colorado City Municipal District). Incurring these costs would result in less than significant impacts.

Table 37. Cost comparison of Alternatives A and B using 30-year Period

Alternative	Alternative A	Alternative B	
Wildfire Probability	10.0%	7.0%	
Present Net Value ($1,000,000s)			**Treatment Costs**
All Partners	-$28.21	-$19.66	$9.40
Municipal	-$4.05	-$2.82	$0.00
Private	-$13.13	-$9.15	$0.00
USDA Forest Service	-$11.03	-$7.69	$9.40
Net Savings ($1,000,000s)			**Including Treatment Costs**
All Partners	-	$8.55	-$0.85
Municipal	-	$1.23	$1.23
Private	-	$3.98	$3.98
USDA Forest Service	-	$3.34	-$6.06

Alternative A (No Action) - Cumulative Effects

The Custer and Pueblo County CWPPs have multiple, small projects that are planned to occur on private lands in the near future. These foreseeable projects, when considered with the treatments associated with Alternative A (No Action) would not result in cumulative effects to socioeconomic resources. Effects to resources with economic value, specifically recreation resources, have been described in other specialist reports. Effects to the NPV of costs of wildfire suppression and related costs would not be cumulative because the above referenced projects are small relative to the Proposed Action and costs would be borne mostly by Custer and Pueblo counties rather than private landowners or the USDA Forest Service.

Alternative B (Proposed Action) - Direct and Indirect Effects

Costs of fuel treatments would all be direct effects since they would be incurred as part of project implementation. As stated above wildfire suppression, resource damage, and burned area restoration costs could be either direct or indirect costs.

The NPV of all costs would be approximately $19.66 million under a 30-year period. As with Alternative A, the majority of costs would be borne by private landowners. However, under this alternative the investment of $9.4 million in fuel treatments by the USDA Forest Service would result in a reduction of private property loss of approximately $3.98 million dollars over a 30-year time period, and the net savings to all parties would be

about $8.55 million (Table 38). The reason for these savings is due to a 30 percent reduction in the risk of wildlife (from 10 to 7 percent), and would result in beneficial impacts.

These dollar savings are based on reduction to damages to various resources and public infrastructure depicted in the 13 cost categories referenced above. Table 38 provides a qualitative summary of the benefits of implementing the Proposed Action relative to meeting the Purpose and Need. Additional detail on the resource related benefits for the Purpose and Need may be found in the appropriate specialist reports.

Table 38. Effects of Alternatives on Meeting Project Objectives

Project Objectives	Alternative A (No Action)	Alternative B (Proposed Action)
To reduce the risk that a wildfire would negatively affect the municipal watershed reserves for the communities of Rye, Beulah, and Colorado City.	Wildfire risk is 10%	Wildfire risk reduced to 7%
To reduce fuels and associated risk of extreme fire behavior in the Wildland Urban Interface.	Fuel loadings remain the same or increase	Fuel loadings of downed and dead material are substantially reduced
To improve forest health, vigor, and resistance to fire, insects and disease.	Forest health conditions or deteriorate over time	Forest health conditions improve with better growth rates, and more heterogeneous stands
To reduce the risk of severe flooding and sedimentation for the protection of public safety, water system infrastructure, and other natural and developed resources.	Sediment loading increases, damage would occur to private residences, public recreation resources, miles of stream habitat and forested habitat	Sediment loading is substantially reduced, damage to private residences, public recreation resources, miles of stream habitat and forested habitat is also substantially reduced

Alternative B (Proposed Action) - Cumulative Effects

The Custer and Pueblo County CWPPs have multiple, small projects that are planned to occur on private lands in the near future. These foreseeable projects, when considered with the treatments associated with Alternative B (Proposed Action) would not result in cumulative effects to socio-economic resources. Effects to resources with social value, specifically recreation and visual resources, have been described in other specialist reports. Effects to the NPV of costs of wildfire suppression and related costs would not be cumulative because the above referenced projects are small relative to the Proposed Action and costs would be borne mostly by Custer and Pueblo counties rather than private landowners or the USDA Forest Service.

3.7 Cultural/Heritage Resources

3.7.1 Cultural/Heritage Resources Affected Environment

The area was used by prehistoric people for habitation, resource procurement/processing, and transportation corridors. The historic uses include; homesteading, lumbering, ranching, mining, settlement, transportation, communication, recreation, and tourism. Heritage resource investigations have been conducted within the East-Central Wet Mountains Hazardous East-Central Wet Mountains Project Area with both historic and prehistoric sites being identified and recorded.

Prior to implementation, background research would be conducted to identify previously conducted heritage resource investigations, previously identified / recorded prehistoric / historic phenomena, and identify cultural phenomena recommended eligible for or listed on the National Register of Historic Places (NRHP). Areas with adequate Cultural Resource investigations would not need additional inventory and sites eligible for nomination / listing to the NRHP would be protected / mitigated from proposed project activities. In addition, background research would assist with developing heritage resource inventory strategy and predict site density.

Numerous comprehensive efforts to identify and evaluate cultural sites have been conducted within the East-Central Wet Mountains Hazardous East-Central Wet Mountains Project Area. This prior work includes a number of Cultural Resource Reports (CRR); these previous investigations were done primarily to satisfy the requirements of Section 106 of the National Historic Preservation Act (NHPA).

It should be noted that surveys conducted before 1985, when field methods could be described as "reconnaissance" by one or two individuals, are not considered as adequate cultural resource survey. Standards for survey coverage was upgraded according to new Colorado State Office of Archaeology and 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 East-Central Wet Mountains Project Areas.

Through these prior investigations, cultural properties were identified, recorded and evaluated. The records for these previously known properties were reviewed during the current analytical process in terms of site significance, meeting criteria for entry into the National Register of Historic Places (NRHP), location and for potential impacts.

If a site(s) are located / recorded and determined / recommended eligible for listing or nomination to the NRHP the proposed fuels treatment impacts to the site(s) would be mitigated through avoidance or Memorandum Of Agreement (MOA) with the State Office of Archaeology and Historic Preservation (OAHP/SHPO) prior to any affects taking place to the site.

"Historic" properties refers to site(s) with materials and items common to European immigrant cultures of the Western Frontier and the use of such properties date after AD 1860 in the Pike and San Isabel National Forest. "Prehistoric" properties refers to sites with materials and items common to American Indian cultures of Colorado, and 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, historic engineering attributes, and / or association with important historic events or persons.

"Prehistoric" properties (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; such concentrations may represent the remnants of temporary dwellings or outdoor activity areas. Total quantities of material items on surface properties range from less than ten to approximately seventy-five. Prehistoric sites with these manifestations are usually interpreted as camps, or as resource collecting and processing areas. Thus, most of the known and recorded 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. The prehistoric sites thought to be seasonal campsites have comparatively few total amounts of surface items. Prehistoric sites in the general area have more than seventy-five (75) total surfaces items. It is not uncommon in other parts of the Pike and San Isabel National Forest for sites to have fifty (50) to one hundred (100) or even more than one hundred (100) surface items.

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.

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, several projectile points identified during previous field work date much earlier; a few, based on their morphology, may have been manufactured more than 2000 years ago. It could not be determined from the available information whether these are items salvaged from early archeological contexts and used by later groups, or whether they actually reflect early use of the general vicinity. It may be that some of the sites contain a mixture of deposits and materials representing the late period and an earlier use.

There are prehistoric properties within the East-Central Wet Mountains Hazardous East-Central Wet Mountains Project Area that are recommended eligible for inclusion and listed on the NRHP. These properties contain preserved archeological deposits that are storehouses of archeological and cultural information. Sites may be important as traditional cultural areas to the modern descendants of the American Indian peoples who previously inhabited the eastern part of the Colorado mountains area.

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 East-Central Wet Mountains Hazardous EA. No tribal groups have responded to these contacts at this time.

3.7.2 Cultural/Heritage Resources Environmental Consequences

Alternative A (No Action) - Direct and Indirect Effects

Only existing and planned activities, previously approved under other NEPA documents, would occur 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.

Indirect effects would include potential destruction or damage of archaeological sites and historically significant buildings and structures within the East-Central Wet Mountains Hazardous East-Central Wet Mountains Project Area and surrounding areas. Such a fire could damage or destroy combustible materials found in historic-era archaeological sites and historic buildings. Other effects of such a fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation.

Alternative A (No Action) - Cumulative Effects

The implementation of Alternative A 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 any related or future resources management projects in the area. There would be minimal effect to unknown heritage resources and no effect to known heritage resources.

Alternative B (Proposed Action) - Direct and Indirect Effects

Implementation of Alternative B (Proposed Action) has the potential to directly affect cultural properties. To meet its responsibilities under Section 106 of the NHPA, the USDA Forest Service would complete archaeological surveys within the East-Central Wet Mountains Project Area and would complete formal National Register eligibility evaluations for all previously recorded and newly recorded archaeological sites that could potentially be adversely affected by the proposed actions. These sites would be flagged and fenced to protect them from direct impacts. Mechanical equipment and workers would be kept out of the protected areas. Alternatively, the USDA Forest Service may chose to avoid the need for formal eligibility evaluations of all recorded sites by avoiding adverse effects to these sites. Under this option, the USDA Forest Service would delineate the horizontal boundaries of these sites and would establish a fenced protective 100-foot buffer around the sites. These actions would prevent direct effects.

The inadvertent discovery of historic or prehistoric material is possible. If an archaeological discovery is made all work would stop within 100 feet, the San Carlos Ranger District, Zone Archeologist and Forest Archeologist would be notified.

Some direct impacts to heritage resources that do not meet the National Register criteria could result from the proposed activities; however, because these sites are not significant, the impacts would be considered less than significant.

In general, indirect effects associated with the implementation of Alternative B, might eventually expand to archeological sites located outside of the proposed project boundary. Therefore a buffer of 164 feet (50m) outside of the proposed project boundary would be inventoried. It is possible that staging areas access (roads, temp roads, skid trail) and erosion (slope wash / slope destabilization) has the potential to effect historic and

prehistoric properties located outside of the East-Central Wet Mountains Project Area therefore staging areas and access for a proposed activity is part of the Area of Potential Effect and requires Heritage Resource inventory.

Hand Thinning

Hand thinning entails the use of chainsaw to cut tree stems at ground level. This activity has to comply with the National Historic Preservation Act (NHPA) as amended and directions in the Forest Plan.

Prescribed Fire

Prescribed fire activities, including pre and post associated activities, have the potential to affect heritage resources (fire line – dozer/hand, fire, fire intensity, suppression / control). Heavy equipment used for the creation of fire lines, and hand constructed line has the potential to disturb cultural material by affecting the sub surface stratigraphy and removal / disturbance of surface constituents. Fire when it is introduced has the potential to affect historic and prehistoric organic surface phenomena. Subsurface disturbance by fire is based on fire intensity and duration. Fire suppression / control has the potential to effect heritage resources through water drops / hand lines / and dozer lines and or hot spot suppression. This activity has the potential to effect heritage resources through disturbance of surface and subsurface cultural material.

Prescribed burning carries with it a small risk of escape. This risk would be minimized by strict adherence to all precautions and policies for prescribed burns, however, the risk cannot be eliminated. It is unlikely that prescribed burning would have any impact on prehistoric archaeological sites. Prehistoric sites within the East-Central Wet Mountains Project Area have already been subjected to a cycle of numerous natural fires over the thousands of years represented by these sites.

Mechanical Fuel Treatment

Mechanical fuel treatment has the potential to affect heritage resources. Staging areas and access routes need to be included into the proposed project are Area of Potential Effect (APE) to address heritage resource concerns. The tire or track on the machine has the potential to churn and disperse surface and subsurface cultural deposits. The thinning blades have the potential to affect above surface cultural manifestations by chopping. The removal of downed trees using conventional logging systems has the greatest potential for ground disturbance and therefore the greatest potential to impact unknown, buried archaeological deposits. Known sites would be protected as discussed above.

The long-term risk of wildfire, especially a large, intense crown fire, would be reduced by the proposed actions. Although the risk of such a fire is not eliminated, it would be lessened by the vegetation treatments and fuel breaks created by openings. It would be more likely that fires started in the East-Central Wet Mountains Project Area would burn less intensely and be more limited in extent. There would be less likelihood that historic sites would be burned or could not be protected by fire fighting efforts. Fires that burn at a lower intensity are also less likely to create the types of erosion that could damage archaeological deposits on destabilized slopes.

Alternative B (Proposed Action) - 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 any related or future resources management projects in the area. Alternative B (Proposed Action) would have minimal effect to unknown heritage resources and no effect to known heritage resources.

3.8 Consistency with the Forest Plan

The proposed actions are designed to meet all the applicable Forest Plan standards. Alternative B is consistent with the Forest Plan standards for all resources. Detailed analysis of how the actions would comply with Forest Plan standards are contained in the Specialist Reports.

3.9 Irreversible and Irretrievable Commitments of Resources

3.9.1 Forest Resources

The proposed vegetation treatments would not cause any irreversible commitments of forest resources.

3.9.2 Wildlife

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 under Alternative A (No Action) or Alternative B (Proposed Action). Loss of old growth could represent an irretrievable loss of habitat, although no known old growth stands would be lost.

3.9.3 Watershed and Soils

Any soil lost from the East-Central Wet Mountains Project Area would be considered an irreversible and irretrievable commitment of the soil resource. BMPs would be used to minimize soil productivity losses from vegetation treatment activities. There would not be irretrievable loss of soil productivity, as landings and skid trails would be ripped and seeded where productivity has been reduced.

None of the proposed activities by themselves would result in irretrievable effects to water quality.

3.9.4 Visual Resources

There would be no irreversible or irretrievable commitments of visual resources. Most of the effects described previously would be short-term. The long-term effects of proposed treatments would result in changed views of forested areas, but these changes would not be irreversible or irretrievable. At some point time, absent future similar treatments, the forested landscape would eventually return to its current appearance.

3.10 Short-term Uses and Long-term Productivity

3.10.1 Forest Resources

Alternative B (Proposed Action) would show a short-term reduction in the amount of standing timber volume in the area following the proposed commercial timber harvest. The decrease in density would improve the vigor of the remaining trees making them less susceptible to wildfires and attack by insect and disease.

3.10.2 Fire and Fuels

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 less environmental damage to wildlife, water, range, recreation, and private lands and structures.

3.10.3 Wildlife

As provided for by the amended Forest Plan (USDA Forest Service 1984), specific standards, objectives, and guidelines would be applied during implementation of Alternative B (Proposed Action) through the use of specific design criteria (*2.4 Design Features*). 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 fish 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.

3.10.4 Watershed and Soils

The soil resource is a key ingredient for maintaining the long-term productive potential for an area. Erosion and effects that may be detrimental to the soil resource would be minimized through use of careful design and BMPs. Soil protection measures in the Forest Plan Standards and Guidelines would maintain critical soil parameters and nutrients, ensuring long-term productivity.

Short-term effects of the proposed activities could include a small change in sediment delivery. Where increased sediment delivery is predicted, it could continue for an indefinite period of time, depending on vegetative recovery and maintenance of roads. These effects are negligible and would not affect long-term productivity. Beneficial uses would not be adversely affected.

3.10.5 Visual Resources

The short-term effects of Alternatives A and B would not result in long-term effects on visual resources. The major scenic features in the East-Central Wet Mountains Project Area would not be changed by either alternative. Nor would views along major travelways or at popular recreation areas be permanently changed. Over the long-term the visual resources in the East-Central Wet Mountains Project Area would be substantially altered.

3.11 Unavoidable Adverse Impacts

3.11.1 Fire and Fuels

Some minor, short-duration impacts are expected from conducting prescribed burning. Potential impacts would include short-term decreases in air quality due to smoke, and would be addressed during the preparation of prescribed fire burning and smoke management plans. Mitigation measures would be developed and implemented as needed.

3.11.2 Wildlife

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 and their nests. Over the long-term, the diversity and functionality of the habitat would increase.

3.11.3 Botany

Some potential habitat for R2 Sensitive plant species might be disturbed during vegetation treatment activities.

3.11.4 Watershed and Soils

Long-term soil productivity would not be adversely affected. However, soil erosion may contribute to a slight decrease in soil productivity. None of the proposed activities would result in an unavoidable adverse environmental effect on water quality.

3.11.5 Visual Resources

Unavoidable, adverse but short-term effects would result from the Alternative B (Proposed Action). As stated above, project treatments would result in ground disturbance that would be viewable from foreground distances, and would produce smoke viewable from middleground and background distances. Some visitors to the East-Central Wet Mountains Project Area may not notice these changes. However, some proportion of the visiting population would notice ground disturbance and smoke and be negatively affected by it. Therefore, there would be short-term, unavoidable adverse effects to visual resources.

3.12 Other Required Disclosures

3.12.1 Wildlife

No waters would be impounded or diverted as part of the project so coordination with the US Fish and Wildlife Service under the Fish and Wildlife Coordination Act is not required.

3.12.2 Botany

No coordination with the with the US Fish and Wildlife Service is required under the Endangered Species Act, as no Threatened or Endangered Plant Species occur on the East-Central Wet Mountains Project Area.

3.12.3 Hydrology and Soils

E.O. 11988 – Floodplain Management

Floodplains in the East-Central Wet Mountains Project Area would be protected by implementation of the BMPs (JW Associates 2010d) and the design features listed in *2.4 Design Features*. There would be no direct, indirect or cumulative effects on floodplains from Alternative B (Proposed Action).

E.O. 11990 – Protection of Wetlands

Wetlands in the East-Central Wet Mountains Project Area would be protected by implementation of the BMPs (JW Associates 2010d) and the design features listed in *2.4 Design Features*. There would be no direct, indirect or cumulative effects on wetlands from Alternative B (Proposed Action).

Clean Water Act of 1977

All alternatives for the East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project would not degrade water quality and would be in compliance and meet the requirements of the CWA.

Section 402

Discharge Permits –This permit applies to point sources. There would not be any point sources of pollutants as a result of this project and silvicultural activities are exempt from this permit. Any potential source of pollutants as a result of this project would be labeled as non-point and this project would meet and comply

with the Forest Plan Standards, which incorporate BMPs that are designed to meet water quality standards through control of non-point source of pollutants.

Storm Water Associated with Construction Activities – Silvicultural activities, including road construction to access treatment areas, are exempt from this permit. As mentioned above, Forest Plan Standards would be implemented to prevent and minimize pollution.

Section 404

Silvicultural activities and roads associated with these activities are exempt from this permit as long as the 15 mandatory BMPs are implemented as listed in 33 CFR 323.4. Those BMPs are listed below:

1. Permanent roads (for farming or forestry activities), temporary access roads (for mining, forestry, or farm purposes) and skid trails (for logging) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific farming, silvicultural or mining operations, and local topographic and climatic conditions;
2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.;
3. The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows;
4. The fill shall be properly stabilized and maintained during and following construction to prevent erosion;
5. Discharges of dredged or fill material into waters of the United States to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;
6. In designing, constructing, and maintaining roads, vegetative disturbance in the waters of the U.S. shall be kept to a minimum;
7. The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;
8. Borrow material shall be taken from upland sources whenever feasible;
9. The discharge shall not take, or jeopardize the continued existence of, a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;
10. Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist;
11. The discharge shall not be located in the proximity of a public water supply intake;
12. The discharge shall not occur in areas of concentrated shellfish production;
13. The discharge shall not occur in a component of the National Wild and Scenic River System;
14. The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts; and
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

3.13 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

The proposed vegetation treatments and other activities are designed to reduce wildfire hazard, restore forest conditions and protection watersheds. These activities would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to reduce the risk of large scale fires and potential damage to property and human health of the type experienced during and following the Hayman Fire.

Chapter 4. References

Abel, S. and A. Vitt. 2005. Grape Creek Data Analysis Unit E-28 Elk Management Plan. Prepared for the Colorado Division of Wildlife. October 2005.

Adams, A.W., 1982. Migration. In: Thomas, Jack Ward; Toweill, Dale E., eds. Elk of North America: ecology and management. Stackpole Books, Harrisburg, PA. pp. 301-322.

Allred, W.S., and W.S. Gaud. 1994. Characteristics of ponderosa pines and Abert squirrel herbivory. Southwestern Naturalist 39:89-90.

Amaranthus, M.P., R.M. Rice, N.R. Barr, and R.R. Ziemer. 1985. Logging and forest roads related to increased debris slides in southwestern Oregon. Journal of Forestry, 83(4): 229-233.

Anderson, T. 2003. Conservation assessment of woodpeckers in the Black Hills National Forest. USDA-Forest Service, Black Hills National Forest, Custer, SD. 272 pp.

Andrews, R. and R. Righter. 1992. Colorado Birds. The Denver Museum of Natural History, Denver, CO. 442 pp.

Armstrong, D.M., R.A. Adams, and J. Freeman. 1994. Natural history inventory of Colorado, No. 15: Distribution and ecology of bats of Colorado. University of Colorado Museum, Boulder, CO.

Baker, Jr., Malchus B. Compiler. 1999. History of Watershed Research in the Central Arizona Highlands. Gen. Tech. Rep. RMRS-GTR-29. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 56 p.

Baxter, G.T. and M.D. Stone. 1985. Amphibians and reptiles of Wyoming. Second edition. Wyoming Game and Fish Department, Cheyenne, WY. 137 pp.

Beecham, J.J. and C.P. Collins. 2007. Rocky Mountain Bighorn Sheep (*Ovis canadensis*): A Technical Conservation Assessment. Available at: http://www.fs.fed.us/r2/projects/scp/assessments/rockymountainbighornsheep.pdf.

Bilby, R.E., K. Sullivan, and S.H. Duncan. 1989. The generation and fate of road-surface sediment in forested watersheds in southwestern Washington. Forest Science, 35(2): 453-468.

Bisson, P.A.; Bilby, R.E.; Bryant, M.D.; [and others]. 1987. Large woody debris in forested streams in the Pacific Northwest: past, present, and future. Streamside Management: Forestry and Fisheries Interactions. Institute of Forest Resources Contribution No. 57. E.O. Salo and T.W. Cundy. Seattle, University of Washington: 143-190.

Brown et al. (1999)

Cannon, S.H. and S.L. Reneau. 2000. Conditions for Generation of Fire-related Debris Flows, Capulin Canyon, New Mexico. Earth Surf. Process. Landforms 25, 1103-1121 (2000).

CDOW. 2008. Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors. Prepared by Gerald R. Craig for Colorado Division of Wildlife.

Chung-MacCoubrey, A.L. 1996. Bat species composition and roost use in piñon-juniper woodlands of New Mexico. Pages 118-123 in R.M. Barclay and R.M. Brigham, editors. 1996. Bats and Forests Symposium, October 19-21, 1995. Victoria, British Columbia, Canada.

Coleman, M.A., and K.D. Fausch. 2007. Cold summer temperature regimes cause a recruitment bottleneck in age-0 Colorado River cutthroat trout reared in laboratory streams. Transactions of the American Fisheries Society 136:639-654.

Colorado Natural Heritage Program. 2009. Biodiversity tracking and conservation system. [DVD] Colorado State University, Fort Collins, CO.

Cook, John G., Larry L. Irwin, Larry D. Bryant, Robert A. Riggs, and Jack Ward Thomas. 1998. Relations of forest cover and condition of elk: a test of the thermal cover hypothesis in summer and winter. Wildlife Monographs. 141:1-61.

COVERS. 2001. Colorado Vertebrate Ranking System. Designed and produced by John E. Gross at the Natural Resource Ecology Laboratory for the Colorado Division of Wildlife.

Crane, M. F. 1982. Fire ecology of Rocky Mountain Region forest habitat types. USDA Forest Service final report. 272 pp.

Custer County. 2007. Custer County Community Wildfire Protection Plan. September 2007.

Davis, R. and S.J. Bissell. 1989. Distribution of Abert's Squirrel (*Sciurus aberti)* in Colorado: Evidence for a Recent Expansion of Range. The Southwestern Naturalist, Vol. 34, No. 2, pp. 306-309.

Dodd, N.L., S.S. Rosenstock, C.R. Miller, and R.E. Schweinsburg. 1998 Tassel-eared squirrel population dynamics in Arizona: index techniques and relationships to habitat condition. Arizona Game and Fish Department. Research Branch. Technical Report 27. 49 pages.

Donald, J.A., B.C. Wemple, G.E. Grant, and F.J. Swanson. 1996. Interaction of logging roads with hillslope and channel processes during the February 1996 flood in western Oregon. In: EOS Transactions, American Geophysical Union, AGU Fall Meeting. Washington, D.C.: American Geophysical Union, 77(46): F273.

Eckhardt, R. C. 1979. The adaptive syndromes of two guilds of insectivorous birds in the Colorado Rocky Mountains.

Edge, W.D., C.L. Marcum, and S.L. Olson-Edge. 1987. Summer habitat selection by elk in western Montana: a multivariate approach. Journal of Wildlife Management. 51(4): 844-851.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. The birder's handbook: A field guide to the natural history of North American birds. Simon and Schuster Incorporated, New York, NY.

Elliot, William J.; Miller, Ina Sue; Audin, Lisa. Eds. 2010. Cumulative watershed effects of fuel management in the western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 299 p.

Erickson, M.G. 1987. Nest site habitat selection of the goshawk (*Accipiter gentilis*) in the Black Hills of South Dakota. University of South Dakota, Brookings, SD. M.S. Thesis. 49pp.

Federal Geographic Data Committee. 2004. Draft Federal Standards for Delineation of Hydrologic Unit Boundaries, Version 2. Available at: ftp://ftp-fc.sc.egov.usda.gov/NCGC/products/watershed/hu-standards.pdf

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History, University Press of Colorado, Niwot, CO. 467 pp.

Foster Wheeler Environmental Corporation. 1999. Landscape Assessment, Upper South Platte Watershed. Volumes 1, 2, and 3. Prepared for the US Department of Agriculture, Forest Service, Colorado State Forest Service, Denver Water Board, and US Environmental Protection Agency.

Graham, R., Harvey, A., Jain, T., and Tonn, J., 1999. The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests. USDA Forest Service, USDI Bureau of Land Management, General Technical Report, PNW-GTR-463, Pacific Northwest Research Station, Portland, OR.

Graham, R., McCaffrey, S., and Jain, T. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. USDA Forest Service, General Technical Report RMRS-GTR-120, Rocky Mountain Research Station, Ft. Collins, CO.

Greenwald, D.N, D. Coleman Croker-Bedford, L. Broberg, K.F. Suckling and T. Tibbits. 2005. A review of northern goshawk habitat selection in the home range and implications for forest management in the western United States. Wildlife Society Bulletin 2005, 33(1): 120-129.

Harig, A.L., K.D. Fausch, and M.K. Young. 2000. Factors Influencing Success of Greenback Cutthroat Trout Translocations. North American Journal of Fisheries Management 20:994-104.

Harig, A.L., and K.D. Fausch. 2002. Minimum habitat requirements for establishing translocated cutthroat trout populations. Ecological Applications 12(2):535-551.

Harr, R.D. 1979. Effects of timber harvest on streamflow in the rain-dominated portion of the Pacific northwest. In: Proc. Workshop on scheduling timber harvest for hydrologic concerns, U.S. For. Serv., Pacific Northwest Region, Portland, OR.

Harrison, H.H. 1979. A field guide to western birds' nests in the United States west of the Mississippi River. Houghton Mifflin, Boston, MA.

Harvey, M.J., J.S. Altenbach, and T.L. Beast.1999. Bats of the US. Arkansas Game and Fish Commission and USFWS. 64pp. Hayward, G.D. 1997. Forest Management and conservation of boreal owls in North America. The Raptor Research Foundation. Journ. Raptor Res. 31(2):114-124.

Hayward, G.D. and R.E. Escano. 1989. Goshawk Nest-Site Characteristics in Western Montana and Northern Idaho. Condor 91: 476-479.

Hayward, G.D. and J. Verner, eds. 1994. Flammulated, boreal and great gray owls in the United States: a technical conservation assessment. Gen. Tech. Rept. RM-253. US Forest Service, Rocky Mountain Forest and Range Experimental Station, Ft. Collins, CO. 214pp.

Holmes, J.A. and M.J. Johnson. 2005. Brewer's Sparrow (*Spizella breweri*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. January 13, 2005.

Honeycutt , R.L. and J.W. Dragoo. 1995. Taxonomic status of hog-nosed skunks (genus *Conepatus*). Report to Texas Parks and Wildlife Department.

Ice, G.G. 1985. Catalog of landslide inventories for the Northwest. Tech. Bull. 456. New York: National Council of the Paper Industry for Air and Stream Improvement. 78 p.

Javernick J. and R. Torretta, 2006. USDA Forest Service, wildlife biologists. Personal observation.

JW Associates. 2010a. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Silviculture Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010b. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Fire/Fuels Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010c. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Air Quality Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010d. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Watershed/Soils Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010e. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Recreation Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010f. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Visuals Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2010g. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Socio-Economics Specialist Report. USDA Forest Service, San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2011a. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Management Indicator Species Specialist Report. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

JW Associates. 2011b. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Wildlife/Fisheries Biological Assessment/Biological Evaluation. USDA Forest Service, Pike and San Isabel National Forest, San Carlos Ranger District. 2010.

Kaufmann, M.R., C.M. Regan, and P.M. Brown. 2000. Heterogeneity in ponderosa pine/Douglas-fir forests: Age and size structure in unlogged and logged landscapes of central Colorado. Canadian Journal of Forest Research. 30:698-711.

Kaufmann, M.R., T. Veblen, and W.H. Romme. 2006. Historical Fire Regimes in Ponderosa Pine Forests of the Colorado Front Range, and Recommendations for Ecological Restoration and Fuels Management. Colorado Forest Restoration Institute, The Nature Conservancy and Colorado State University.

Keinath, D.A. 2004. Fringed Myotis (*Myotis thysanodes*): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. October 29, 2004.

Keith, J.O. 1965. The Abert squirrel and its dependence on ponderosa pine. Ecology 46:150-163.

Keith, J.O. 2003. Abert's Squirrel (*Sciurus aberti*): a technical conservation assessment. US Department of Agriculture, USDA Forest Service, Rocky Mountain Region. Available at: http://www.fs.fed.us/r2/projects/scp/assessments/abertsquirrel.pdf.

Kennedy. P.L. 2003. Northern Goshawk (*Accipiter gentiles atricapillus*): A technical conservation assessment. USDA-Forest Service, Rocky Mountain Region. Available at: http://www.fs.fed.us/Region 2/projects/scp/assessments/northerngoshawk.pdf.

Kingery, H.E. (ed.) 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Colorado Wildlife Heritage Foundation, Denver, CO. 636 pp.

Koehler and Aubrey. 1994

Koehler and Brittell. 1990

Larson, G.L., and S.E. Moore. 1985. Encroachment of exotic rainbow trout into stream populations of native brook trout in the southern Appalachian Mountains. Trans. Am. Fish. Soc. 114:195-203.

Leege, T.A., compiler. 1984. Guidelines for evaluating and managing summer elk habitat in northern Idaho. Wildlife Bull. No. 11. Boise, ID: Idaho Fish and Game. 37 p. [A cooperative effort. Financial support provided by the Idaho Department of Fish and Game Federal Aid Project W-160-R, USDA Forest Service, Bureau of Land Management, Plum Creek Timber Company and Idaho Forest Industry Council].

Leonard, D.L. 2001. Three-Toed Woodpecker (*Picoides tridactylus*). In: The Birds of North America (A. Poole and F. Gill, eds.) No. 588. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and the American Ornithologists' Union, Washington, DC.

Libohova, Z. 2004. Effects of Thinning and a Wildfire on Sediment Production Rates, Channel Morphology, and Water Quality in the Upper South Platte River Watershed. Master of Science Thesis, Department of Forest, Rangeland, and Watershed Stewardship, Colorado State University, Fort Collins, Colorado, Spring 2004.

Luce, B., A. Cerovski, B. Oakleaf, J. Priday, and L.Van Fleet. 1999. Atlas of birds, mammals, reptiles, and amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division, Biological Services Section, Lander, WY.

MacDonald, L.H. and J.D. Stednick. 2003. Forests and Water: A State-of-the-Art Review for Colorado. CWRRI Completion Report No. 196.

Martin, A. 2008. Final report: Genetic identification of cutthroat trout in Rocky Mountain National Park based on MTDNA and microsatillite analysis. University of Colorado, Boulder, CO. 18 pp.

Martin, A., J. Mitton, and J.L. Metcalf. 2005. Describe existing populations and determine appropriate source populations for restoration of native trout subspecies in Rocky Mountain National Park utilizing mitochondrial and nuclear DNA analysis. Unpublished report to Rocky Mountain National Park. 21 pp.

Megahan, W.F. and J. Hornbeck. 2000. Lessons learned in watershed management: a retrospective view. USDA Forest Service Proceedings RMRS-P-13. 2000.

Megan, W., and W. Kidd. 1972. Effects of Logging and Logging Roads on Erosion and Sediment Deposition from Steep Terrain, 70 J. Forest. 136-41 (1972)

Melton, M.A. 1957. An analysis of the relations among elements of climate, surface properties, and geomorphology. Technical Report 11. Department of Geology, Columbia University. New York, NY. p. 102.

Merwin, D.S. 2000. Comparing levels and factors of lamb mortality between two herds of Rocky Mountain bighorn sheep in the Black Hills, South Dakota. M. S.Thesis, University of Washington, Seattle, WA. 125pp.

Metcalf, J.L., V. L. Pritchard, S. M. Silvestri. 2007. Across the great divide: genetic forensics reveals misidentification of endangered cutthroat trout populations. Molecular Ecology 16:4445-4454.

Moody, J.A. and D.A. Martin. 2001. Initial Hydrologic and Geomorphic Response Following a Wildfire in the Colorado Front Range. Earth Surf. Process. Landforms 26, 1049-1070 (2001).

National Wildfire Coordination Group. 2008. Glossary of Wildland Fire Terminology, PMS 205

Nature Serve. 2010. Infonature species profiles. Internet Web site: http://www.natureserve.org/infonatura/.Accessed in January through September 2010.

NDIS (Natural Diversity Information Source). 2010. Species county occurrence data and Geographic Information System data. Internet Web site: ndis.nrel.colostate.edu/. Accessed July 2010.

Nelson, E., M. Tupa, J. Schler, and D. Laughlin. 2004. America's Scenic Byways: The Colorado Report. Vehicle Miles Traveled on Frontier Pathways. http://www.santafetrailscenicandhistoricbyway.org/cordvmiles.html. site accessed August 21, 2010.

Nicholoff, S.H., compiler. 2003. Wyoming bird conservation plan, version 2.0. Wyoming Partners In Flight. Wyoming Game and Fish Department, Lander, WY. Internet Web site: http://www.blm.gov/wildlife/plan/WY/menu.htm. Accessed on July 14, 2004.

Patton, D.R., R.L. Wadleigh, and H.G. Hudak. 1985. The effects of timber harvesting on the Kaibab squirrel. Journal Wildlife Management 49:14-19.

Pederson, J.C., R.C. Farentinos, and V.M. Littlefield. 1987. Effects of logging on habitat quality and feeding patterns of Abert Squirrels. Great Basin Naturalist 47(2):252-258.

Pollet, J., and P.N. Omi. 2002. Effect of Thinning and prescribed burning on crown fire severity in ponderosa pine forests. International Journal of Wildland Fire 11:1-10.

Pueblo County. 2006. Pueblo County Community Wildfire Protection Plan For Southwest Pueblo County, Colorado. Beulah Area Wildfire Mitigation Council, Pueblo County Department of Emergency Management and the Pueblo County Geographic Information System. September 2006.

Raleigh, R.F. 1982. Habitat suitability index models: Brook trout. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.24.

Ratcliff, T.D., D.R. Patton, and P.F. Ffolliott. 1975. Ponderosa pine basal area and the Kaibab squirrel. Journal of Forestry 73:284-286.

Reid, L.M., and T. Dunne. 1984. Sediment production from road surfaces. Water Resources Research, 20(11): 1753-1761.

Reynolds, R.T., and B.D. Linkhart. 1992. Flammulated owl in ponderosa pine: evidence of preference for old growth. Pages 166-169 in M.R. Kaufman, W.H. Moir, and R.L. Bassett, technical coordinators. Proceedings of the workshop on old-growth in the Southwest and Rocky Mountain Region. Portal, AZ.

Rich, L.R. and G.J. Gottfried. 1976. Water yields resulting from treatments on the Workman Creek Experimental Watersheds in central Arizona. Water Resources Research 12:1053-1060.

Rice, R.M., and J. Lewis. 1986. Identifying unstable sites on logging roads. In: Forest Environment and Silviculture, Eighteenth IUFRO World Congress, division 1, volume 1. Vienna, Austria: IUFRO Secretariat, 239-247.

Rich, L.R., H.G. Reynolds, and J.A. West. 1961. The Workman Creek experimental watershed. USDA Forest Service, Station Paper, No. 65.

Richardson, C.T. and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review Wildl. Soc. Bull. 25(3):634-638.

Robichaud, P.R., and R.E. Brown. 1999. What happened after the smoke cleared: onsite erosion rates after a wildfire in Eastern Oregon. Proceedings of the Annual Summer Specialty Conference (Track 2: Wildland Hydrology). June 30 to July 2, 1999. Bozeman, MT. Herndon, VA: American Water Resources Association 419-426.

Rodrick, E., and R. Milner, eds. 1991. Management Recommendations for Washington Priority Habitats and Species. Washington Department of Fish and Wildlife, Habitat Management Divisions.

Rothacher, J. 1971. Regimes of streamflow and their modification by logging. In: Proceedings of a Symposium, Forest Land Uses and Stream Environment. Corvallis, Oregon: Oregon State University, 40-54.

Ruediger, Bill, Jim Claar, Steve Gniadek, Bryon Holt, Lyle Lewis, Steve Mighton, Bob Naney, Gary Patton, Tony Rinaldi, Joel Trick, Anne Vandehey, Fred Wahl, Nancy Warren, DickWenger, and Al Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.

Sahr, Robert. 2010. Inflation conversion factors from 1774 to 2019. http://oregonstate.edu/cla/polisci/sahr/sahr, site accessed August 9, 2010

Shepperd, W.D., M.A. Battaglia. 2002. Ecology, silviculture, and management of Black Hills ponderosa pine. Gen. Tech. Rep. RMRS-GTR-97. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 112 p.

Sibley, D.S. 2000. The Sibley Guide to Birds. Alfred A. Knopf, New York, NY.

Skovlin, J.M. 1982. Habitat requirements and evaluations. In: Thomas, Jack Ward; Toweill, Dale E., eds. Elk of North America: ecology and management. Stackpole Books, Harrisburg, PA. pp. 369-414.

Smith, B.E. and D.A. Keinath. 2007. Northern Leopard Frog (*Rana pipiens*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available at: http://www.fs.fed.us/r2/projects/scp/assessments/northernleopardfrog.pdf. Accessed in March 2010.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S.D.A. USDA Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

Squires, J.R. and L.F. Ruggiero. 1996. Nest-site Preference of Northern Goshawks in Southcentral Wyoming. Journal of Wildlife Management. 60(1): 170-177.

States, J.S. and W.S. Gaud. 1997. Ecology of hypogeous fungi associated with ponderosa pine. 1. Patterns of distribution and sporocarp production in some Arizona forests. Mycologia 89:712-721.

Sullivan, K.O., and S.H. Duncan. 1981. Sediment yield from road surfaces in response to truck traffic and rainfall. Research Report. Centralia, Washington, Weyerhaeuser, Western Forestry Research Center, 46 p.

Swanson, F.J., M.M. Swanson, and C. Woods. 1981. Analysis of debris-avalanche erosion in steep forest lands: an example from Mapleton, Oregon, USA. In: Davies, T.R.H., and A.J. Pearce, eds. Erosion and Sediment Transport in Pacific Rim Steeplands, Symposium. IAHS-AISH Pub. 132. Washington, D.C.: International Association of Hydrologic Sciences, 67-75.

Swanson, Frederick J.; Benda, Lee E.; Duncan, Stanley H.; Grant, Gordon E.; Megahan, Walter F.; Reid, Leslie M.; Ziemer, Robert R. 1987. Mass failures and other processes of sediment production in Pacific Northwest forest landscapes. In: Salo, Ernest O.; Cundy, Terrance W., eds. Streamside management: forestry and fishery interactions: Proceedings of a symposium; 1986 February 12-14; Seattle. Contribution No. 57. Seattle: University of Washington, Institute of Forest Resources: 9-38.Chapter 2

Swift, L.W. 1988. Forest access roads: design, maintenance, and soil loss. In: Swank, W.T., and D.A. Crossley, Jr., eds. Forest Hydrology and Ecology at Coweeta. Ecological Studies, volume 66. New York, New York: Springer-Verlag, 313-324.

Thomas, J.W., M.G. Raphael, R.G. Anthony. E.D. Forsman, A.G. Gunderson, R.S. Holthausen, B.G. Marcot, G.H. Reeves, J.R. Sedell and D.M. Solis. 1993. Viability assessments and management considerations for species associates with late-successional and old-growth forests of the Pacific Northwest. Pacific Salmon Workgroup. March 1993.

Torretta, R. 2005. US Forest Service, wildlife biologist. Personal observation, Olive-sided flycatcher observation.

Torretta, R., and D. Bressan. 2006. US Forest Service. Personal observation Boreal owl observation.

Torretta, R., and J. Valledares. 2006. US Forest Service, wildlife biologists. Personal observation Black swift observations.

Torretta, R. 2010. US Forest Service. Wildlife biologist. Personal communication with EMPSi, August 10, 2010 and September 16, 2010.

Udvardy, M.D.F., ed. 1977. The Audubon Society field guide to North American birds. Alfred A. Knopf, New York, NY. 855 pp.

U.S. Census Bureau. 2008. Custer and Pueblo County American Factfinder. http://factfinder.census.gov, site accessed August 23, 2010

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.

USDA Forest Service. 1996. Landscape Aesthetics, A Handbook for Scenery Management, Agricultural Handbook Number 701.

USDA Forest Service. 2001a. National Fire Plan, 2001. U.S. Department of Agriculture, Forest Service, Washington, DC.

USDA Forest Service. 2001b. Forest Roads: A Synthesis of Scientific Information.

USDA Forest Service. 2002a. Healthy Forests Initiative. U.S. Department of Agriculture, Forest Service, Washington, DC.

USDA Forest Service. 2002b. Economic Analysis for Roadless Area Vegetation Treatments, Upper South Platte Protection and Restoration Project. Prepared by Steve Culver, South Platte Ranger District. Morrison, Colorado. January 11, 2002.

USDA Forest Service. 2005a. MIS Amendment to the Pike and San Isabel National Forests 1984 Land and Resource Management Plan. USDA Forest Service, Pike and San Isabel National Forests, Pueblo, CO.

USDA Forest Service. 2005b. Annual Monitoring Report for FY 2004. Pike and San Isabel National Forests and Cimarron Comanche National Grasslands. USDA Forest Service, Pike and San Isabel National Forests, Pueblo, CO.

USDA Forest Service. 2008a. Catamount Landscape Assessment. Pikes Peak Ranger District. Pike and San Isabel National Forests. Prepared by Continuing Education in Ecosystem Management, Module XIV. June 2-13, 2008. Woodland Park, CO.

USDA Forest Service. 2008b. Final Environmental Impact Statement: Southern Rockies Lynx Management Direction (Amendment). USDA Forest Service, Rocky Mountain Region.

USDA Forest Service. 2009. Annual Monitoring Report for FY 2008. Pike and San Isabel National Forests and Cimmaron Comanche National Grasslands. USDA Forest Service, Pike and San Isabel National Forests, Pueblo, CO. July 1, 2009.

USDA Forest Service. 2010a. East-Central Wet Mountains Hazardous Fuels Reduction & Forest Restoration Project. Botany Specialist Report. USDA Forest Service, San Isabel National Forest, San Carlos Ranger District. November 2010.

USDA Forest Service. 2010b. San Carlos Ranger District Trail Guide website. Available at URL: http://www.fs.usda.gov/wps/portal/fsinternet. Accessed August 21, 2010.

USFWS. 1995. Recovery Plan for the Mexican Spotted Owl (*Strix occidentalus lucida*). Southwest Region. December 1995.

USFWS. 1998. Greenback Cutthroat Trout Recovery Plan, prepared for Region 6. USFWS.

USFWS. 2001. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Mexican Spotted Owl. Federal Register Vol. 66, No. 22 / Thursday, February 1, 2001. pp 8530-8553.

USFWS. 2004. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Mexican Spotted Owl; Final Rule. Federal Register Vol. 69, No. 168 / Tuesday, August 31, 2004. pp 53182-53229.

USFWS. 2010. Federally Threatened, Endangered, and Candidate Species Lists for Colorado counties. Updated January 2010. Internet Web site http://www.fws.gov/mountain prairie/endspp/CountyLists/Colorado.pdf. Accessed on March 2, 2010.

Veblen, T.T. and J.A. Donnegan. 2005. Historical Range of Variability for Forest Vegetation of the National Forests of the Colorado Front Range. Colorado Forest Restoration Institute, Colorado State University. Final Report for: USDA Forest Service, Rocky Mountain Region.

Whitaker, J.O. Jr. 1980. National Audubon Society field guide to North American mammals. Alfred A. Knopf, New York, NY.

Wiggins, D. 2004. American Three-toed woodpecker (*Picoides dorsalis*): a technical conservation assessment. US Forest Service, Rocky Mountain Region.

Wrigley, M., M. White, B. Elliott, M. Comer, R.E. Torretta, P. Gaines, and S. Olson. 2007. Threatened, endangered, and Forest Service sensitive species on the San Isabel National Forest. Unpubl. Rpt. U.S. Department of Agriculture. Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands, Salida, CO. 103 pp.

Young, M.K. 1995. Conservation assessment for inland cutthroat trout. USDA Forest Service General Technical Report RM-GTR-256.

Chapter 5. List of Preparers

Name	Education/Experience	Role
John Baas, PhD JW Associates	Ph.D. Forest Resource Mgmt., Oregon State University M.S., Recreation Resources, Colorado State University B.S. Wildlife Biology, Colorado State University 22 Years Experience	Recreation, Visuals and Socio-Economics Author
Carl Bauer USDA Forest Service	Purdue University 15 Years Experience	Recreation Review
Chris Bevilacqua, RMC Consultants	M.A. Anthropology 9 Years Experience	GIS
Ed Biery USDA Forest Service	Education 15 Years Experience	GIS
Paul Crespin USDA Forest Service	B.S. Range Management, New Mexico State 32 Years Experience	District Ranger
Floyd Freeman USDA Forest Service	B.S. Forest Management, University of Montana USFS Certified Silviculturist, SAF Certified Forester 39 Years Experience	Silviculture Review
Zoe Ghali EMPS Inc.	M.S. Environmental Physiology, University of Colorado B.S. Biology, University of California 8 Years Experience	Wildlife Author
Cathie Kamke USDA Forest Service	BA in Anthropology, UCCS 7 Years Experience	Cultural/Heritage Author
Steve Olson USDA Forest Service	B.A. Zoology, Southern Illinois University 23 Years Experience	Botany Author
Dennis Page USDA Forest Service	B.S. Electrical Engineering, University of Wyoming 14 Years Experience	Project Lead Fire/Fuels
Dave Park USDA Forest Service	M.S. Hydrology, Colorado State University 15 Years Experience	Hydrology/Soils Review
Mike Picard USDA Forest Service	B.S. Forestry 21 Years Experience	NEPA Lead, Socio-Economics Review

Name	Education/Experience	Role
Brad Piehl, JW Associates	M.S. Forest Engineering/Hydrology, Oregon State University B.S. Forest Resources, University of Minnesota 24 Years Experience	Project Management Hydrology and Soils Author
Laura Scotford, JW Associates	M.F. Silviculture, Oregon State University B.S. Forestry, University of Michigan 23 Years Experience	Silviculture Author
Robert Solari, Indepedent	B.S. Forestry, University of Maine 35 Years Experience	Fire Fuels and Air Quality Author
Ron Torretta USDA Forest Service	B.S. Wildlife Biology, Washington State University 21 Years Experience	Wildlife Review
Stan Vallejos USDA Forest Service	B.S. Rangeland and Wildlife Management, Colorado State University 30 Years Experience	Range/Noxious Weed Review
Jessica Wald, JW Associates	M.S. Water Resources Engineering, University of Colorado B.S. Civil Engineering, University of Minnesota 20 Years Experience	Technical Manager Editor
Neal Weierbach USDA Forest Service	Bachelors of Landscape Architecture Virginia Tech 26 Years Experience	Recreation and Visuals Review
Mike Welker USDA Forest Service	M.S. Zoology B.S. Environmental Biology 20 Years Experience	Fisheries Review