3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter discusses the existing physical, biological, and socioeconomic resources in the study area (Affected Environment) and the anticipated environmental effects (Environmental Consequences) of the alternatives presented in Chapter 2 (see Maps 8 and 9). The No Action Alternative describes anticipated future conditions if neither action alternative is implemented. The level of analysis is commensurate with the expected level of potential effects.

The analysis of the potentially affected resources is based on the professional judgment and experience of Forest Service resource specialists, discussions with other agency resource experts and professionals, literature review, and field trips to the study area by resource personnel.

The goal of this chapter is to disclose, to the greatest extent possible, the effects of each alternative on the affected resources. If quantitative estimates are not possible, qualitative estimates are provided to facilitate the comparison of alternatives by the public and decision makers.

3.2 IMPACT THRESHOLDS

Direct, indirect, and cumulative effects are analyzed for each impact topic and are described in terms of type, duration, and intensity; general definitions of each are provided below. All potential effects discussed represent the residual effect expected after incorporating and successfully implementing the Design Criteria presented in Section 2.4.2.

3.2.1 Impact Type

Classifies the effect as direct, indirect, or cumulative, and then determines whether the effect would result in beneficial or adverse effects.

- **Direct**: Effect caused by alternative and occurs in the same time and place (e.g., removal of vegetation, use of machinery, etc.).
- **Indirect**: Effect caused by alternative but is later in time or farther removed in distance, but is still reasonably foreseeable (e.g., hazardous fuel accumulation, accelerated erosion).
- **Cumulative**: Incremental effect caused by alternative when added to other past, present, and reasonably foreseeable future actions (e.g., combined effect of hazardous fuel accumulation *and* naturally caused wildfire); see Section 3.4 for more information.
    - ***Beneficial:*** Positive change in the condition or appearance of the resource, or a change that moves the resource toward the desired condition or goals identified in Chapter 2.0.
    - ***Adverse:*** Negative change that detracts from the condition or appearance of the resource, or a change that moves the resource away from the desired condition or goals identified in Chapter 2.0.

3.2.2 Impact Duration

Describes the length of time an effect would occur as short or long term.

- **Short Term**: Lasting no longer than the immediate 3-5 year implementation period (e.g., construction period, build-out period).
- **Long Term**: Lasting beyond the implementation period (beyond 5 years), typically extending beyond a decade or indefinitely.

3.2.3 Impact Intensity

Describes the degree, level, or significance of an effect as no effect, negligible, minor, moderate, or significant.

- **No effect**: No discernable effect.
- **Negligible**: Effect is at the lowest level of detection and causes very little or no disturbance or improvement.
- **Minor**: Effect that is slight but detectable, with some perceptible effects of disturbance or improvement.
- **Moderate**: Effect is readily apparent and has measurable effects of disturbance or improvement.
- **Significant**: Effect is readily apparent and has measurable effects of disturbance or improvement that are of local, regional, or global importance; or sets a precedent for future project undertakings by Federal agencies.

3.3 SPECIAL STATUS SPECIES

"Special status species" include Federal and state listed species, Regional Forester's Sensitive Species (RFSS), Management Indicator Species (MIS), and state and/or county listed noxious weeds identified as having potential to occur in the Locke Mountain analysis area. These species will be addressed under the "*Special Status Species*" subheading within the plants and wildlife Affected Environment and Environmental Consequences discussions and, with the exception of the noxious weed species, in full detail in the Biological Evaluation/Biological Assessment and Management Indicator Species (MIS) Report (to be filed at the SCRD). A determination of effects, as required by the Section 7, ESA consultation guidelines, is presented for all Federally listed species with potential to occur in the analysis area(s).

3.4 CUMULATIVE EFFECTS ANALYSIS

3.4.1 Cumulative Effects under NEPA

The Council on Environmental Quality defines cumulative effects as:

> The impacts on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

The NEPA cumulative effects analysis is focused on defining the incremental effects of this fuels treatment project in context with the effects from:

- Past actions with relevance to the current resource conditions.
- Present actions of relevance, but not part of the Proposed Action or action alternatives.
- Reasonably foreseeable future actions of relevance, but not part of the Proposed Action or action alternatives.

To analyze the implications of cumulative effects, this analysis considers background levels of effects, past project contributions, on going project contributions, effects from this project's proposals, as well as the effects anticipated from reasonably foreseeable actions (future actions). Additionally, these effects will be collectively evaluated against legal or administrative thresholds to further judge significance of the effects.

Public scoping comments, local trend analyses (demographic and recreational), and consultation with various agencies or entities, such as Forest Service, USFWS, BLM, municipalities, and project stakeholders, were used to develop an inventory of past, present, and reasonably foreseeable projects pertinent to this cumulative effects analysis.

The effects of various past, present, or future actions (regardless of the entity pursuing the action) and natural processes have the potential to coincide either in time or space with the effects of the Locke Mountain project. The nexus of these effects will be discussed by resource throughout the remainder of this chapter. Identifying past and present activities is especially important to understanding the environmental baseline of resources within the analysis area. Furthermore, the following list of projects provides context for the Locke Mountain fuels management activities:

- **Wildland Fire**: "The most extensive and serious problem related to the health of national forests in the interior west is the overaccumulation of vegetation, which has caused an increasing number of large, intense, uncontrollable, and catastrophically destructive wildfires," according to the General Accounting Office (1999). Recent history (e.g., 2002, 2008) has seen an increasing trend in record-breaking wildfires on public forests and grasslands. Decades of fire suppression policies, heavy fuel accumulation, altered vegetation composition, and sustained drought conditions have increased fire intensity and spread rates and resistance to control throughout the west. Wildfires will continue to occur, potentially with increasing severity, on forest lands as a result of natural and human causes.

- **Cattle Grazing**: There is one currently inactive grazing allotment (Newlin Allotment) in the analysis area. The Newlin Allotment has not received any grazing use since 2001. However, all allotments on the SCRD are being reviewed for future grazing activities in the *San Carlos Ranger District Range Allotment Management Plans* (SCRD RAMPs) *EA*. The SCRD RAMPs planning and analysis process is occurring concurrently with this fuels planning and analysis process. A decision on the SCRD RAMPs EA is not anticipated until late 2008. At the earliest, the allotment would be open to grazing in the summer of 2009. The allotment would be open on a flexible season schedule, beginning mid-June through mid-October. The permitted number of cattle would vary by season, not to exceed 161 Animal Unit Months (AUMs) per year.

- **Recreation**: Maintenance of existing NFS roads and trails will continue throughout the area. Additionally, visitor uses of the SCRD are expected to increase commensurate with regional population growth and demands for relatively local recreation opportunities.

- **Forest Pathogens, Disease, and Epidemics**: Mountain pine beetle (MPB) (*Dendroctonus ponderosae)* is native to the forests of western North America. Periodic outbreaks of the insect can result in the loss of millions of trees. Outbreaks develop irrespective of property lines, being equally evident in wilderness areas, mountain subdivisions, and private backyards. MPB epidemics develop in pine stands, particularly ponderosa, lodgepole, bristlecone, and limber pine. Colorado's northern and central pine forests are currently experiencing an MPB epidemic that was triggered by drought in 1997. The infestation has occurred on 755,000 acres in northern Colorado and southeastern Wyoming (USDA 2007c, d, and e). More than 1.5 million acres of lodgepole pine in northern and central Colorado and southeastern Wyoming could be affected by the time the epidemic ends (USFS 2007c, d, and e). Currently, there are no documented occurrences of the MPB within the analysis area; however, other locations on the SCRD have MPB infestations, including forests in the Sangre de Cristo Mountains. MPB epidemics have also been reported on neighboring San Isabel National Forest Ranger Districts, and the overall spread of the epidemic shows a southward moving trend (USDA 2007c, d, and e). Other forest pathogens known to occur within the analysis area include white pine blister rust in limber pine stands (see Section 2.2.1(b) for additional discussion).

- **Community Wildfire Protection Plans**: HFRA requires the preparation of Community Wildfire Protection Plans (CWPP) to define local WUI areas, and to establish locally based strategic priorities for wildfire preparedness and hazardous fuels reduction work in these areas (10-year Strategy Implementation Plan 2006, pg. 3). Both Custer and Fremont counties have prepared CWPPs to address fire mitigation and preparedness in at-risk areas countywide (Custer County 2007 and Fremont County, pending).

  The specific objectives of these plans include identifying WUI areas within the county(ies); identifying critical and high priority projects necessary to protect community resources, homes, and infrastructure; and projects and procedures to improve the safety of forested lands and subdivisions.

  The anticipated outcomes of these plans include the possibility of HFRA cost-share funding for designated WUI areas, improved funding for adjacent public land fuels reduction projects, and the identification of new methods to lessen wildfire risk.

- **Timber Harvests (including public fuelwood) and Fuels Treatments**: Relatively little fuels treatment has been conducted in or near the analysis area in the past. Any past

fuels treatment activities were completed in conjunction with timber harvest or wildlife habitat improvement projects, or through firewood/fuel-wood gathering activities. Currently, there is only one small meadow maintenance project (approx. 200 acres) in the analysis area. The primary objective of this project is to prevent conifer encroachment into the Locke Park meadow areas by cutting/slashing small seedling/sapling-sized conifer trees. With the increased emphasis on fuels treatment on public lands and increasing residential development adjacent to public lands, mechanical and prescribed fire fuels treatments will continue to occur throughout the PSICC and SCRD. Future fuels treatment projects could include prescribed burning (400-500 acres) in the North Hardscrabble drainage adjacent to Colorado Highway 96. Additionally, several communities near the analysis area have been prioritized for fuels treatments by local and state agencies under the recently completed Custer County and Fremont County CWPPs. The actual timing and extent of treatments in these areas has yet to be determined, and will be based primarily on interest from individual landowners in the identified areas.

Timber harvests in the region likely occurred throughout the late 1800s and early 1900s as wood products were needed by developing communities. Historically, large and small timber sales occurred throughout the analysis area. Multiple timber harvests occurred during the period from 1975-1985 to manage insect infested trees, which removed mature and overmature ponderosa pine and Douglas-fir associated with MPB and spruce budworm outbreaks (Smith 2008). Timber sales, public fuelwood permits, and Christmas tree sales are likely to continue on the PSICC and in areas within or adjacent to the analysis area.

3.4.2 Cumulative Effects under ESA

Cumulative effects under NEPA, as defined above, are distinct from the “cumulative effects” required by Section 7 of the ESA [50 C.F.R. § 402.02]. Cumulative effects under ESA are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 C.F.R. §402.02]. This definition applies only to Section 7 analyses and should not be confused with the broader use of this term under NEPA or other environmental laws. For the purposes of this document, all discussions and analyses of cumulative effects adhere to the NEPA definition, **unless otherwise noted.** Additionally, ESA cumulative effect analyses will examine a separate list of future activities than those noted above. These activities will be noted on a case-by-case basis in the individual resource analyses.

3.5 AIR QUALITY

3.5.1 Affected Environment

Air Quality Regulations

The U.S. Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) regulate air quality in Colorado through implementation of the Federal Clean Air Act (CAA) (42 U.S.C. §§ 7401-7671q). The CAA is a Federal air quality law, which is intended to protect human health and the environment by reducing emissions of specified pollutants at their source.

The CAA outlines three types of airshed classification areas: Class I, II, and III. The analysis area is located within a Class II airshed. Class I areas include wilderness areas designated as of August 7, 1977 that are 5,000 acres or greater in size, and also include all National Parks over 6,000 acres. These areas have the most stringent degree of protection from current and future air quality degradation. Class II areas are wilderness areas designated as of August 7, 1977 that are smaller than 5,000 acres, those wilderness areas designated after August 7, 1977, and all other NFS lands. Class II areas are often as sensitive to air pollution effects and as much “at risk” from air pollution effects as Class I areas. At this time, there are no Class III airsheds defined in the U.S.

The CAA requires the adoption of national ambient air quality standards (NAAQS) to protect the public health and welfare from the effects of air pollution. The CAA defines National Ambient Air Quality Standards (NAAQS) as levels of pollutant above which detrimental effects on human health and welfare could occur. Standards are provided for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and lead (Pb), which are known as the criteria pollutants (see Appendix B) (EPA 2008a). The EPA has identified PM_{10} particle sizes as the standard for evaluating emissions and its effect on human health. PM_{10} particles are those particles in smoke less than 10 microns in size. These particles are too small to be filtered out by the human respiratory system. These small particulates can cause respiratory problems, especially to smoke sensitive portions of the population.

A state or region is given the status of “attainment” if the NAAQS thresholds have not been exceeded for any criteria pollutant, or “nonattainment” for a specific pollutant if the NAAQS thresholds have been exceeded for that pollutant. An area designated as nonattainment may request redesignation if it can be shown that the area has not exceeded the NAAQS for a period of three years. Redesignation requires the appropriate agency with jurisdiction over the area to prepare a maintenance plan and demonstrate compliance with NAAQS for 10 years.

Existing Conditions

PM_{10} annual average concentrations in Canon City, located near the analysis area, have been in the "good" category according to the Air Quality Index (Colorado Air Pollution Control Program 2008). This may be due to the relatively limited local emissions from stationary and mobile sources. The analysis area is located in a Class II airshed and maintains “attainment” status for all six criteria pollutants (EPA 2008b). The closest nonattainment area is the Denver Metro area, approximately 100 miles to the northeast. During the winter months, temperature inversions often trap particulates close to the surface, especially in the late evening and early morning hours.

High winds, dust, and smoke production from agricultural practices or wildland fires have temporarily influenced regional air quality in the past. Additional factors that may permanently affect the local airshed include pollutants from nearby major highways, including Highways 50 and I-25, and smoke from wood-burning stoves throughout the region.

Smoke Sensitive Areas include those locations where, for reasons of visibility, health, or human welfare, smoke could have an adverse effect. Examples of smoke sensitive areas include, but are not limited to, interstate highways, hospitals, schools, population centers, nonattainment areas, recreation areas, and airports. Several smoke sensitive areas are located within a 30-mile radius of the analysis area and are displayed below in Table 3-1. While some of these areas may not necessarily meet the official definition of smoke sensitive, these areas should be considered when planning and executing prescribed fires.

Table 3-1. Examples of Smoke Sensitive Areas within 30 Miles of the Analysis Area.

Area	Direction and Distance from Analysis Area
Canon City	13 miles northeast
Florence	15 miles northeast
Westcliffe	14 miles southwest
Wetmore	8 miles east
Pueblo	30 miles east
Highway 50	15-25 miles north
Highways 96 & 67	5-8 miles south and east

Great Sand Dunes National Park is the only Class I Federal airshed within 50 miles of the analysis area.

Airshed Characteristics

The following local airshed characteristics provide a description of existing conditions and context for assessing the potential air quality effects as a result of project implementation.

- **Season**: Spring and summer seasons typically produce the best conditions for smoke dispersal as daytime heating and general wind flows help to raise smoke columns high into the atmosphere and disperse them rapidly. By mid- to late October, air quality naturally begins to deteriorate as nighttime temperature inversions often develop. Temperature inversion cycles are hard to break during stable high-pressure systems. The effect of prescribed burning on air quality is usually most severe from mid-October through November, when smoke dispersal during daytime hours (when burning is likely to be conducted) may be fair to good.
- **Atmosphere and Wind Flows**: Stable high-pressure systems are poor for smoke dispersal, especially during the fall and winter months. Temperature inversions often develop where warm air at the higher elevations traps cold air and particulates in the lower elevations with very little wind flow. During the late spring and summer months, there is usually adequate daytime heating to lift the smoke high into the atmosphere, even during stable high-pressure systems. Strong winds help to disperse smoke rapidly. Winds in excess of 15 miles per hour will sometimes push smoke from the higher elevations into the lower elevations, but the smoke spreads and disperses so rapidly that the effects are very temporary. Nighttime downslope winds can carry residual smoke and may cause the smoke to pool at lower elevations. This trapped smoke is usually dispersed by afternoon the following day. Historically, smoke plumes from prescribed burning on the SCRD have traveled in an easterly direction due to the prevailing westerly winds. Most smoke columns are well dispersed by the time they have moved several miles east (Page and Toelle 2008).
- **Topography**: Smoke produced from high elevation burns is lifted over the ridgetops and remains at altitude until it disperses. When burning at the lower elevations, the smoke has to rise over the high ridges. Lower elevations usually are not as exposed to the prevailing winds, so the nighttime downslope winds tend to push more residual smoke down to lower elevations until convection from the next day's heating lifts the smoke into the atmosphere.
- **Time of Day**: Smoke dispersal is best when the daytime heating causes upward convection. This is usually when the winds are the strongest, aiding dispersal. Mid-morning to afternoon hours (approximately 10:00 a.m. to 6:00 p.m.) are generally the

best times for smoke dispersal. Nighttime burning conditions are usually poor for smoke dispersal, as cool downslope winds normally prevent smoke from rising up to the higher atmosphere.

- **Natural Conditions**: Although there is no known historical air quality data for the natural ecosystems in the analysis area, it is known that fire historically played a major role in the ecosystem. The annual amount of smoke generated from forest and range fires has generally decreased since the early 1900s, despite the modern uses of prescribed fire. Historically, lightning caused fires would have generated smoke for as short as a few hours to as long as 2-3 months. Since that time, smoke has been considerably reduced due to the current policy of suppressing fires on forested and grasslands. Settlement and subsequent fire protection reduced the amount of area burned and reduced the duration of smoke emissions from wildland fires.

Fire, Smoke, and Air Quality

Both prescribed fires and wildfires are potential sources of air pollutant emissions. The amount of emissions depends on the size and intensity of the fire (determined by meteorological conditions such as temperatures and wind speed and direction); the fuel type and fuel moisture content (including age class, size, and mixture of vegetation types); and the available fuel loading (the total mass of combustible fuels).

All prescribed burning on Federal lands in Colorado (and open burning on private lands) is regulated through a permitting system with the CDPHE Air Pollution Control Division. Each prescribed fire must have a valid smoke permit that has been reviewed by the CDPHE. Smoke permits are issued immediately prior to burning if smoke and fire weather modeling results demonstrate no exceedances of PM concentrations or visibility values in nearby sensitive receptor sites (e.g., communities). The goal of air resource management is to prevent prescribed fire smoke from being carried into sensitive areas, such as populated areas and communities, airports, or other areas where people may be sensitive to smoke.

Most of the management or landowner-ignited fire on the SCRD (including both on Federal and private land) is conducted for fire and hazardous fuels reduction purposes. Generally, the methods used are broadcast/underburning and pile burning. Underburning has to be conducted under somewhat dry conditions, especially at higher elevations, to achieve an efficient burn and to minimize particulates. Most underburning on Forest Service land occurs in the spring, less in the summer, and increases again in early to late fall. Pile burns are conducted in the fall and winter after sufficient snow accumulations provide needed moisture to prevent fires from spreading from ignited piles. Few private landowners broadcast burn or underburn slash due to the associated fire control problems. Most slash burning by private landowners is pile burning, which can be done at a later season of the year after precipitation reduces the likelihood of escape.

Pile burning on both public and private lands normally takes place from mid-October through November for control reasons. Smoke from pile burning on public and private lands is also regulated by permit conditions, and smoke is managed by limiting the number of piles burned per day based on size and location relative to nearest occupied residences.

Typically, prescribed burning activities conducted with best smoke management practices are not a major contributor to diminished air quality. Effects from prescribed burning activities are localized and of short duration. A Colorado Emission Inventory (2006) showed that agricultural burning, prescribed fire, and wildfire combined accounted for 3.3% of the total PM_{10} emissions

for the year, whereas agriculture (tilling) and road dust were major contributors (60.7%) to the PM_{10} emissions during the same year (Colorado Air Pollution Control Program 2006). PM_{10} annual average concentrations in Canon City have been in the "good" category according to the Air Quality Index.

Smoke from wildland fires can contain high concentrations of fine particulate matter. Wildland fires do not necessarily occur when wind speeds, direction, and other dispersion factors are conducive to dispersing smoke away from sensitive areas. In 2002, for example, large wildfires in Colorado (e.g., Hayman, Million) created air pollution problems for both firefighters and the general public. In some cases, the public was affected over 100 miles from the fire as a result of long-range transport.

3.5.2 Environmental Consequences

3.5.2(a) Direct and Indirect Effects

Alternative A – No Action

No further fuels or fire management activities are proposed under the No Action Alternative. As such, the No Action Alternative would have no direct effect on local or regional air quality.

Alternative A would indirectly perpetuate hazardous fuel accumulation and increase the potential for high severity wildland fires in the analysis area. Potential air quality effects as a result of future wildland fire events in the analysis area are discussed under Cumulative Effects, Section 3.5.2(b).

Alternative B – Proposed Action

Prescribed fire activities proposed under Alternative B would result in adverse short-term minor effects in the immediate vicinity of the analysis area.

Adverse smoke effects from the burning of slash piles would be short term and minor. Adverse smoke effects from broadcast burning activities would be variable, but still within the permissible PM_{10} criteria.

The combustion products of fire treatments include: carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. Federal and state ambient air quality standards have been established for particulate matter, which is the pollutant of most concern in prescribed burning. Specifically, particulate matter less than or equal to 10 micrometers in aerodynamic diameter (PM_{10}) is the size that can penetrate the inner recesses of the lungs, causing health problems. It is also the size that most severely affects local and regional visibility. Prescribed fire treatments would be conducted in compliance with an approved burn plan and state-issued burn permit. These two documents would establish criteria for burning activities, such as meteorological conditions, season, and treatment acreages, such that treatment activities would have only short-term minor adverse effects to local air quality. Burn plans and smoke permits would not be approved or allowed if the proposed treatments were expected to result in major effects to smoke sensitive areas, effects to nonattainment areas, or any exceedances of NAAQS.

Smoke effects as a result of prescribed fire in the analysis area would generally occur downwind in a northeasterly direction from the analysis area (prevailing winds are southwesterly). As such, the nearby communities of Florence, Wetmore, and Canon City (located northeast, east, and

north, respectively) may experience short-term adverse effects as a result of prescribed fire activities. Prevailing westerly winds would push smoke east. Potential smoke dispersal rates from burning activities in the analysis area are enhanced by the high elevation and site topography. The analysis area is situated such that there are no other ridges for the smoke to rise over or topographic features for the smoke to become trapped behind. Smoke effects would be of short duration (2-5 days) and have only temporary effects. Smoke is expected to remain at nuisance or negligible levels rather than at levels that could impair human health. Alternative B would have no effect on the attainment status of local municipalities, nor would it affect the Denver Metro area's attainment/nonattainment redesignation.

Impaired visibility in the immediate area of burning is possible; however, given that the treatment units would be closed to the public during prescribed fire activities, this would not affect the public or recreational users (see also Recreation, Section 3.8). The Forest Service and prescribed fire managers would coordinate directly with residents of the private inholding near Locke Park to ensure that they are aware of the proposed fire treatments and potential hazards. The Forest Service would work to accommodate the private residents such that any short-term adverse effects as a result of fire treatments would be negligible.

The proposed fuels reduction treatment (both mechanical and prescribed fire) would, in the long term, result in a beneficial reduction of potential emissions during natural wildfire events in the analysis area by reducing the availability of fuels for future, unplanned wildland fires. In the long term, reduced fuel loads throughout the analysis area would have a minor beneficial effect on severity and extent of air quality effects as a result of future unplanned wildland fires.

Given the topography of the analysis area, distance to Class I airsheds, the Design Criteria for Air Quality identified in Section 2.4.2, the approved burn plan, and the requirements of the state issued burn permit, there would be no effects to nearby Class I airsheds.

In addition to potential smoke effects from fire treatments, the operation of heavy equipment and vehicles under Alternative B would generate low levels of particulate emissions (road and travelway dust) and exhaust emissions. Air quality effects as a result of these emissions would be short term adverse and negligible, and would be localized to active treatment units. Road dust would result in short-term adverse minor effects to the private inholding. However, these effects would be limited primarily to the summer and early fall months when soil (i.e., road surface) moisture is low. There would be no effects to Class I airsheds or adjacent communities as a result of these emissions.

The proposed treatments cannot provide assurance that wildfire in the analysis area would not occur in the future. Therefore, some of the effects described for Alternative A could result even with the proposed treatment activities. However, the overall risk of wildfires and their associated effects would be substantially reduced.

Alternative C

Short-term effect types would be the same as described for Alternative B; however, the duration and magnitude would be greatly reduced because of the smaller area (-35% difference from Alternative B) proposed for fire treatments.

Less biomass or hazardous fuels would be removed from the analysis area or effectively treated under Alternative C. Long-term beneficial effects as a result of reduced biomass and potential emissions during future wildland fire events would therefore be negligible.

3.5.2(b) Cumulative Effects

Alternative A – No Action

Although air quality would be maintained in the short term, in the long term it may deteriorate as the cumulative result of nonaction and future wildfires in the analysis area. As stated above, Alternative A would perpetuate hazardous fuel accumulation. As a result, future stand-replacing wildfire events are increasingly probable. Due to the abundance of fuels in the area, future wildfire events would be likely to release increasingly large quantities of PM_{10} emissions. The incremental contribution of the consequences of nonaction (accumulation of fuels) and a stand-replacing fire event in the analysis area would result in adverse cumulative effects to air quality, ranging in intensity from minor to moderate. Diminished air quality conditions would last from one to several weeks, or until the fire was adequately contained.

Examples of typical effects to air quality or diminished air quality conditions as a result of cumulative effects include reduced visibility or breathing complications in at-risk population (e.g., elderly or children). In the event of a wildfire event under Alternative A, adverse effects to air quality in the analysis area and nearby Smoke Sensitive Areas would be short term (lasting for the duration of the fire), ranging from minor to moderate and depending on factors such as weather, wind dispersal, and season.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative A, would result in cumulative effects to local or regional air quality.

Alternative B – Proposed Action

Considering the increasing susceptibility to stand-replacing wildfires in forests throughout the west due to decades of fire suppression policies and hazardous fuels accumulations, the proposed fuels treatments would result in minor long-term beneficial cumulative effects to air quality in the analysis area. The proposed treatments would ultimately delay, diminish, or altogether impede the effects of reasonably foreseeable future stand-replacing wildland fires and the subsequent high-volume PM_{10} emissions in the analysis area, thereby preserving local air quality conditions in the long term. On a regional scale, however, Alternative B would have no cumulative effect on air quality, as the analysis area (approx. 5,000 acres) is insignificant compared to the burnable area in proximity to population centers or smoke sensitive areas.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative B, would result in cumulative effects to local or regional air quality.

Alternative C

The cumulative effects of Alternative C would be the same as described for Alternative B.

3.6 FISH AND WILDLIFE

3.6.1 Affected Environment

In this section, the potential effects of the alternatives are compared in a qualitative analysis based on expected changes in the environment. Changes in wildlife habitat are evaluated in both the short and long term, focusing on key issues such as cover, food, water, and reproductive/rearing habitats (nesting/denning/calving, etc.). The species analyzed under this section include those species identified through public concern, Federal and state threatened, endangered, proposed species, Regional Forester's Sensitive Species (RFSS), and Management Indicator Species (MIS).

The analysis area is located within the montane forests of the Southern Rocky Mountain geographic area and is centered on the Wet Mountain Range. As stated in Chapter 1, elevations range from 8,000-9,500 feet. Terrestrial vegetation and habitats are varied depending on elevation, aspect, and topographic features, and include areas of shrub, conifer, grass, and aspen cover types (Table 3-2). Aquatic and riparian habitat occurs along intermittent and perennial streams and several small ponds located north of the private inholding. Rock outcroppings and deeply incised ravines are common on the west and northern boundaries of the analysis area.

Table 3-2. Vegetation Cover Type Distribution in the Analysis Area.

Cover Type	Acres	Percentage of Analysis Area
Coniferous forest	2,808	60%
Aspen	817	17.5%
Grassland	479	10%
Shrubland	581	12.5%

Forested and woodland areas, including aspen stands, occur over much of the analysis area. These areas provide cover for many wildlife species such as deer, coyote, and elk; smaller mammals such as pine marten; and a variety of bird species, including woodpeckers, sparrows, and owls. Grass and shrubland cover types support numerous passerine bird species and small mammal populations, and are used for browse by big game species. The species listed in Table 3-3 are known to occur and are either abundant or common in Custer and Fremont counties (NDIS 2008). (Threatened or endangered species are discussed in a separate section.)

Table 3-3. Abundant and Common Wildlife Species in Fremont and Custer Counties, Colorado.

Group*	Common Name	Scientific Name	County of Occurrence
Amphibians	Woodhouse's Toad	*Bufo woodhousii*	Fremont
Birds	American Crow	*Corvus brachyrhynchos*	Custer/Fremont
Birds	American Robin	*Turdus migratorius*	Custer/Fremont
Birds	Barn Swallow	*Hirundo rustica*	Custer/Fremont
Birds	Black-billed Magpie	*Pica pica*	Custer/Fremont
Birds	Brewer's Blackbird	*Euphagus cyanocephalus*	Custer/Fremont
Birds	Chipping Sparrow	*Spizella passerina*	Custer/Fremont
Birds	Cliff Swallow	*Petrochelidon pyrrhonota*	Custer/Fremont
Birds	Common Grackle	*Quiscalus quiscula*	Custer/Fremont
Birds	Dark-eyed Junco	*Junco hyemalis*	Custer/Fremont

Group*	Common Name	Scientific Name	County of Occurrence
Birds	European Starling	*Sturnus vulgaris*	Custer/Fremont
Birds	Hermit Thrush	*Catharus guttatus*	Custer/Fremont
Birds	House Finch	*Carpodacus mexicanus*	Custer/Fremont
Birds	House Sparrow	*Passer domesticus*	Fremont
Birds	House Wren	*Troglodytes aedon*	Custer/Fremont
Birds	Killdeer	*Charadrius vociferus*	Custer/Fremont
Birds	Lincoln's Sparrow	*Melospiza lincolnii*	Custer/Fremont
Birds	Mallard	*Anas platyrhynchos*	Custer/Fremont
Birds	Mountain Bluebird	*Sialia currucoides*	Custer/Fremont
Birds	Mourning Dove	*Zenaida macroura*	Custer/Fremont
Birds	Pine Siskin	*Carduelis pinus*	Custer/Fremont
Birds	Pinyon Jay	*Gymnorhinus cyanocephalus*	Fremont
Birds	Red-winged Blackbird	*Agelaius phoeniceus*	Custer/Fremont
Birds	Ruby-crowned Kinglet	*Regulus calendula*	Custer/Fremont
Birds	Spotted Towhee	*Pipilo maculatus*	Custer/Fremont
Birds	Vesper Sparrow	*Pooecetes gramineus*	Custer/Fremont
Birds	Violet-green Swallow	*Tachycineta thalassina*	Custer/Fremont
Birds	Warbling Vireo	*Vireo gilvus*	Custer/Fremont
Birds	Western Wood-Pewee	*Contopus sordidulus*	Custer/Fremont
Birds	White-throated Swift	*Aeronautes saxatalis*	Custer/Fremont
Birds	Yellow-rumped Warbler	*Dendroica coronata*	Custer/Fremont
Mammals	American Badger	*Taxidea taxus*	Custer/Fremont
Mammals	American Elk	*Cervus elaphus*	Custer/Fremont
Mammals	American Pika	*Ochotona princeps*	Custer/Fremont
Mammals	Black Bear	*Ursus americanus*	Custer/Fremont
Mammals	Bobcat	*Lynx rufus*	Custer/Fremont
Mammals	Common Muskrat	*Ondatra zibethicus*	Custer/Fremont
Mammals	Coyote	*Canis latrans*	Custer/Fremont
Mammals	Deer Mouse	*Peromyscus maniculatus*	Custer/Fremont
Mammals	Fox Squirrel	*Sciurus niger*	Fremont
Mammals	Hoary Bat	*Lasiurus cinereus*	Fremont
Mammals	House Mouse	*Mus musculus*	Custer/Fremont
Mammals	Least Chipmunk	*Tamias minimus*	Custer/Fremont
Mammals	Long-legged Myotis	*Myotis volans*	Custer
Mammals	Long-tailed Weasel	*Mustela frenata*	Custer/Fremont
Mammals	Meadow Vole	*Microtus pennsylvanicus*	Custer/Fremont
Mammals	Montane Shrew	*Sorex monticolus*	Custer/Fremont
Mammals	Mule Deer	*Odocoileus hemionus*	Custer/Fremont
Mammals	Northern Pocket Gopher	*Thomomys talpoides*	Custer/Fremont
Mammals	Pinyon Mouse	*Peromyscus truei*	Fremont
Mammals	Prairie Vole	*Microtus ochrogaster*	Fremont
Mammals	Pronghorn	*Antilocapra americana*	Custer/Fremont
Mammals	Raccoon	*Procyon lotor*	Custer/Fremont
Mammals	Silver-haired Bat	*Lasionycteris noctivagans*	Fremont
Mammals	Striped Skunk	*Mephitis mephitis*	Custer/Fremont
Mammals	Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	Custer
Mammals	Western Small-footed Myotis	*Myotis ciliolabrum*	Custer/Fremont

Group*	Common Name	Scientific Name	County of Occurrence
Mammals	White-footed Mouse	*Peromyscus leucopus*	Fremont
Mammals	White-tailed Jackrabbit	*Lepus townsendii*	Fremont
Mammals	Wyoming Ground Squirrel	*Spermophilus elegans*	Fremont
Mammals	Yellow-bellied Marmot	*Marmota flaviventris*	Custer
Reptiles	Fence Lizard	*Sceloporus undulatus*	Custer/Fremont

* NDIS has no county occurrence data for fish at this time.
Source: NDIS 2008.

Forest Plan Direction

Pertinent Forest Plan goals and direction for the management of fish and wildlife resources are summarized in Table 3-4.

Table 3-4. Pertinent Forest Plan Goals and Direction for Fish and Wildlife Resources.

Forest Plan Goals (III-3 through III-5)
• Increase diversity for wildlife and habitat improvement. • Increase winter range habitat capability for deer and elk. • Protect riparian areas and wetlands from degradation.
Management Direction
• Provide for the habitat needs of management indicator species in the National Forest (III-30). • Manage and provide habitat for recovery of endangered and threatened species (III-31). • Maintain habitat for viable populations of all fish and wildlife species in the analysis area (III-32). • Establish elk, bighorn sheep, and threatened and endangered species on sites that can supply the habitat needs of the species and the population levels and distribution agreed to with the States.

Special Status Species

Federal and State Listed Species

Species listed as threatened or endangered under the ESA are afforded protection from actions that could affect their survival. The Colorado Nongame, Endangered, or Threatened Species Conservation Act provides protection for state listed species and identifies statewide species of special concern.

Information regarding special status species occurrence was determined based on review of USFWS's Federally listed and candidate species list for Custer and Fremont counties (USFWS 2008); Colorado Natural Heritage Program's (CNHP) 2007 Species Tracking Lists for Fremont and Custer Counties, Colorado; Colorado's State Threatened and Endangered Species List (CDOW 2007); and the Natural Diversity Information Source (NDIS) (NDIS 2008b). Information on species of concern that are known to occur or have the potential to occur in the project area are shown in Table 3-5. Only those species known to occur or with a potential to occur within the analysis area will be analyzed in this EA.

Table 3-5. Federal and State Listed Species with Potential to Occur in the Analysis Area.

Common Name	Scientific Name	Status
FEDERALLY LISTED SPECIES		
Mammals		
Canada lynx	*Lynx canadensis*	FT, SE
Birds		
Mexican spotted owl	*Strix occidentalis lucida*	FT, ST, @
Fish		
Greenback cutthroat trout	*Oncorhynchus clarkii stomias*	FT, ST
STATE LISTED SPECIES		
Birds		
American peregrine falcon	*Falco peregrinus anatum*	SC
Mammals		
Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	SC

KEY

Federal Status: The Federal legal status of the species as assigned by the U.S. Fish and Wildlife Service under the Endangered Species Act (ESA).

@ There is designated Critical Habitat for the species in the analysis area.

FT Threatened

FE Endangered

State Protection Status: The state legal status of vertebrate or invertebrate species as assigned by the Colorado Division of Wildlife.

SE State endangered; native wildlife whose prospects for survival or recruitment within this state are in jeopardy

ST State threatened; is not in immediate jeopardy of extinction, but is vulnerable due to small numbers, restricted throughout its range, or experiencing low recruitment or survival

SC Species of special concern; not a statutory category

Sources: USFWS 2008, CNHP 2007, Species Profiles (various), CDOW website, Wrigley et al. 2007.

Species that have been eliminated from further analysis are discussed in the Locke Mountain Fuels Management Project Biological Assessment and Biological Evaluation (to be filed at the SCRD office). Excluded species have been eliminated from further analysis for one or more of the following conditions:

1. The species does not occur nor is expected to occur in the analysis area during the time period activities would occur;
2. The species occurs in habitats that are not present; and/or
3. The affected area is outside of the geographical or elevational range of the species.

Federal or state listed species with potential to occur in the analysis area are described below.

Canada lynx

The Canada lynx (*Lynx canadensis*), a Federally threatened species, was listed as a distinct population segment threatened species in portions of the lower 48 states by USFWS on April 24, 2000 (Ruediger et al. 2000).

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). Currently, there is no designated or proposed Critical Habitat designated for the Canada lynx in Colorado (USFWS 2008b). Additionally, there are no lynx linkage areas in the analysis area; the closest linkage is the Black Mountain linkage area and is located approximately 15 miles southwest of

the analysis area (USDA 2008b). The Black Mountain linkage area provides a connection from the Sangre de Cristo mountain range to the Wet Mountain range. It includes a very narrow corridor of pinyon-juniper habitat for cover, which is the only forested canopy habitat available. It has mixed land ownership (USDA 2008).

Potential habitat is defined as having the capability to provide necessary habitat components. Dry forest types (i.e., ponderosa pine) were mapped as nonhabitat in LAUs (Wrigley et al. 2007). 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, and are closely associated with snowshoe hare (Wrigley et. al 2007).

A portion of the Wet Mountain LAU for Canada lynx occurs within the Locke Mountain analysis area, including areas designated as denning, wintering, or other suitable habitats. Approximately 3,872 acres (or 2.4% of the total LAU acreage) of the analysis area are located in the LAU's boundaries. Lynx habitat types within the Wet Mountain LAU and the Locke Mountain analysis area are shown in Table 3-6 and on Map 10.

Table 3-6. Lynx Habitat within the Locke Mountain Analysis Area.

Habitat Type	PSICC National Forest* (acres)	Wet Mountain LAU* (acres)	Locke Mountain Analysis Area (acres)	Percentage of LAU total in Locke Mountain Analysis Area
Denning	274,901	30,201	589	1.9%
Other**	278,076	14,717	522	3.5%
Winter (additional winter foraging habitat)	270,086	54,194	877	1.6%
Unsuitable***	5,727	911	0	0%
Non-Habitat or Blank****	604,552	62,434	1,884	3.0%
Total	1,433,342	162,457	3,872	2.4%

Source: R2Veg, PSICC LAU Data (May 2007)

KEY

*Lynx Habitat on National Forest Land within the PSICC LAUs and National Forest Land within the Wet Mountain LAU.

****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 Blank** – No data or no suitable habitat present.

See Section 2.3.3(c) for a discussion on the recently signed SRLA and its guidelines for fuels treatments in lynx habitat.

The 2000 LCAS indicates that fire suppression and snow compaction are two of the primary factors affecting lynx productivity in the Southern Rockies geographic area. The exclusion of fire throughout the Southern Rockies has created homogeneous forests of aspen, Douglas-fir, and ponderosa pine, lacking a forest understory of shrubs and seedlings important to snowshoe hares, the preferred prey of lynx (Ruediger et al. 2000). These changes have likely reduced habitat quality and quantity for lynx and lynx prey.

Additionally, recreational uses or activities, such as ski resorts or snowmobile play areas, create compacted snow conditions that may reduce the competitive advantage lynx have in deep snow environments. Development of facilities can result in the loss of lynx habitat and contribute to

the overall fragmentation of the landscape. There are no developed winter recreational uses in the analysis area; however, some snowmobile use does occur in winter months (see Section 3.8, Recreation).

Mexican spotted owl

Mexican spotted owl (MSO) are found in southwestern Colorado, and their habitat includes steep-sided canyons with old-growth mixed conifer forests. They will nest on cliff ledges, or in caves along canyon walls in shady or cool canyons in the piñon-juniper zone (Wrigley et. al 2007).

The range of the MSO was divided into six Recovery Units by the USFWS in the 1995 Mexican Spotted Owl Recovery Plan (USFWS 1995). The San Isabel National Forest is within the Southern Rocky Mountains–Colorado Recovery Unit. The Recovery Plan recommends three levels of habitat protection:

1. Protected Habitat: Designated Protected Activity Centers (PACs), areas outside of PACs that have steep slopes (greater than 40%) and have not been harvested in the last 20 years, and reserved lands (e.g., wilderness or Research Natural Areas)
2. Restricted Habitat
3. Other Forest and Woodland Types

PACs are areas established around an owl nest (or sometimes roost) site, for the purpose of protecting that area. Management of PACs is largely restricted to managing for forest health objectives.

Protected habitat receives the highest level of protection under the Recovery Plan; most management activities are very restricted or disallowed altogether (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).

The Locke Mountain analysis area does not contain any designated PACs; however, because of the steep slopes (>40%) and mixed-conifer and pine-oak cover types present, the analysis area does contain approximately 183 acres that meet the criteria of Protected Habitat for MSO (Table 3-7 and Map 11).

Table 3-7. Summary of Mexican Spotted Owl Habitat.

Habitat Type	Pike and San Isabel National Forests	San Carlos Ranger District	Locke Mountain Analysis Area
Protected Habitat	88,603	32,528	183
Restricted Habitat	316,008	59,467	1,598
Restricted Target/Threshold	82,297	24,818*	All (4,680)**
Critical Habitat	400,869	110,148	2,880

Source: Valldares 2008, USFS Unknown

*Not all areas within this total acreage meet Target/Threshold requirement. However, all areas within this total acreage are being managed to trend towards Target/Threshold requirements.

**As noted in the footnote above, not all of the Restricted Habitat within the analysis meets Target/Threshold requirements, however, all of the analysis area Restricted Habitat is within the area being managed to ultimately achieve Target/Threshold conditions.

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 and riparian environments. In Restricted Habitat areas, the landscape should be managed to sustain or promote nesting habitat that is well distributed spatially. The Locke Mountain analysis area contains approximately 1,598 acres of Restricted Habitat (Table 3-7 and Map 11). Additionally, the 1995 MSO Recovery Plan identifies nesting and roosting Target/Threshold Restricted Habitat conditions. The entire analysis area is located within an MSO Target/Threshold Restricted Habitat area. Target/Threshold criteria are provided in Table III.B.1 of the 1995 Recovery Plan (Appendix D); these criteria define the proportion of the landscape that should be in or approaching conditions suitable for nesting and roosting.

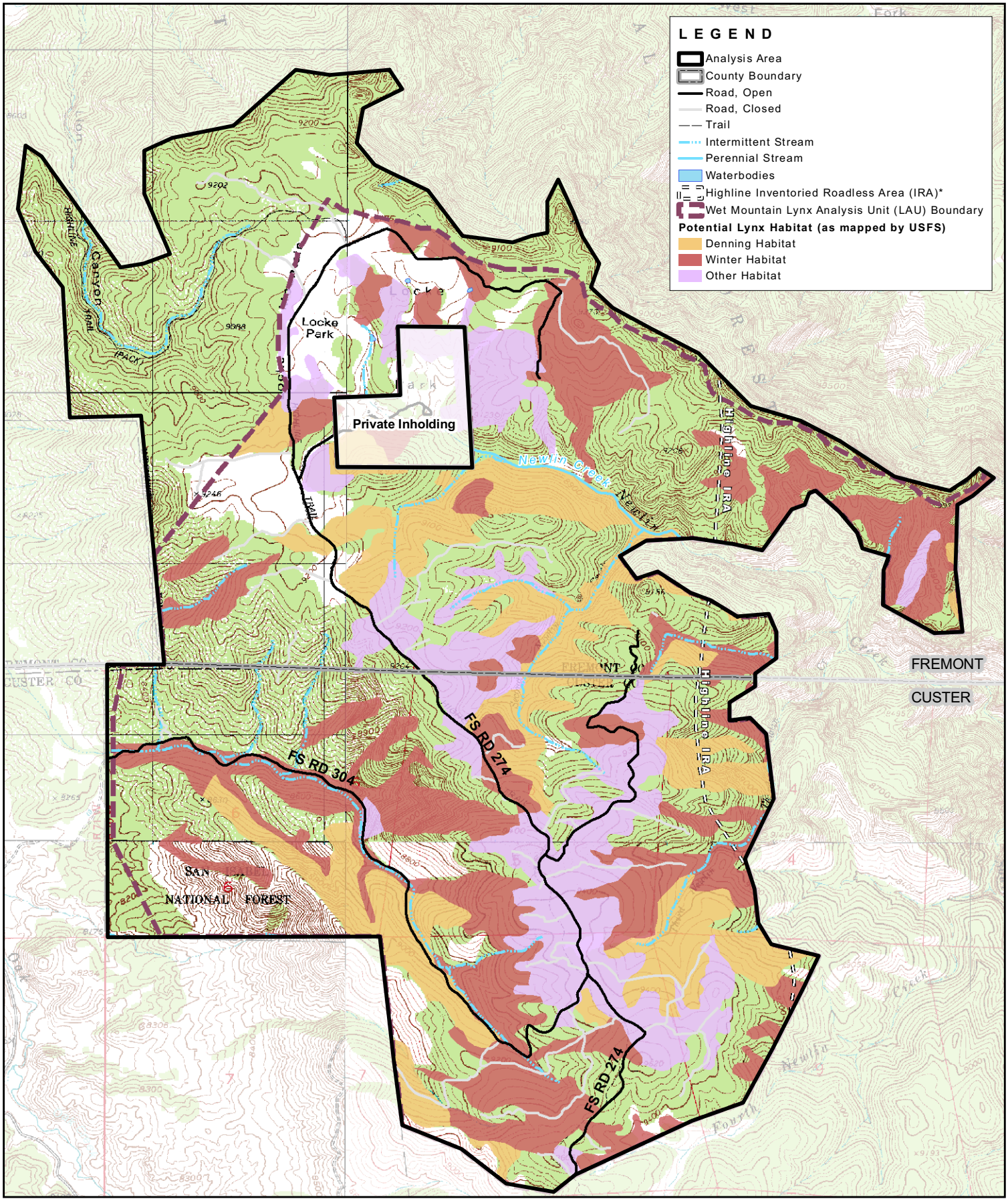
Recent, preliminary investigations into stand condition and projected stand development indicate that the analysis area may contain one or more stands that meet Threshold Habitat requirements. MSO and Threshold Habitat-specific Design Criteria (Section 2.4.2) have been incorporated to ensure the protection of these stands during project implementation activities.

Critical Habitat has been designated for the MSO throughout the southwestern United States. Approximately 2,880 acres of the analysis area are located within designated Critical Habitat (area SRM-C-1b) (Table 3-7 and Map 11). Critical Habitat is a “specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.” Critical Habitat areas are not necessarily occupied by the species, but may be necessary for the species’ recovery (USFWS 2005). Additionally, not all areas within the designated Critical Habitat boundary contain the constituent elements necessary to be “Critical Habitat”. The presence of designated Critical Habitat in the analysis area does not necessitate any specific restrictions. Any requisite restrictions on management activities are due to the presence of MSO habitat, in general. In this scenario, the Critical Habitat designation provides for an additional layer of consultation with the Federal agencies in order to analyze potential adverse effects (Ellwood 2008).

The 1995 MSO Recovery Plan indicates that catastrophic wildfire and even-aged silvicultural practices are the two primary threats to MSO habitat. Heavy accumulations of ground and ladder fuels have rendered many southwestern forests vulnerable to stand-replacing fires (USFWS 1995). Even-aged silviculture within potential owl habitat is regarded as a threat because it tends to simplify stand structure and move stands away from having owl habitat characteristics (USFWS 1995).

Subsequently, the 1995 Recovery Plan has identified proactive fire management and uneven-aged management as the highest priorities in protecting and enhancing MSO habitat. Fire-risk abatement, including the removal of hazardous fuels through thinning and prescribed fire activities, is encouraged to enhance existing habitat and to promote marginal habitat to conditions suitable for MSO nesting and roosting.

The Forest Service conducted four field surveys for MSO in the analysis area in the spring and early summer of 2008. No individuals or nests were identified; however, the surveys did confirm the presence of suitable habitat throughout the analysis area.



0 0.25 0.5 1 Miles

Portions of the Highline IRA are located in the analysis area east of the white dashed line.

MAP 10

CANADA LYNX HABITAT

LOCKE MOUNTAIN FUELS MANAGEMENT EA
San Carlos Ranger District

Source Data: USFS Roads, NHD Streams and Waterbodies (24k), USFS Wet Mountain LAU Data

EDAW | AECOM

November 12, 2008

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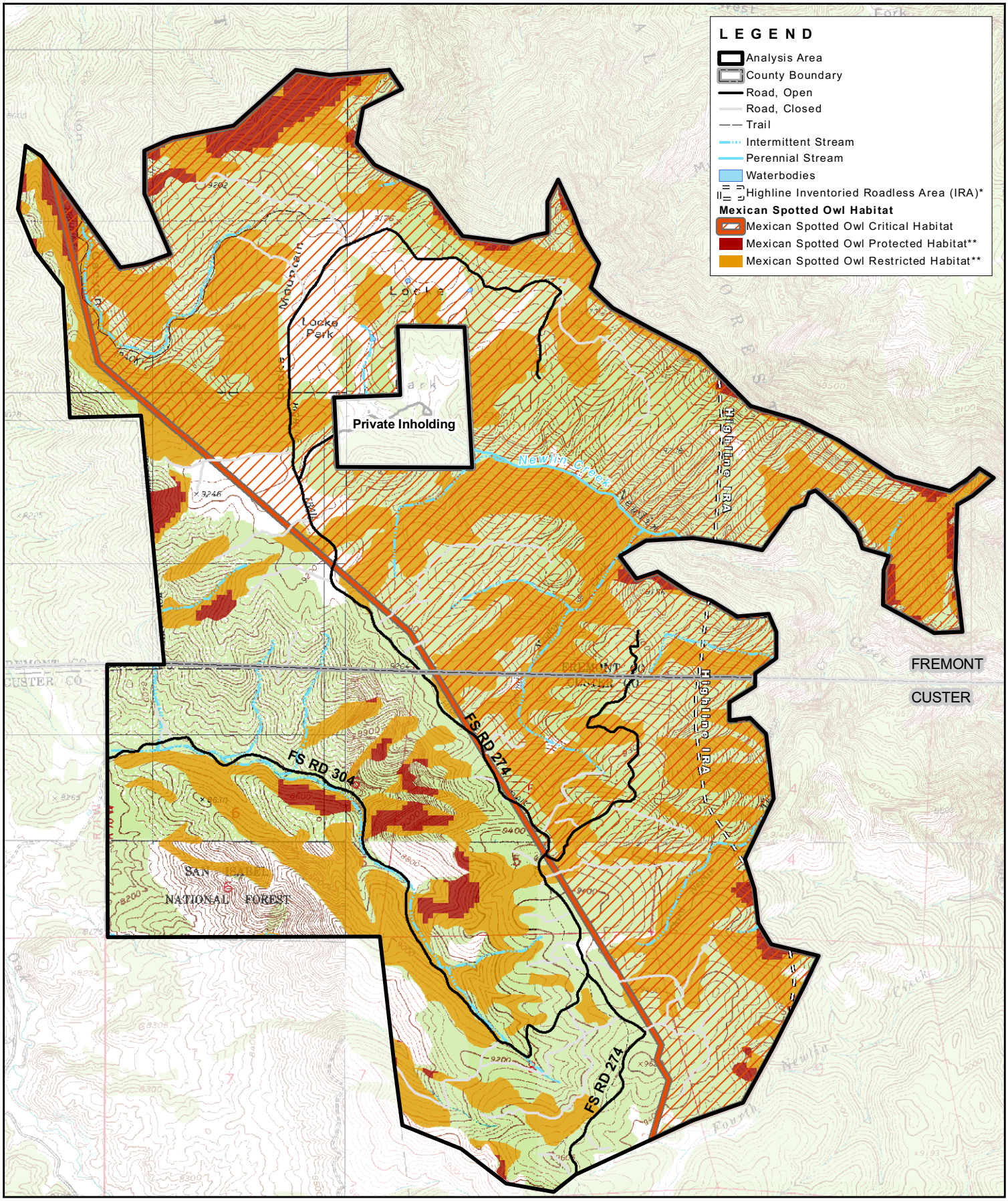

0 0.25 0.5 1 Miles

MAP 11
MEXICAN SPOTTED OWL HABITAT

LOCKE MOUNTAIN FUELS MANAGEMENT EA
San Carlos Ranger District

**Portions of the Highline IRA are located in the analysis area east of the white dashed line.*

***Approximate MSO Protected and Restricted Habitat areas.*

Source Data: USFS Roads, NHD Streams and Waterbodies (24k), MSO Protected, Restricted, and Critical Habitat

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Greenback cutthroat trout

Greenback cutthroat trout were Federally listed under the ESA as "endangered" in 1973 and later downlisted to "threatened" in 1978 (Wrigley et al. 2007). Historically, greenback cutthroat trout occurred in the South Platte and Arkansas river basins in Colorado, from the headwaters to the foothills, and in a few headwater tributaries of the South Platte in a small area of southeastern Wyoming (NatureServe 2007). Currently, in the South Platte drainage, the most stable populations are located in Rocky Mountain National Park; a few stable populations exist in the Arkansas River drainage (NatureServe 2007).

Greenback cutthroat trout are ecologically similar to other cutthroat trout species inhabiting streams of the western United States (NatureServe 2007). The 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 man-made fish movement barriers.

Greenback cutthroat trout are native to the Front Range of Colorado and are now found in isolated headwater streams in the Rocky Mountains. This species is adapted to high elevations and cold streams with adequate pools, riffles, and runs. Competition and hybridization with introduced and nonnative trout and fishing pressure are among the reasons for the decline of this species (USFWS 1998). Other causes for their decline include the diversion of water for irrigation and water pollution, and sedimentation caused by mining and logging. The primary cause of the decline of greenback cutthroat distribution, however, was the introduction of nonnative salmonids, which hybridized and competed with native fish. Greenbacks hybridize readily with rainbow trout and other subspecies of cutthroat (USFWS 1998). Widespread introductions of rainbow trout (*Oncorhynchus mykiss*) have contributed to the decline of native cutthroat trout populations (NatureServe 2007).

The objective of the 1998 *Greenback Cutthroat Trout Recovery Plan* (Recovery Plan) is to recover sufficient habitat and populations for the species' removal from the list of threatened and endangered species. Greenback cutthroat trout will be considered "recovered" when a minimum of 20 stable populations are documented to exist. At least five of these populations must exist in the Arkansas River basin (USFWS 1998). The Recovery Plan defines the necessary population criteria to qualify for delisting or successful recovery.

Populations have increased in recent decades due to successful reintroduction efforts by Forest Service, Colorado Division of Wildlife (CDOW), USFWS, and other stakeholders. As of 1999, 21 of 55 populations were considered to be stable, and more than half of these were within Rocky Mountain National Park (NatureServe 2007). The number of extant populations is approaching the delisting goal, but some biologists argue that the recovery goals for this subspecies need to be upgraded (strengthened) to ensure long-term viability and adequate protection of populations throughout the historical range (NatureServe 2007). Reintroduction projects typically involve identification of sites with suitable habitat and a high likelihood of success. Once a stream has been identified, in most cases, a barrier to upstream fish migration is constructed, followed by chemical removal of nonnative salmonids and stocking of pure strain greenback cutthroat trout. Several streams have been identified as future reintroduction sites. The efforts to find and document existing populations will continue on the PSICC.

Genetically pure greenback cutthroat trout have been documented to occur in only seven locations on the entire PSICC. Other strains occur in numerous streams throughout the PSICC,

however, these populations are not recognized or protected under ESA. A strain of greenback cutthroat trout is known to occur in Newlin Creek, approximately three miles downstream of the analysis area. This population is managed by the USFWS and USFS according to ESA guidelines for threatened species. This known population occurs in a location that, due to a natural barrier, does not allow the migration or passage of enough individuals to support a self-sustaining population upstream (Gaines 2008). As of summer 2008, CDOW fish counts did not identify any individuals within this population at this Newlin Creek location (Ellwood 2008). However, some individuals from this population were recorded in a tributary drainage (to Newlin Creek) that is not within or connected to the analysis area (Ellwood 2008). As such, the occurrence of the species in the analysis area is highly unlikely. CDOW, however, considers this stream to contain high quality greenback cutthroat trout habitat and has identified this basin to be an important future reintroduction site for one of the rarer greenback populations.

American peregrine falcon (State Species of Concern)

On August 25, 1999, the peregrine falcon was delisted throughout its range as a Federally listed species (Wrigley et al. 2007) due to increases in population numbers. Peregrine falcons are occasional spring and fall migrants in western valleys, foothills, lower mountains, mountain parks, and on eastern plains; and have been observed in the winter at Monte Vista National Wildlife Refuge (Wrigley et al. 2007). Peregrines have also been observed in Rocky Mountain National Park and Grand Junction, Colorado (Wrigley et al. 2007). It is also a rare summer resident in foothills and lower mountains.

Breeding pairs nest on cliffs and forage over adjacent coniferous and riparian forests. Nesting habitat includes areas such as river cutbanks, trees, and manmade structures, including tall towers and the ledges of tall buildings. Peregrines in the Rocky Mountain and southwest region now persist mainly on dominant cliffs that generally exceed 200 feet in height (NatureServe 2007). Most nest sites in Colorado are within one mile of water. Because peregrines are extremely sensitive to disturbance during the egg-laying, incubation, and brood-rearing periods, protection from disturbances is essential to reproductive success (NatureServe 2007). Migrants and winter residents occur mostly around reservoirs, rivers, and marshes, but may be seen in grasslands, agricultural areas, and other habitats. The prey species are usually hunted over open habitat types, such as waterways, fields, and wetland areas such as swamps and marshes.

Habitat for the falcon includes a wide variety of habitats, and breeding pairs select cliff ledges or rock outcroppings for nesting, preferring high, open cliff faces that dominate the surrounding area (Wrigley et. al 2007).

Townsend's big-eared bat (State Species of Concern)

Townsend's big-eared bats are typically associated with caves and abandoned mines, used as day roosts and hibernacula. They will also use abandoned buildings in western shrubland, piñon-juniper woodlands, and open montane forests in elevations up to 9,500 feet (Wrigley et. al 2007).

Townsend's big-eared bat is considered rare or uncommon in Colorado (Fitzgerald et. al. 1994) and in the south and southeastern United States. Townsend's big-eared bat is primarily cave dwelling, but can also roost in large diameter snags in stands of old growth, as well as man-made structures. It is found in areas of semi-desert shrublands, pinyon pine-juniper woodlands, and open montane forest species. Foraging occurs in a variety of habitats, including stream corridors, grassland openings, and within forested vegetation. The CDOW found that

Townsend's big-eared bat roosts in mines at elevations averaging approximately 7,000 feet, and this species has been found in several mines at elevations greater than 9,000 feet. A Townsend's big-eared bat was caught about eight miles east of Westcliffe, CO in an abandoned mine, about six miles from the San Carlos District in the Wet Mountains (Wrigley et al. 2007).

Regional Forester's Service Sensitive Species and Management Indicator Species

The Forest Service is required to manage NFS lands so that all existing native and desired nonnative wildlife, fish, and plants can maintain viable populations (FSM 2670.32). Forest activities are required to be conducted such that they avoid actions that may cause a species to become threatened or endangered (FSM 2670.12). Current management direction is to manage NFS habitats for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the ESA are no longer necessary (FSM 2670.21).

The Region 2 RFSS List was used to identify all Forest Service Sensitive species with the potential to occur on the San Isabel National Forest. Fourteen RFSS Species have the potential to occur within the analysis area, including two state species of special concern, Townsend's big-eared bat and American peregrine falcon (Table 3-5).

The National Forest Management Act (NFMA) of 1976 requires that national forest planning "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." To carry out this mandate, in 1982 the USFS developed and implemented regulations that require selection of Management Indicator Species (MIS) to be used as planning and analysis tools to set goals, objectives, and minimum management requirements in Forest Plans; focus analysis of effects of plan alternatives; and monitor the effects of plan implementation at the project level. Specifically, the regulations state that "these species shall be selected because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19). They are not intended to provide special protective status, serve as biological diversity benchmarks, or represent every species of plant or animal found in the forest. All of the species listed as MIS for the Pike & San Isabel National Forests have the potential to occur within the analysis area (USDA 2005).

For the purposes of the EA, the list of RFSS and MIS species and their habitat preferences are summarized in Table 3-8. A full description of the species' natural history and habitat preferences is available in the BA/BE (to be filed at the SCRD).

Table 3-8. RFSS and MIS with Potential to Occur in the Analysis Area.

Common Name	*Scientific Name*	General Habitat Description
Regional Forester's Sensitive Species		
Northern leopard frog	*Rana pipiens*	Occurs along banks & shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds & streams, especially those with rooted aquatic vegetation up to 11,000 ft.

Common Name	*Scientific Name*	General Habitat Description
American peregrine falcon	*Falco peregrinus anatum*	Occurs in a wide variety of habitats; selects cliff ledges or rock outcroppings for nesting, preferring high, open cliff faces that dominate the surrounding area.
American three-toed woodpecker	*Picoides dorsalis*	Occurs in mature or old-growth spruce-fir forest, but also occurs in ponderosa pine, Douglas-fir, & lodgepole pine forests with abundant snags and insect populations due to outbreaks from disease or fire.
Boreal owl	*Aegolius funereus*	Occurs in high elevation, subalpine mature & old-growth coniferous woodlands, including mature Engelmann spruce, subalpine fir or spruce/fir-lodgepole pine forests, interspersed with meadows, nesting in cavities in trees larger than 15" dbh.
Flammulated owl	*Otus flammeolus*	Occur in old-growth or mature ponderosa pine, ponderosa pine, & Douglas-fir forests, often mixed with mature aspen, nesting in cavities, feeding on insects.
Loggerhead shrike	*Lanius ludovicianus*	Occurs in open riparian areas, montane meadows, agricultural areas, grasslands, shrublands, and pinyon-juniper woodlands in western valleys, but is most common in eastern Colorado and is not found to breed in the mountain parks or mountains.
Northern goshawk	*Accipiter gentilis*	Two field surveys were conducted in the summer of 2008. No individuals or nests were identified in the analysis area. Occurs primarily forest habitat, especially in mountains, nesting in lower portions of mature Douglas-fir, ponderosa pine, lodgepole pine, or aspen canopies; prefers mature or old-growth forest structure.
Northern harrier	*Circus cyaneus*	Spring & fall migrant in western valleys mountain parks, and eastern plains in Colorado inhabiting grasslands, agricultural areas, marshes & tundra in fall; 3,500-13,000 ft.
Olive-sided flycatcher	*Contopus cooperi*	Occurs in mature spruce-fir & Douglas-fir forests, especially on steep slopes or near cliffs, near bogs & meadows during the summer, typically 10,000-11,000 ft. This species was observed in the analysis area during summer 2005 field surveys.
American marten	*Martes americana*	Occurs in spruce-fir & lodgepole pine mature to old-growth forests with moderate to high density canopy closures & abundant snags & logs; 8,000- 13,000 ft.
Rocky Mountain bighorn sheep	*Ovis canadensis canadensis*	Prefers semi-open, precipitous terrain characterized by a mixture of steep and gentle slopes, broken cliffs, rocky outcrops, and canyons.

Common Name	*Scientific Name*	General Habitat Description
Townsend's big-eared bat	*Plecotus townsendii*	Typically associated with caves & abandoned mines for day roosts & hibernacula, will also use abandoned buildings in western shrubland, piñon/juniper woodlands, & open montane forests in elevations up to 9,500 ft.
Wolverine	*Gulo gulo*	(Listed as extirpated); suitable habitat includes alpine & subalpine mature/intermediate timbered areas around natural openings, including cliffs, slides, basins, & meadows, dependant on ungulates, historically in Colorado, extending the length of the Rocky Mountains.
Common hog-nosed skunk	*Conepatus leuconotus*	Typically associated with rocky canyon country in piñon-juniper woodlands and montane shrublands in the desert southwest; it has also been reported from desert and grassland environments. Colorado records are associated with oakbrush and piñon-juniper woodland in the southeastern portion of the state.
Fringed myotis	*Myotis thysanodes*	Typically associated with ponderosa pine woodlands, greasewood, oakbrush, and saltbrush shrublands; preferring coniferous woodlands and desert scrub habitats. Snags are very important for this species for roost sites.
Management Indicator Species		
American elk	*Cervus elaphus*	Preferred habitat varies widely; 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.
Abert's squirrel	*Sciurus aberti ssp. ferreus*	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. On the PSICC, surveys show approximately 92% of nests were in a tree group, with 75% having three or more interlocking canopy trees.
Brook trout	*Salvelinus fontinalis*	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. Strong association with beaver ponds and tend to hold along undercuts, submerged brush piles, beaver houses and dams.

Common Name	*Scientific Name*	General Habitat Description
Greenback cutthroat trout	*Oncorhynchus clarkii stomias*	(Addressed as Federally listed species – see habitat description above.)

Source: Wrigley et al. 2007, CDOW 2007, Torretta 2008.

3.6.2 Environmental Consequences

Effects to important and sensitive habitats and wildlife corridors were calculated based on literature reviews, field surveys, and GIS mapping of project alternatives. A determination of effects, as required by ESA consultation guidelines, is presented for all Federally listed species with potential to occur in the analysis area. The determination is presented in **boldface type**.

3.6.2(a) Direct and Indirect Effects

Alternative A - No Action

General

There would be no direct effects to wildlife, including habitat, as a result of the No Action Alternative. However, Alternative A would perpetuate hazardous fuel accumulation and, subsequently, the potential for high intensity or stand-replacing wildfire would continue to increase. The effects of high intensity or stand-replacing wildfire on wildlife species and habitat would vary from negligible to moderate, depending on the species, habitat type affected, and fire intensity.

Alternative A would indirectly conflict with the Forest Plan goals and management direction highlighted in Table 3-4. Specifically, it would not increase wildlife habitat diversity or provide or enhance habitat for the recovery of sensitive species.

Federal and State Listed Species

Canada lynx

There would be no direct effects to Canada lynx, including its habitat, as a result of Alternative A. Over time, Alternative A would result in the accumulation of additional CWD (coarse woody debris or down woody material) that would provide hiding cover and suitable habitat for potential lynx prey species. In this case, Alternative A would provide some beneficial effects. Alternative A would not directly result in the conversion of any lynx habitat areas to an unsuitable condition.

Alternative A would result in minor beneficial habitat effects in the short-term as a result of additional CWD recruitment. However, given the unlikely use of this area by lynx for activities other than movement and the unknown probability of a stand-replacing wildfire, Alternative A results in a determination of **"may affect, not likely to adversely affect"** the Canada lynx or its habitat within the analysis area.

Mexican spotted owl

There would be no direct effects to Mexican spotted owl (MSO) or its habitat as a result of Alternative A. Alternative A would not address the primary threats to this species, catastrophic wildfire and even-aged management, as identified in the 1995 Recovery Plan. Alternative A would not directly result in the conversion of any Restricted MSO habitat areas to an unsuitable condition; likewise, Alternative A would not directly result in the loss of any Target/Threshold Habitat conditions.

For the purposes of ESA consultation, the analysis of Alternative A results in a determination of **"may affect, not likely to adversely affect"** the MSO and its habitat if the owl is found to exist within the analysis area at the time of the management decision.

Mexican spotted owl – Critical Habitat

There would be no direct effects to Mexican spotted owl (MSO) Critical Habitat as a result of Alternative A. Alternative A would not address the primary threats to this species, catastrophic wildfire and even-aged management, as identified in the 1995 Recovery Plan.

For the purposes of ESA consultation, the analysis of Alternative A results in a determination of **"may affect, not likely to adversely affect"** the MSO Critical Habitat within the analysis area at the time of the management decision.

Greenback cutthroat trout

There would be no direct effects to greenback cutthroat trout or its habitat as a result of Alternative A.

Given the unlikely occurrence of greenback cutthroat trout in Newlin Creek or its tributaries in the analysis area and the absence of direct impacts to the species or its potential habitat, and the fact that the only suitable habitat for the species in this watershed is located outside of the analysis area, Alternative A results in a determination of **"may affect, not likely to adversely affect"** the greenback cutthroat trout and its habitat.

American peregrine falcon

As this species is also an RFSS, the Alternative A effect assessment for this species is provided in Table 3-9.

Townsend's big-eared bat

As this species is also an RFSS, the Alternative A effect assessment for this species is provided in Table 3-9.

Forest Service Sensitive Species and Management Indicator Species

Alternative A would not result in any short-term direct effects on any of the RFSS or MIS, but may have long-term indirect effects as a consequence of nonaction, such as the accumulation of understory or ladder fuels, continued conifer encroachment into aspen and meadow habitats, and increased potential for high intensity or stand-replacing wildfires.

For all species listed below, unless otherwise noted, stand-replacing fires would have adverse short-term effects, such as loss of habitat, loss of prey sources, or sedimentation from post-fire erosion. The intensity of the effect and the length of recovery from these effects would vary by

species from negligible to moderate. The effects of stand-replacing fire on wildlife and habitat in the analysis area are further discussion under Cumulative Effects (Section 3.6.2(b)).

Table 3-9. Alternative A Effects on RFSS and MIS.

Common Name	Alternative A Effects
Regional Forester's Sensitive Species (RFSS)	
Northern leopard frog	There would be no direct effects to this species as a result of Alternative A. Indirectly, Alternative A would result in additional down and dead material on the forest floor and, ultimately, better interception of precipitation by keeping soils from direct exposure to raindrops and snowmelt.
American peregrine falcon	There are no documented peregrine falcon nests in the area; however, project Design Criteria stipulate that if any active nests are identified during project implementation, a no-activity buffer zone consistent with CDOW's recommendations (Appendix H) would be designated around the nest. Given that there are no known species occurrences or nest sites in the analysis area, and there are no proposed treatments under Alternative A, there would be no direct or indirect effects to this species.
American three-toed woodpecker	Alternative A would result in long-term minor beneficial effects due to the potential for increased insect populations, particularly pine beetle, in unmanaged stands. Cumulatively, Alternative A would result in minor beneficial effects. If a high intensity wildfire occurred in the analysis area, the remaining dead wood and snags would create optimal conditions for insect populations and nesting cavities.
Boreal owl	Alternative A would result in no effects additional to those described above in the general effects assessment.
Flammulated owl	There would be no direct effects to the species as a result of Alternative A. However, indirectly, Alternative A would diminish habitat effectiveness for the flammulated owl. Overstocking or unnaturally dense stands may prohibit preferred forest habitats from developing into old-growth.
Lewis's woodpecker	Currently, there is very limited suitable habitat present in the analysis area due to overall canopy closure >30%. In the short term, lack of forest treatments or fire return would perpetuate closed canopy conditions. If a high intensity wildfire occurred in the analysis area, the canopy would be opened to levels suitable for the species, and the remaining dead wood and snags would create optimal conditions for insect populations and nesting cavities.
Loggerhead shrike	Alternative A would result in no effects additional to those described above in the general effects assessment.
Northern goshawk	Summer 2008 surveys did not return any positive results for this species in the analysis area. However, potential habitat effects as a result of Alternative A would be similar to those described above for the flammulated owl.
Northern harrier	There would be no direct effects to this species as a result of Alternative A. Within the analysis area, suitable habitat for this species is very limited. In the long term, minor adverse effects may occur if natural processes or conifer encroachment convert open meadows suitable for breeding to woodland habitat.
Olive-sided flycatcher	There would be no direct effects to this species as a result of Alternative A. However, potential habitat effects as a result of Alternative A would be similar to those described above for the flammulated owl.
American marten	There would be no direct effects to this species as a result of Alternative A. Alternative A may, in some cases, perpetuate suitable marten habitat by ensuring adequate overhead cover. In the event of a wildfire, however, the same dense understory and canopy characteristics that ensure good foraging and movement habitat would act as ladder and crown fuels potentially resulting in stand-replacing fires and ultimately, loss of habitat in the long term.

Common Name	Alternative A Effects
Rocky Mt. Bighorn sheep	There would be no direct effects to this species as a result of Alternative A. In the long term, Alternative A would result in increasingly dense understory and canopy characteristics which would diminish visibility, a primary habitat element, in suitable bighorn sheep habitat areas. In the event of a wildfire, however, the same dense understory and canopy characteristics that detract from visibility would act as ladder and crown fuels potentially resulting in stand-replacing fires and ultimately, open the stand in the long term.
Townsend's big-eared bat	There would be no direct effects to this species as a result of Alternative A. However, in the long term, encroachment into meadow areas may diminish edge habitat characteristics preferred by the species. Overall, there is very limited suitable habitat for this species available in the analysis area. As such, these potential long-term impacts are anticipated to be negligible.
Wolverine	There would be no direct effects to this species as a result of Alternative A. However, in the long term, minor beneficial effects to potential habitat may occur as a result of understory development and heavy timber of preferred habitat; however, wolverines are considered extirpated from both Custer and Fremont counties and it is highly unlikely that wolverines occur in the analysis area. Overall, impacts are anticipated to be negligible.
Common hog-nosed skunk	No effects additional to those described above.
Fringed myotis	Minor beneficial effects due to the potential for increased insect populations, particularly pine beetle, and higher snag densities in unmanaged forests.
Management Indicator Species (MIS)	
American elk	Minor adverse effects in the long term due to the loss of forest openings or meadows from continued conifer encroachment.
Abert's squirrel	No effects additional to those described above.
Brook trout	No effects additional to those described above.
Greenback cutthroat trout	(Addressed as Federally listed – see impact analysis above.)

Alternative B – Proposed Action

General

The proposed treatments would reduce or eliminate some types of vegetation used by common species and alter current habitat structure and functioning. Effects to wildlife habitat, in general, as a result of Alternative B would include the mechanical removal of live and dead trees in forests, riparian areas, and meadows; and the reduction of shrubs, grasses, and forbs in forest and riparian understory and meadow areas due to prescribed fire.

Short-term disturbances caused by the treatment activities may adversely affect wildlife throughout the analysis area. These disturbances would result in interruptions of normal behavior due to stress or avoidance of typical or necessary habitats, and loss of or alterations to habitats of some species, including the potential for sediment to enter the stream system.

In the long term, Alternative B would reduce the risk of stand-replacing wildfire. Alternative B would restore ecosystem health and introduce natural ecological processes in a manner and frequency that would benefit wildlife and their habitats.

Alternative B would advance the Forest Plan goals and management direction highlighted in Table 3-4. The proposed vegetation treatments would promote habitat diversity, enhance habitat necessary for the recovery of sensitive species, and improve forage for big-game species.

Federal and State Listed Species

Canada lynx

Implementation of treatments, including patch cuts, under Alternative B would be scheduled over a period of 3-5 years. The acreage treated per year would vary both in quantity and by vegetation type. The mechanical and harvest treatments would result in clumps of uneven-aged trees and shrubs remaining in a mosaic pattern throughout the analysis area and would, therefore, minimize potential effects to lynx and/or lynx habitat within the analysis area. Additionally, the use of prescribed fire would help to stimulate regrowth necessary for preferred prey habitats. Fire is important for maintaining high-quality habitat for Canada lynxes and their preferred prey, snowshoe hares. However, in the short-term, fire use may negatively affect food and cover resources for both the lynx and its prey.

Short-term effects should be minimized through the implementation of specific Design Criteria measures (see Section 2.4.2) that require a minimum threshold for CWD and other understory structure, so that prey species are not entirely devoid of cover and habitat following treatment implementation.

Given the amount of lynx habitat within the analysis area relative to the remainder of the Wet Mountain LAU (Table 3-6), the proposed project's activities would not 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.

The proposed Alternative B treatments would be within the SRLA guidelines for fuels treatments in lynx habitat in WUI areas (see Tables 3-10a and 3-10b). Treatments would affect less than 0.3% of the total potential lynx habitat present in the PSICC (administrative unit). Within the LAU, the project would affect up to 2.4% of the total potential habitat, but would not necessarily result in the conversion of all areas to "unsuitable" habitat.

All patch cut areas would be converted to unsuitable habitat until enough regeneration has occurred to provide sufficient prey cover. Under Alternative B, approximately 70-116 acres would be converted to unsuitable habitat due to patch cuts (Table 3-10a). Although patch cuts would, in the short-term, convert some areas to unsuitable habitat, these small openings would, in the long-term, support winter snowshoe hare habitat as young trees and shrubs become established.

There is some debate concerning what treatment types or forest management practices convert suitable lynx habitat to "unsuitable" habitat. According to the 2007 Lynx Habitat Master dataset, stands that have been treated in either of the following ways are considered to be "unsuitable" until they have successfully reestablished:

A: Prescribed/management ignited and wildfire burns in spruce-fir, lodgepole pine or Douglas-fir stands that do not meet the definition of denning or winter foraging habitat; or

B: Stands with the following treatments (*italicized* treatments are not proposed under Alternative B):

- *Overstory removal cut*
- < 10 years Clearcuts
- < 20 years Precommercial thinning
- *< 10 years Shelterwood seed cut*
- < 10 years Mistletoe sanitation/stand removal
- *< 20 years Spruce clearcuts, any age*

The unsuitable habitat acreage estimates in Table 3-10a include prescribed fire treatments in Douglas-fir and spruce-fir stands that do not meet the definition of denning or winter foraging habitat (i.e., are considered "other" lynx habitat).

The 1-3 acre patch cuts proposed under Alternative B would be similar to the <10 year clearcuts. At this time, it is not possible to estimate the acreage treated with <20 years Precommercial thinning or with <10 years Mistletoe sanitation/stand removal treatment types, however, it is anticipated to be minimal.

Table 3-10a. Lynx Habitat Area Affected by Alternative B Treatments (acres treated / total percentage of habitat type within Wet Mountain LAU).

Treatment Type	Denning Habitat	Winter Habitat	Other Suitable Habitat	Potentially Converted to Unsuitable Habitat*
Prescribed fire w/ pre-fire prep or no treatment	201 / 0.67%	345 / 0.6%	19 / 0.1%	Up to 15 acres
Prescribed fire only (primarily non-forest cover types)	0 / 0%	0 / 0.0%	5 / 0.03%	0 acres
Mechanical thinning followed by prescribed fire	28 / 0.09%	166 / 0.3%	382 / 2.6%	Up to 74 acres
Mechanical enhancement followed by prescribed fire	0 / 0%	0 / 0%	0 / 0%	n/a
Meadow enhancement	1 / 0.003%	35 / 0.06%	33 / 0.2%	0 acres
Harvest and fuelwood followed by prescribed fire	354 / 1.2%	336 / 0.6%	85 / 0.6%	Up to 40 acres
Total**	**584 / 1.9%**	**882 / 1.6%**	**524 / 3.6%**	**Up to 129 acres of "other" lynx habitat in Douglas-fir or spruce-fir stands would be treated with prescribed fire**
Patch Cuts / <10 years Clearcuts (not included in treatments above)	46-76	24-40	0	70-116 acres of denning or winter habitat would be eligible for patch cuts

Source: EDAW GIS, Wet Mountain LAU data
*These acreage estimates are based solely on the USFS Lynx Habitat Master dataset definition of "unsuitable" habitat. As stated in the discussion above, treatments in these areas would not necessarily result in the conversion of habitat to unsuitable conditions. Some areas treated with prescribed fire or mechanical treatments may still retain the constituent lynx habitat characteristics.
**Treatment totals in lynx habitat may vary slightly from the habitat type totals shown in Table 3-6 due to GIS analysis methods.

Table 3-10b. Comparison of Alternative B Treatments in WUI and Non-WUI Areas within the Analysis Area.

Treatment Type	Acres in WUI	Acres Outside of WUI	Total
Constraint Area: Prescribed fire w/ pre-fire prep. or no treatment	1,614	194	1,805
Prescribed fire only (non-forest cover type)	195	3	198
Mechanical thinning followed by prescribed fire	724	91	815
Mechanical enhancement followed by prescribed fire	75	27	102
Meadow enhancement	458	0	458
Harvest and fuelwood followed by prescribed fire	1,237	65	1,302
Total	4,303	380	4,683

Alternative B would result in some short-term, minor impacts to lynx habitat within the analysis area, including the temporary conversion of habitat to unsuitable conditions due to the use of patch cuts and prescribed fire. In the long-term, however, these treatments would benefit the lynx and its preferred prey. Patch cuts would ensure a variety of successional stages throughout the analysis area, including late-succesional areas for denning habitat and early- to mid-sucessional areas for foraging habitat. Prescribed fire use would stimulate the understory and browse development necessary for supporting prey populations.

Overall, the long-term effects would be beneficial to the 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 that would provide important denning and foraging habitat characteristics; and diminished risk of stand-replacing wildfire.

For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the Canada lynx.

Mexican spotted owl

Alternative B would directly address the two primary threats to this species: catastrophic wildfire and even-aged management. Alternative B would reduce the hazardous fuel loads in habitats suitable for MSO, including designated Critical Habitat, Protected Habitat, and Restricted Habitat areas. This would result in beneficial effects to species in the long term due to the reduced likelihood of catastrophic wildfires, as well as the stimulated regeneration of shrub, grass, and forb understory, which support owl prey species.

Small-scale natural fires and prescribed burns, however, can reduce fuel loadings and create small openings and thinned stands that increase horizontal diversity and reduce the spread of catastrophic fire (USFWS 1995). Small-scale fires and lightning also create snags, canopy gaps, and large logs, plus they perpetuate understory shrubs, grasses, and forbs, which are important habitat components to the owl, its prey, and other wildlife (USFWS 1995).

The project would not remove any tree species greater than 24" dbh. Given the small amount of Restricted Habitat within the analysis area relative to that found at the District level, the proposed project's activities would not cause the overall Restricted Habitat area to fall below the minimum Target/Threshold acreage requirements. Additionally, the implementation of several MSO specific Design Criteria (#24-27) would ensure that, with the exception of patch cuts, no other treatment types would convert MSO suitable habitat to unsuitable conditions. Design Criteria #27 is of particular importance as preliminary investigations of stand conditions indicate that the analysis area may contain one or more Threshold Habitat stands. Treatment activities in these stands would not result in the loss of threshold habitat characteristics; treatments would not be permitted to reduce the stand to non-Threshold conditions.

In stands approaching the Target/Threshold requirements identified in the Recovery Plan (see Appendix D), mechanical thinning treatments would aim to maintain the current basal area while still accomplishing hazardous fuels reduction objectives. Limbing or removing ladder fuels in these stands would minimize fire risks while also promoting or releasing the growth of larger diameter trees.

Patch cuts (group selection) would promote the horizontal diversity and forest structure most conducive to MSO nesting and roosting. However, in the short-term, all patch cut areas would be converted to unsuitable habitat until regeneration has occurred enough to provide sufficient prey cover (Table 3-11). Based on the 12-20% patch cut objective identified in Chapter 2, it is estimated that approximately 73-122 acres of MSO Restricted Habitat would be converted to unsuitable nesting habitat due to patch cuts. Although patch cuts would, in the short-term, convert some areas to unsuitable habitat, these small openings would, in the long-term, support enhanced prey populations and improved roosting and hunting opportunities by providing a diversity of stand conditions distributed throughout the landscape.

Table 3-11. MSO Habitat Area (acres in analysis area) Affected by Alternative B Treatments.

Treatment Type	Critical Habitat	Protected Habitat	Restricted Habitat
Prescribed fire only or no treatment (constraint)	719	183	656
Prescribed fire only	156	0	40
Mechanical thinning followed by prescribed fire	559	0	176
Mechanical enhancement followed by prescribed fire	74	0	0
Meadow enhancement	410	0	26
Harvest and fuelwood followed by prescribed fire	962	0	700
Total*	**2,880**	**183**	**1,598**
Patch cuts (not included in treatments above)	**See Restricted Habitat acreage	0	73-122

Source: EDAW GIS, USFS MSO data
*Treatment/habitat type totals are not applicable since Critical Habitat overlaps with both Protected and Restricted Habitat types.
**The majority of Patch Cut treatments would occur in Restricted Habitat areas within the Critical Habitat boundary.

Overall, Alternative B would result in long-term beneficial effects to the MSO and Protected, Restricted, and Critical Habitat. Treatment activities would enhance and promote the habitat features essential for the conservation of the MSO. The treatments proposed are consistent with the Recovery Plan guidelines for fuels and forest management practices in MSO habitat. Although the patch cuts would temporarily convert some suitable habitat areas to unsuitable nesting or roosting habitat, the overall result would mimic natural canopy gap processes and would introduce additional variation into the forest structure.

With successful implementation of the Design Criteria, short-term effects to the MSO are anticipated to be discountable and insignificant. Alternative B has the potential to result in considerable benefits to the species and its habitat. For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the MSO.

Mexican spotted owl - Critical Habitat

Alternative B would result in long-term minor beneficial effects to the quality of habitat in the designated Critical Habitat in the analysis area. The emphasis on uneven-aged management would, over time, would enhance and promote the habitat features essential for the conservation of the MSO.

For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** MSO Critical Habitat.

Greenback cutthroat trout

There would be no direct effects to greenback cutthroat trout or its habitat as a result of Alternative B. Alternative B could result in minor runoff and sedimentation increases and ash litter due to prescribed fires, and ground disturbance with subsequent erosion from heavy machinery and vehicles in the analysis area. However, the established riparian vegetation in the analysis area is considered healthy enough to act as a buffer between the management actions and any downstream populations of trout (Gaines 2008). Additionally, various project Design Criteria (Section 2.4.2) have been incorporated into the project to ensure that impacts to streams, riparian areas, and ultimately, suitable greenback cutthroat trout habitat are minimized. The removal of slash and debris from treatment units would expose soils to more raindrop or precipitation impacts in the short-term. However, short-term effects should be minimized through the complete and successful implementation of the Design Criteria listed above. As such, adverse effects to the greenback cutthroat trout as a result of Alternative B would be negligible.

In the long-term, the removal of slash and debris and the opening of 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 would reduce the potential for stand-replacing fires which often contribute to major erosional events. Alternative B would, therefore, result in long-term beneficial effect to the health of the Newlin Creek watershed and, subsequently, greenback cutthroat trout downstream of the analysis area.

With successful implementation of the Design Criteria, short-term effects to greenback cutthroat trout habitat are anticipated to be negligible. Overall, Alternative B has the potential to enhance watershed health in the Newlin Creek drainage, which ultimately benefits the greenback cutthroat trout and its habitat. For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the greenback cutthroat trout and its habitat

American peregrine falcon

As this species is also an RFSS, the Alternative B effect assessment for this species is provided in Table 3-12.

Townsend's big-eared bat

As this species is also an RFSS, the Alternative B effect assessment for this species is provided in Table 3-12.

Forest Service Sensitive and Management Indicator Species Effects

Alternative B has a range of effects on Forest Service Sensitive Species and Management Indicator Species as listed below for each species in Table 3-12. For cavity-nesting or denning species, effects are evaluated based on the aforementioned inclusion of project Design Criteria that protects and maintains current snag densities. Effects are described with consideration for species' overall habitat needs within the analysis area.

Table 3-12. Alternative B Effects to RFSS and MIS.

Common Name	Alternative B Effects
FOREST SERVICE SENSITIVE	
Northern leopard frog	Potential effects would be minimized through the implementation of Design Criteria for Hydrology and Soils and Wetlands and Riparian areas. Potential adverse effects would be negligible.
American peregrine falcon	There are no known peregrine falcon nests in the area; however, project Design Criteria stipulate that if any active nests are identified during project implementation, a no-activity buffer zone consistent with CDOW's recommendations (Appendix H) would be designated around the nest. Given that there are no known species occurrences or nest sites in the analysis area and the preferred nesting sites (i.e., cliffs, rocks) are not likely to be affected by fire treatments, there would be no direct effects to this species as a result of Alternative B. Prey habitat may be adversely affected by treatment activities in the short term; however, the impacts to the peregrine falcon are anticipated to be negligible. In the long term, regrowth of the understory, meadow and shrub vegetation would benefit prey populations and ultimately enhance peregrine falcon habitat in this area. All impacts, adverse and beneficial, are anticipated to be negligible overall and localized to the analysis area.

Common Name	Alternative B Effects
American three-toed woodpecker	The successful incorporation of Design Criteria stipulates that no evident nesting trees would be removed during project implementation. However, other direct effects of project implementation would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the short term, down and dead material, snags created as a result of treatment opportunities, and some residual slash would result in increased colonization of some insect populations which would temporarily enhance habitat for the American three-toed woodpecker. In the long term, however, Alternative B would lower the potential for future insect epidemics, which would result in fewer standing dead trees (i.e., snags). Ultimately, Alternative B would diminish habitat characteristics for this species. Overall, all impacts would be minor, however, short-term impacts (beyond the immediate short-term when personnel or equipment are present) would be beneficial but long-term impacts would be adverse.
Boreal owl	Boreal owls tolerate human disturbance and machine noise well (Wrigley et al. 2007). As such, project implementation activities, including increased human presence, noise, or vehicle use is not likely to have measurable short-term direct effects on this species, particularly since Design Criteria stipulate a no-activity buffer around nest sites and a moratorium on treatments during nesting seasons. In the long term, Alternative B would have minor beneficial impacts on nesting, hunting, and foraging habitat. Creating uneven-aged stands with a multi-layered canopy, opening the understory, and promoting the growth of larger diameter trees would enhance nesting habitat for the species throughout the analysis area. The patch-cuts and forest openings proposed under Alternative B would be below the size considered detrimental to hunting and foraging habitat, typically several hectares or more (>5 acres) (Wrigley et al. 2007). The 1-3 acre patch cuts proposed under Alternative B may be beneficial to boreal owl hunting and foraging activities by creating small islands of dense understory suitable for an abundant prey base. Additionally, forest habitat on the edges of small openings would provide suitable perches for hunting and foraging without requiring the species to cross large openings.
Flammulated owl	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term, potential habitat conditions would be enhanced through Alternative B treatments. Specifically, thinning in ponderosa pine and pinyon-juniper stands would promote healthier and more vigorous stands by reducing competition with understory growth and would promote the development of old-growth characteristics.
Lewis's woodpecker	The successful incorporation of Design Criteria stipulates that no evident nesting trees would be removed during project implementation. However, other direct effects of project implementation would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the short term, down and dead material, snags created as a result of treatment opportunities, and some residual slash would result in increased colonization of some insect populations which would temporarily enhance foraging habitat for the Lewis's woodpecker. In the long term, Alternative B would result in open stand characteristics preferred by the species, however, the reduced potential for future insect epidemics would result in fewer standing dead trees (i.e., snags). Overall, the project impacts would be minor and beneficial.
Loggerhead shrike	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. Meadow enhancement or prescribed fire treatments in grassland areas are unlikely to result in direct effects to the shrike as it can easily fly away from thinning equipment or low-intensity fires. Fire treatments may temporarily diminish prey populations, resulting in short-term minor adverse impacts to the species. Overall, however, Alternative B would result in long-term minor beneficial impacts by enhancing vegetative cover and subsequently, insect and small vertebrate populations in suitable habitat areas.
Northern goshawk	Summer 2008 surveys did not return any positive results for this species in the analysis area. However, potential habitat effects as a result of Alternative B would be similar to those described above for the flammulated owl.
Northern harrier	Short-term effects and long-term potential habitat effects as a result of Alternative B would be similar to those described above for the loggerhead shrike.
Olive-sided flycatcher	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term,

Common Name	Alternative B Effects
	potential habitat conditions would be enhanced through Alternative B treatments. Specifically, thinning in spruce-fir and mixed conifer stands would promote healthier and more vigorous stands by reducing competition with understory growth and would promote the development of old-growth characteristics, including larger and taller trees preferred by this species for nesting and hunting.
American marten	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term, Alternative B would result in both beneficial and adverse effects on suitable marten habitat. Mechanical treatments would remove much of the understory structure from forested areas. Prescribed fire treatments would further reduce structural complexity by consuming much of the dead and down material. However, project Design Criteria stipulate that a minimum of 200 linear ft/ac be left intact throughout the analysis area, so habitat would still be present in the immediate short term following treatments. Prescribed fire can be used to create a diversity of forest communities, which, over time, may support more American marten. Small fires, such as prescribed fire treatments, that create a mosaic of diverse habitats provide good cover for American marten and their prey in the long term (Snyder 1991). Fires can create and maintain openings where abundant fruits, insects, ground squirrels, and voles provide summer food (Snyder 1991). Prescribed fire treatments, or other small fire events (as compared to large fire events), may be more beneficial because they ultimately result in less restriction on winter movement patterns and because cover is reestablished more quickly (Snyder 1991) and because small or low-intensity fires typically do not remove the large woody debris essential for movement. Large woody debris provides cover from predators. High intensity fires typically consume large woody debris and, for the marten, result in increased susceptibility to predation.
Rocky Mountain bighorn sheep	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term, the removal of understory growth through mechanical and prescribed fire treatment would improve the species' visibility in suitable foraging areas resulting in minor beneficial enhancements to potential habitat within the analysis area.
Townsend's big-eared bat	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. This species typically does not use large clearcuts or regenerating stands in early seral stages (Gruver and Keinath 2006). Therefore, harvest, thinning, patch cut-openings, and prescribed burning treatments would reduce canopy cover and encourage regeneration in forested stands, thus reducing potential foraging habitat quality in the long term, until these stands again reach mature and older stages. Overall, Alternative B would result in adverse effects to this species. However, given that suitable habitat within the analysis area is extremely limited and there are no documented occurrences of the species in analysis area, the impacts are expected to be negligible to minor.
Wolverine (listed as extirpated)	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term, Alternative B would result in both beneficial and adverse effects on suitable wolverine habitat. Mechanical treatments would remove much of the understory structure from forested areas. Prescribed fire treatments would further reduce structural complexity by consuming much of the dead and down material. However, project Design Criteria stipulate that a minimum of 200 linear ft/ac be left intact throughout the analysis area so habitat would still be present in the immediate short term following treatments. Fires can create and maintain openings where abundant fruits, insects, ground squirrels, and voles provide summer food (Snyder 1991).
Common hog-nosed skunk	Minor adverse short-term effects due to disturbance and temporary loss of habitat for prey species; Potential beneficial long-term effects due to regrowth of understory, meadow, and shrub vegetation and dependant prey base.
Fringed myotis	Minor adverse short-term effects due to loss of insect-infested trees. No known caves, abandoned mine tunnels or abandoned buildings that could be used for communal or maternity roost sites would be affected by the proposed treatments.

Common Name	Alternative B Effects
MANAGEMENT INDICATOR SPECIES	
American elk	Minor adverse short-term effects due to disturbance; potential beneficial long-term effects due to regrowth of herbaceous and shrub understory, and meadow enhancement
Abert's squirrel	Minor adverse short-term effects due to disturbance; potential beneficial long-term effects due to enhanced growth of ponderosa pine from reduced competition and regeneration as a result of prescribed fire. Group selection thinning is likely to promote important ponderosa pine "clump" habitat for this species.
brook trout	Minor adverse short term effects due to potential erosion and sedimentation into streams.
Greenback cutthroat trout	(Addressed as Federally listed – see impact analysis above.)

For all RFSS and MIS species assessed in Table 3-12, Alternative B results in an effect determination of **"may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing."**

Alternative C

Similar to Alternative B, the Alternative C treatments would affect the habitat within the analysis area through the removal of live and dead trees in forests, riparian areas, and meadows; removal of shrub and understory in forests and riparian areas; alteration due to prescribed fire; and the creation of disturbances in the area from equipment, road work, and human presence.

The primary difference between Alternatives B and C is the follow-up or post-mechanical burning prescribed for all mechanical treatments in Alternative B and the lack of follow-up fire treatments in Alternative C. Treatment types for Alternative C would include mechanical thinning or burning, but not both. This difference in treatment type would result in four different habitat effects:

1. Mechanically thinned forests would retain most of their shrub/forb understory
2. Fire treated forests would potentially retain their small diameter trees, but may have minor residual or no understory, forbs, or grasses in the short term
3. Mechanically treated meadows and shrublands would retain most of their grass, shrub, and forb stands
4. Fire treated meadows would potentially retain trees, but may have minor residual or no grasses, forbs, or shrubs in the short term

Similar to Alternative B, the proposed treatments used within the analysis area would reduce or eliminate some types of vegetation used by common species, and alter current habitat structure and functioning, specifically in the short term. Disturbance caused by the activity of the treatment methods would also affect wildlife in the area. These disturbances could result in interruptions of normal behavior due to stress or avoidance of typical or necessary habitats, and loss of, or alterations to, habitats of some species, including the potential for sediments to enter the stream system.

Due to the single treatment type proposed (versus follow-up fire treatments, as discussed in Alternative B), the short-term disturbances as a result of personnel, heavy machinery, and project traffic would be of a shorter duration.

Alternative C would advance the Forest Plan goals and management direction highlighted in Table 3-4. The proposed vegetation treatments would result in habitat enhancements similar to those described for Alternative B.

Federal and state listed species

Canada lynx

The effects of Alternative C on lynx and lynx habitat would be similar to those described for Alternative B. The single-treatment type proposed under Alternative C would result in more residual CWD following implementation than Alternative B. The single-treatment type proposed in Alternative C may, therefore, result in greater short-term habitat benefits for preferred prey species than Alternative B.

The proposed Alternative C treatments would be within the SRLA guidelines for fuels treatments in lynx habitat in WUI areas (see Tables 3-13a and 3-13b). Treatments would affect less that 0.3% of the total potential lynx habitat present in the PSICC (administrative unit). Within the LAU, the project would affect up to 2.4% of the total potential habitat, but would not necessarily result in the conversion of those areas to “unsuitable” habitat. All patch cut areas, however, would be converted to unsuitable until regeneration has occurred enough to provide sufficient prey cover. Approximately 42-70 acres would be converted to unsuitable habitat due to patch cuts. Although patch cuts would, in the short-term, convert some areas to unsuitable habitat, these small openings would, in the long-term, support winter snowshoe hare habitat as young trees and shrubs become established.

Table 3-13a provides an estimate of the acreage converted to an unsuitable condition as a result of Alternative C based on the definition of unsuitable habitat per the 2007 Lynx Habitat Master dataset. For more information on how these estimates were derived, see the discussion on unsuitable habitat in the Alternative B impact assessment (located immediately before Table 3-10a).

Table 3-13a. Lynx Habitat Area Affected by Alternative C Treatments (acres treated / total percentage of habitat type within Wet Mountain LAU).

Treatment Type	Denning Habitat*	Winter Habitat*	Other Suitable Habitat*	Potentially Converted to Unsuitable Habitat*
Prescribed fire only or no treatment	365 / 1.2%	504 / 0.9%	45 / 0.3%	Up to 17 acres
Prescribed fire only	0 / 0%	0 / 0%	5 / 0.03%	0 acres
Mechanical thinning	1 / 0.003%	91 / 0.2%	371 / 2.5%	0 acres
Mechanical enhancement	0 / 0%	0 / 0%	0 / 0%	n/a
Meadow enhancement	0 / 0%	35 / 0.06%	30 / 0.2%	0 acres
Harvest and fuelwood	218 / 0.7%	252 / 0.5%	73 / 0.5%	0 acres
Total**	**584 / 1.9%**	**882 / 1.6%**	**524 / 3.6%**	**Up to 17 acres of "other" lynx habitat in Douglas-fir or spruce-fir stands would be treated with prescribed fire**
Patch cuts / <10 years Clearcuts (not included in treatments above)	27-44	15-26	0	42-70 acres of denning or winter habitat would be eligible for patch cuts

Source: EDAW GIS, Wet Mountain LAU

*These acreage estimates are based solely on the USFS Lynx Habitat Master dataset definition of "unsuitable" habitat. As stated in the discussion above, treatments in these areas would not necessarily result in the conversion of habitat to unsuitable conditions. Some areas treated with prescribed fire or mechanical treatments may still retain the constituent lynx habitat characteristics.

**Treatment totals in lynx habitat may vary slightly from the habitat type totals shown in Table 3-6 due to GIS analysis methods.

Table 3-13b. Comparison of Alternative C Treatments in WUI and Non-WUI Areas within the Analysis Area.

Treatment Type	Acres in WUI	Acres Outside of WUI	Total
Constraint Area: Prescribed fire w/ pre-fire prep. or no treatment	2,180	325	2,505
Prescribed fire only (non-forest cover type)	155	0	155
Mechanical thinning only	626	29	655
Mechanical enhancement only	36	9	45
Meadow enhancement	431	0	431
Harvest and fuelwood only	875	18	893
Total	4,303	381*	4,684*

*The difference in the total acreage (approx. 1 acre) between Tables 3-11 and 3-14 is due to decimal rounding.

Similar to Alternative B, Alternative C would result in some short-term, minor impacts to lynx habitat within the analysis area, including the temporary conversion of habitat to unsuitable conditions as a result of patch cuts. With the exception of 17 acres of prescribed fire use in "other" habitat areas, Alternative C generally avoids converting habitat to unsuitable conditions as a result of prescribed fire since follow-up fire treatments are not proposed. The short-term impacts of Alternative C are primarily limited to the effects of patch cuts on habitat suitability and any disturbances to the lynx or its prey during implementation. In the long-term, the patch cut treatments would benefit the lynx and its preferred prey. Patch cuts would ensure a variety of successional stages throughout the analysis areas, including late-successional areas for denning habitat and early- to mid-successional areas for foraging habitat. Under Alternative C, slash and debris left on the forest floor after thinning and harvest treatments would contribute additional coarse woody debris suitable for lynx denning habitat. However, without the use of prescribed fire follow-up treatment, the regeneration of important understory cover and browse for prey populations may be prolonged or even stifled if slash and debris impede the growth of browse species necessary to support prey populations. As lynx distribution is influenced more by prey abundance than by forest structure, the long-term effects of Alternative C would be beneficial, but limited. Overall, the long-term effects of Alternative C would be to enhance denning habitat and diminish the risk of stand-replacing wildfire.

As such, for the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the Canada lynx and its habitat.

Mexican spotted owl

Similar to Alternative B, Alternative C would reduce the hazardous fuel loads and promote a multi-layered canopy and forest structure in habitats suitable for MSO. The single-treatment type proposed under Alternative C may not reduce hazardous fuels loads as effectively as Alternative B, but the lack of prescribed fire follow-up would provide enhanced habitat structure for MSO prey species, in the short-term, by leaving more residual CWD following implementation. Alternative C would still result in beneficial effects to species in the long term due to some reduced likelihood of catastrophic wildfires, as well as the stimulated regeneration of shrub, grass, and forb understory, which support owl prey species.

All patch cut areas would be converted to unsuitable habitat until enough regeneration has occurred to provide sufficient prey cover. Approximately 39-65 acres of MSO Restricted Habitat would be converted to unsuitable habitat due to patch cuts (Table 3-14). Although patch cuts would, in the short-term, convert some areas to unsuitable habitat, these small openings would, in the long-term, support enhanced prey populations and improved hunting and foraging opportunities as young trees and shrubs become established.

The implementation of several MSO specific Design Criteria (#24-27) would ensure that, with the exception of patch cuts, no other treatment types would convert MSO suitable habitat to unsuitable conditions. Design Criteria #27 is of particular importance as preliminary investigations of stand conditions indicate that the analysis area may contain one or more Threshold Habitat stands. Treatment activities in these stands would not result in the loss of threshold habitat characteristics; treatments would not be permitted to reduce the stand to non-Threshold conditions.

Table 3-14. Mexican Spotted Owl Habitat Area Affected by Alternative C Treatments (acres treated).

Treatment Type	Critical Habitat	Protected Habitat	Restricted Habitat
Prescribed fire w/ pre-fire prep or no treatment	1279	183	1015
Prescribed fire only (non-forest cover type)	120	0	38
Mechanical thinning	422	0	79
Mechanical enhancement	31	0	0
Meadow enhancement	389	0	23
Harvest and fuelwood	639	0	443
Total*	**2,880**	**183**	**1,598**
Patch Cuts (not included in treatments above)	** See Restricted Habitat acreage	0	39-65

Source: EDAW GIS
*Treatment/habitat type totals are not applicable since Critical Habitat overlaps with both Protected and Restricted Habitat types.
**The majority of Patch Cut treatments would occur in Restricted Habitat areas within the Critical Habitat boundary.

Overall, Alternative C has the potential to result in benefits to the species and its habitat. For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the MSO.

Mexican spotted owl - Critical Habitat

Similar to Alternative B, Alternative C would result in long-term minor beneficial effects to the quality of habitat in the designated Critical Habitat in the analysis area. Treatment activities would enhance and promote the habitat features essential for the conservation of the MSO.

For the purposes of ESA consultation, the analysis of Alternative C results in a determination of **"may affect, not likely to adversely affect"** MSO Critical Habitat.

Greenback cutthroat trout

The effects of Alternative C would be the same as described for Alternative B, with the following exceptions:

Under Alternative C, slash and debris from mechanical treatments would be left on the ground to decompose through natural processes. The additional cover provided by branches, leaf and pine needle litter, wood chips, and other debris would protect soils from raindrop or other precipitation impacts and ultimately help to intercept sedimentation or runoff. In the long-term, the remaining slash and debris would potentially slow the recovery and regeneration of understory species. Adverse effects to the greenback cutthroat trout as a result of Alternative C would be negligible.

Overall, Alternative C would result in long-term beneficial minor effects to the health of the Newlin Creek watershed and, subsequently, greenback cutthroat trout downstream of the analysis area.

Overall, Alternative C has the potential to enhance watershed health in the Newlin Creek drainage, which ultimately benefits the greenback cutthroat trout and its habitat. For the purposes of ESA consultation, the analysis of Alternative B results in a determination of **"may affect, not likely to adversely affect"** the greenback cutthroat trout and its habitat.

American peregrine falcon

As this species is also an RFSS, the Alternative C effect assessment for this species is provided in Table 3-15.

Townsend's big-eared bat

As this species is also an RFSS, the Alternative C effect assessment for this species is provided in Table 3-15.

Forest Service Sensitive and Management Indicator Species

Alternative C has a range of effects on Forest Service Sensitive Species and Management Indicator Species as listed below for each species in Table 3-15. For cavity-nesting or denning species, effects are evaluated based on the aforementioned inclusion of project Design Criteria that protects and maintains current snag densities. Effects are described with consideration for species' overall habitat needs within the analysis area. In many cases, the potential effects of Alternative C are the same as described for Alternative B.

Table 3-15. Alternative C Effects to RFSS and MIS.

Common Name	Alternative C Effects
FOREST SERVICE SENSITIVE	
Northern leopard frog	See effects analysis for this species under Alternative B.
American peregrine falcon	See effects analysis for this species under Alternative B.
American three-toed woodpecker	See effects analysis for this species under Alternative B.
Boreal owl	See effects analysis for this species under Alternative B.
Flammulated owl	See effects analysis for this species under Alternative B.
Lewis's woodpecker	See effects analysis for this species under Alternative B.
Loggerhead shrike	See effects analysis for this species under Alternative B.
Northern goshawk	See effects analysis for this species under Alternative B.
Northern harrier	See effects analysis for this species under Alternative B.
Olive-sided flycatcher	See effects analysis for this species under Alternative B.
American marten	The short-term adverse direct effects of project implementation on this species would include temporary displacement or disturbance as a result of noise, smoke, or increased human activity. In the long term, Alternative C would result in both beneficial and adverse effects on suitable marten habitat. Mechanical treatments under Alternative C would remove much of the understory structure from forested areas, but would result in much higher loads of down and dead material as a result of the single-treatment type. The increase in CWD would enhance foraging habitat. Without the use of prescribed fire to clear slash and debris from the understory, revegetation following mechanical treatments would occur at a slower rate than if fire were used to consume the down and dead material.
Rocky Mountain bighorn sheep	See effects analysis for this species under Alternative B.
Townsend's big-eared bat	See effects analysis for this species under Alternative B.
Wolverine (listed as extirpated)	See effects analysis for American marten under Alternative C above.

Common Name	Alternative C Effects
Common hog-nosed skunk	See effects analysis for this species under Alternative B.
Fringed myotis	See effects analysis for this species under Alternative B.
MANAGEMENT INDICATOR SPECIES	
American elk	Minor adverse short-term effects due to disturbance; potential beneficial long-term effects due to regrowth of herbaceous and shrub communities where prescribed fire and meadow enhancement activities occur.
Abert's squirrel	Minor adverse short-term effects due to disturbance; potential beneficial long-term effects due to enhanced growth of ponderosa pine from reduced competition. Group selection mechanical thinning is likely to promote important ponderosa pine "clump" habitat for this species. However, without prescribed fire follow-up treatments, Alternative C would not be especially effective at regenerating ponderosa pine.
brook trout	Minor adverse short term effects due to potential erosion and sedimentation of streams
Greenback cutthroat trout	(Addressed as Federally listed – see impact analysis above.)

For all RFSS and MIS species assessed in Table 3-15, Alternative C results in an effect determination of **"may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing."**

3.6.2(b) Cumulative Effects

Alternative A (NEPA)

The incremental contribution of nonaction (heavy fuel accumulation), when combined with widespread declines in forest health, a stand-replacing wildfire event, and/or future grazing activities, would result in long-term adverse cumulative effects on wildlife and habitat in the analysis area. The effects would vary from minor to moderate, depending on the species, habitat type affected, and fire intensity. Heavy fuel accumulations combined with high intensity or stand-replacing wildfires would cause extensive short- and long-term losses or destruction of habitat for all wildlife species, including sensitive species. Cumulative effects would include the loss of winter denning, summer nesting, and foraging habitat; reduction or loss of prey species; or alteration of migration and movement corridors. With the exception of the two species noted below, there would be no measurable cumulative effects to RFSS or MIS as a result of Alternative A. Exception include:

Northern leopard frog: In the long term, minor to moderate cumulative adverse effects would be expected if high intensity or stand-replacing wildfire occurred in the analysis area resulting in increased erosion, runoff, and/or sedimentation into breeding pools or other suitable aquatic habitat.

Flammulated owl: Cumulatively, dense understory growth as a result of nonaction could have moderate adverse effects in the long term in the event of high intensity wildfire. Understory growth would act as ladder fuels, substantially increasing the potential for large, catastrophic wildfires in the future.

Alternative B - Proposed Action (NEPA)

The Locke Mountain project, when combined with other reasonably foreseeable future forest health and fuels treatments projects, including CWPP and other Forest Service undertakings, would continue to lower risks of stand-replacing fires, reduce susceptibility to insect and disease epidemics, and stimulate regeneration and new growth of vegetation, particularly aspen, throughout the Wet Mountains. The incremental contribution of Alternative B, enhancement of habitat throughout the analysis area, when combined with other past, present, or reasonably foreseeable future actions, would have minor long-term beneficial cumulative effects on wildlife habitat quality in the northern Wet Mountains, in general (except where noted otherwise in Table 3-12) and including sensitive species. With the exception of the species noted below, there would be no measurable cumulative effects to RFSS or MIS as a result of Alternative A. In some cases below, cumulative effects are not anticipated, but additional rationale is provided (e.g., Rocky Mountain bighorn sheep). Exceptions and species with additional rationale are provided below:

American peregrine falcon: It is highly unlikely that the negligible effects of Alternative B would, when combined with the effects of other actions, result in any measurable cumulative effects to this species.

American three-toed woodpecker: Cumulatively, Alternative B, when combined with other reasonably foreseeable future fuels and forest health projects would, by design, reduce the potential for insect epidemics and standing dead trees and ultimately result in adverse cumulative effects to this species. The cumulative effect of all treatments in the region would be moderate overall; however, the incremental contribution of Alternative B (maximum of 4,680 acres treated) would be relatively minor.

Boreal owl: When combined with the similar effects of other fuels and forest health projects in the region, Alternative B would likely result in minor adverse cumulative effects to overall habitat conditions for this species, particularly since the species is at the periphery of its range and potentially susceptible to higher mortality rates (Wrigley et al. 2007).

Flammulated owl: When combined with the similar effects of other fuels and forest health projects in the region, Alternative B would likely result in minor beneficial cumulative effects to overall habitat conditions for this species.

Lewis's woodpecker: Cumulatively, Alternative B, when combined with other reasonably foreseeable future fuels and forest health projects would, by design, reduce the potential for insect epidemics and standing dead trees, but would result in enhanced open stand characteristics on a regional scale. The cumulative effects of all treatments in the region would be moderate overall; however, the incremental contribution of Alternative B (maximum of 4,680 acres treated) would be relatively minor.

Loggerhead shrike: Assuming that the emphasis of other reasonably foreseeable future fuels and forest health projects is on the removal of forest vegetation types, it is unlikely that Alternative B would contribute to any measurable cumulative effects on this species.

American marten: Cumulatively, Alternative B, when combined with other reasonably foreseeable future fuels and forest health projects would, by design, reduce ground and ladder fuel accumulation and ultimately result in adverse cumulative effects to this species due to loss of understory and CWD habitat. The cumulative effect of all treatments in the region would be moderate overall; however, the incremental contribution of Alternative B (maximum of 4,680 acres treated) would be relatively minor.

Rocky Mountain bighorn sheep: Although other reasonably future fuels and forest health projects in the region would have similar effects on potential habitat areas, Alternative B is not expected to contribute any measurable effects, adverse or beneficial, to sheep habitat in Wet Mountains given the limited value of sheep habitat in the analysis area and the limited acreage that would potentially benefit from treatments.

Townsend's big-eared bat: Alternative B would not incrementally contribute to region or forest-wide cumulative effects on this species.

Wolverine: Cumulatively, Alternative B, when combined with other reasonably foreseeable future fuels and forest health projects would, by design, reduce ground and ladder fuel accumulation and ultimately result in adverse cumulative effects to this species due to loss of understory and CWD habitat. Given the likely extirpation of the wolverine from both Fremont and Custer counties, the cumulative effect of all treatments in the region would be minor overall; the incremental contribution of Alternative B (maximum of 4,680 acres treated) would likely be negligible.

Alternative C (NEPA)

The cumulative effects of Alternative C would be the same as described for Alternative B, with the following exception:

American marten: Cumulatively, Alternative C would have very little or no impact on American marten habitat in the region or Forestwide. In the short term, Alternative C would actually perpetuate down and dead material (i.e., ground fuels) suitable for marten habitat since fire treatments would not be used as a follow up to mechanical treatments whereas other reasonably foreseeable future fuels and forest health projects would likely reduce ground fuel accumulation thereby adversely affecting suitable habitat. Overall, the incremental contribution of Alternative C effects to these other project effects would have no impact on the overall trend in available or suitable habitat.

Cumulative Effects (ESA)

Canada lynx

Non-Federal future activities expected to occur in or adjacent to the Wet Mountain LAU include the subdivision of private properties, commercial and residential construction, road and utility corridor construction and development, forest thinning and harvest, increased recreational use, grazing on private and public lands, and other habitat fragmenting actions such as changing land use patterns or conversion of agricultural lands to developed uses.

For the most part, development in areas adjacent to the analysis area is expected to occur at fairly low rural densities. As such, lynx movement corridors and the Black Mountain linkage area would experience only minor effects, whereas large-scale subdivisions or sprawling

communities, similar to those developing along the Colorado Front Range would drastically alter the available movement corridors for lynx and greatly diminish suitable habitat for the preferred prey populations (i.e., snowshoe hare).

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 under certain protection criteria or conservation measures. Cumulative effects to lynx habitat and preferred prey populations as a result of non-Federal actions are anticipated to be minor in the Wet Mountain LAU.

Mexican spotted owl

There are no reasonably foreseeable future state or private undertakings proposed within the analysis area. Therefore, there would be no cumulative effects, as defined by ESA, to the MSO or Critical, Protected, or Restricted Habitat within the analysis area boundaries.

In the immediate surrounding areas outside of the analysis area boundaries, the rate of residential development and/or conversion of natural landscapes to urban or developed uses has steadily increased over the last decade. However, the preferred habitat for MSO, as stated above, is typically characterized by steep, rocky slopes that are unsuitable for residential or other developed uses. As such, these uses are unlikely to contribute to cumulative effects to the owl or its preferred habitat.

As stated in the 1995 Recovery Plan, the greatest threats to the owl and its habitat are catastrophic fire and the continued use of even-aged timber management. Hazardous fuels reduction treatments have been completed and are being planned on state, private, and other Federal lands within the mixed conifer forests throughout Fremont and Custer counties to reduce the risk of catastrophic crown fires. As such, these reasonably foreseeable future state or private land fuels treatments would result in long-term beneficial cumulative effects to the owl and its preferred habitat in the immediate vicinity of the analysis area. 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 habitat suitable for Protected or Restricted status.

Greenback cutthroat trout

Hazardous fuels reduction treatments and forest health projects are likely to occur on state, county, and private lands in mixed conifer forests throughout Fremont and Custer counties to reduce the risk of catastrophic crown fires and to protect private property. As such, these actions constitute reasonably foreseeable non-Federal actions that could result in short-term cumulative effects to trout and habitat through stream sedimentation, chemical alterations, or the removal of shade from riparian corridors. The potential cumulative effects could vary from minor to moderate, depending on the known occurrences of the species in or near the proposed treatment areas and/or the area of affected stream habitat.

3.7 HYDROLOGY AND SOILS

3.7.1 Affected Environment

Soils

Soils are a major factor in determining the productivity of an area. Soil characteristics such as parent material, texture, and other properties determine available water holding capacity and available nutrients. Soil characteristics also determine susceptibility to erosion. The soils in the analysis area can generally be characterized by shallow, well drained, rocky soil on steep terrain derived from a variety of sedimentary, igneous, and metamorphic bedrock (Irvine, in preparation).

The analysis area includes ten different soil mapping units (Table 3-16 and Map 7). The two dominant soil complexes are Hechtman–Ashcroft families complex, which occurs on 5-25% slopes, and the Hechtman–Guffey families complex, which occurs on 40-60% slopes. These two soil complexes comprise 42% and 23% of the analysis area, respectively. The soil mapping units found within the project analysis area are described below (Irvine, in preparation). A complete description of each soil map unit is provided in Appendix E.

Table 3-16. Summary of Soil Map Units within the Analysis Area.

Soil Map Unit	Soil Unit Name	Acres within Analysis Area	Erosion Hazard Rating	Landslide Hazard Rating	Soil Type Characteristics
101F	Silas family – Cryaquolls association, 0-15% slopes	75.9	1	1	Silas – loam or silt loam, very deep, well drained Cryaquolls - silty clay loam and sandy clay loam, very deep, very poorly drained
702M	Rogert family – Cryoborolls complex, 5-40% slopes, very stony	434.3	1	1	Rogert – fine sandy loam, sandy loam or loam, shallow, excessively well drained Cryoborolls – gravelly loam, shallow to very deep, well drained
706Y	Cathedral family – Rock outcrop complex, 40-150% slopes, rubbly	583.4	3	2	Cathedral – very stony sandy loam, shallow, somewhat excessively drained
707Y	Merino family – Rock outcrop complex, 40-150% slopes, rubbly	190.1	3	2	Merino – gravelly sandy loam, somewhat excessively drained
708S	Hechtman – Guffey families complex, 40-60% slopes, extremely bouldery	1,087.4	2	1	Hechtman – gravelly loam and gravelly sandy clay loam, shallow and excessively drained Guffey – very fine sandy loam and sandy loam, moderately deep, well drained
709Y	Cathedral family, moist – Rock outctop complex, 40-150% slopes, rubbly	119.4	3	2	Cathedral – very stony sandy loam, shallow, somewhat excessively drained
710M	Hechtman – Ashcroft families complex, 5-25% slopes, extremely bouldery	1,955.3	1	1	Hechtman – gravelly loam and gravelly sandy clay loam, shallow and excessively drained Ashcroft – fine sandy loam with some loam, moderately deep to very deep, well drained
713Y	Hechtman family – Rock complex, 40-150% slopes, extremely bouldery	65.8	3	2	Hechtman – gravelly loam and gravelly sandy clay loam, shallow and excessively drained
716M	Teaspoon – Trag families complex, 5-25% slopes,	114.4	1	2	Teaspoon – gravelly silt loam, shallow, well drained Trag – loam, deep to very deep, well

Soil Map Unit	Soil Unit Name	Acres within Analysis Area	Erosion Hazard Rating	Landslide Hazard Rating	Soil Type Characteristics
	extremely stony				drained
719Y	Cryoborolls – Rock outcrop complex, 40-150% south slopes, rubbly	54.8	3	2	Cryoborolls – gravelly loam, well drained

Source: Irvine, in preparation.

Soil erosion hazard rating definitions are as follows:

- A value of 1 (low) means little or no loss of surface soil is expected. Some minor sheet and rill erosion may occur.
- A value of 2 (moderate) means some loss of surface soil can be expected. Some sheet and rill erosion and small gullies are probable.
- A value of 3 (severe) means a large loss of surface soil can be expected. Many large and/or small gullies and/or a great amount of sheet erosion are probable.

The erosion potential for many of these ten soils types present is moderate to high following disturbance. The erosional processes that are likely to occur within the analysis area are rilling, sheeting, and mass wasting events.

Erosion is a natural process that contributes sediment to streams; however, erosion can be accelerated by land management activities as well as soil and vegetation disturbance. Soil development and soil erosion are closely tied to hydrological processes. Soil erosion hazard ratings were developed based upon soil type, texture, slope, K-factor, and vegetative cover. The erosion hazard rating is based on expected losses of surface soil when all vegetation cover, including litter, is removed. The likelihood of significant fertility loss increases dramatically with increases in erosion potential. Each of the three erosion hazard ratings is present in the analysis area (Table 3-17).

Table 3-17. Summary of Soil Hazards Present in Analysis Area.

Hazard Type	Acres Present
Erosion Hazard	
1	2,465.0
2	1,201.5
3	1,013.4
Landslide Hazard	
1	3,666.5
2	1,013.4
3	None

Source: EDAW GIS; Irvine, in preparation.

Landslide hazard potential is a rating of the possibility of natural or man-caused mass movements occurring within a soil map unit.

Mass movements, whether natural or man-caused, are undesirable because of the adverse effects on soil productivity and water quality. To date, there have been no large mass movements in either mountain range in recent history, and few in ancient history.

Movements that displace bedrock include, but are not limited to, landslides and slumps. These may be triggered by earth tremors and quakes, active fault movement, or over saturation of geologic strata by water. Debris, earth, and mud flows are caused by surface runoff accumulating soil and debris, such as rocks and trees, and moving downslope with considerable force. These are generally confined to the upper several feet of earth surface (Irvine, in preparation).

The higher the landslide hazard potential rating, the higher probability of mass failure and risk to management for activities planned for such areas. Landslide hazard ratings are defined as follows:

- Areas with a rating of 1 (low) potential are on consolidated geologic materials such as gneiss, schist, granit, and sandstone. Photo interpretation and field work showed no evidence of recent or previous landslides. There is little mass movement risk to management for activities planned for such areas.
- Areas with a rating of 2 (moderate) mass movement potential are on poorly consolidated geologic materials such as interbedded sandstones, siltstone, and shales. On-site investigations and air photo interpretation have shown these areas to be relatively stable or have few ancient landslide materials. Little recent movement has occurred or is likely to occur under normal conditions. Periods of prolonged seasonal precipitation or undercutting soil and geologic material may increase the risk of mass movement activities. A rating of moderate represents a certain amount of risk to the use and management of such areas. Higher costs for construction and design can be expected.
- Areas with a rating of 3 (high) mass movement potential occur on soft or poorly consolidated geologic materials such as shale or sandstone over soft shale. A rating of high represents a serious risk to use and management of such areas. An on-site soil, geotechnical, and hydrologic investigation is highly recommended. Higher costs for design and construction can be anticipated to achieve adequate resource protection.

There are no soil map units within the analysis area with a landslide hazard rating of "**3**" (see Table 3-17).

Five of the soil units within the analysis area are rated "**2**" for landslide hazard and "**3**" three for erosion hazard. A total of 2,465 acres of the analysis area is rated such that little or no loss of surface soil would be expected as a result of erosional processes; 1,202 acres are rated such that moderate or some loss of surface soil can be expected through sheet and rill erosion and small gullies. A severe value is given to 1,013 acres of the analysis area where large loss of surface soil is expected through many large and/or small gullies and/or a great amount of sheet erosion as well as landslide hazards. Many large and small gullies and a great amount of sheet erosion are probable. These high hazard soils include:

- Cathedral family – Rock outcrop complex, >40% slope
- Merino family – Rock outcrops complex, >40% slope
- Cathedral family, moist – Rock outcrop complex, >40% slope
- Hechtman family – Rock outcrop complex, >40% slope
- Cryoborolls – Rock outcrop complex, >40% south facing slope

All of these high hazard soils are associated with steep slopes in the analysis area. These soils have management and use limitations, such as road and trail stability and revegetation success.

Hydrology

The analysis area is comprised of four 6th level Hydrologic Unit Code (HUC) watersheds, including Newlin Creek on the east side, Upper Oak Creek on the west side, Oak Creek at the north side, and Coal Creek on the northeast side (see Table 3-18). All of these watersheds flow north into the Arkansas River, a major tributary of the Mississippi River.

Table 3-18. Analysis Area Watershed Characteristics.

Watershed	Perennial Stream (miles)	Intermittent Stream (miles)	Riparian (acres)
Newlin Creek	0.9	4.4	218
Upper Oak Creek	0	4.8	75
Oak Creek	0	1.3	39
Coal Creek	0	0	0
Total	0.9	10.5	332

Source: NHD, USFS Riparian data, 6th Level HUC data, EDAW GIS

The stream data used for this hydrology assessment was compiled from the USGS National Hydrology Dataset (NHD) and USFS riparian data. The NHD data show a limited number of streams within the analysis area; however, when combined with the riparian data, more of the unidentified drainages on topographic maps are captured as streams. The majority of the streams within the analysis area are intermittent. Table 3-19 shows the length of streams by watershed and acres of riparian area by watershed. The project elevation ranges from 8,000-9,500 feet in mostly steep rugged forested terrain with slope ranging from 0-135% slope, with the steepest terrain being located in the Upper Oak Creek watershed.

Table 3-19. Length of Streams and Riparian in the Analysis Area.

Watershed	Perennial Stream (miles)	Intermittent Stream (miles)	Riparian (acres)
Newlin Creek	0.9	4.4	218
Upper Oak Creek	0	4.8	75
Oak Creek	0	1.3	39
Coal Creek	0	0	0
Total	0.9	10.5	332

Source: NHD, EDAW GIS

The analysis area also contains three small unnamed waterbodies in the Newlin Creek watershed totaling approximately 0.5 acre; the largest of these ponds is 0.24 acre.

Roads within the analysis area provide access for management activities and public recreation. The analysis area contains approximately 10 miles of unimproved, class 4 road and 1.8 miles of an uncompleted trail system. Road density for the analysis area is 2.8 mi/mi^2. The roads are primarily used for recreational access.

Factors that affect the impact a road has on a stream and riparian drainages include proximity, number of crossings, slope, surface material, road use, and road density. The proximity of roads to hydrologic features, such as streams and riparian drainages, can degrade water quality and have an adverse effect on watershed function through sedimentation. Runoff can accelerate freely on roads and cause erosion through rilling and sheet flow, which can contribute sediment directing to streams. There are seven locations where existing roads cross streams. Table 3-20 shows the amount of roads located in each of the four watersheds, road

density, number of stream crossings, and miles of road found within the WIZ or within 25 feet of mapped riparian habitat.

Table 3-20. Summary of Roads within the Analysis Area.

Watershed	Roads (miles) Open / Closed	Road Density (all) (mi/mi^2) Open / Closed	Stream crossings Open / Closed	Roads (miles) within the WIZ and Riparian Buffer Open / Closed
Newlin Creek	5.97 / 5.93	0.24 / 0.24	0 / 1	0.72 / 0.53
Upper Oak Creek	3.66 / 3.92	0.08 / 0.09	7 / 2	1.83 / 0.26
Oak Creek	0.14 / 1.12	0.06 / 0.04	0 / 0	1.36 / 0.05
Coal Creek	0 / 0	0 / 0	0 / 0	0 / 0
Total	9.77* / 10.97	n/a	7 / 3	3.91 / 0.84

*Does not include road within private inholding.
Source: NHD, 6th level HUC data, EDAW GIS, USFS Roads data

The nearest weather stations to the analysis area are located in Canon City, approximately 13 miles to the north, and in Westcliffe, approximately 13 miles to the southwest. For the purposes of analysis, a custom climate dataset was created for the analysis area based on the Westcliffe station summary data. Custom climate datasets, one for the northern portion of the analysis area and one for the southern portion, are provided in Appendix F. These two datasets are nearly identical, and indicate that precipitation throughout the analysis area varies by less than 3 inches annually.

3.7.2 Environmental Consequences

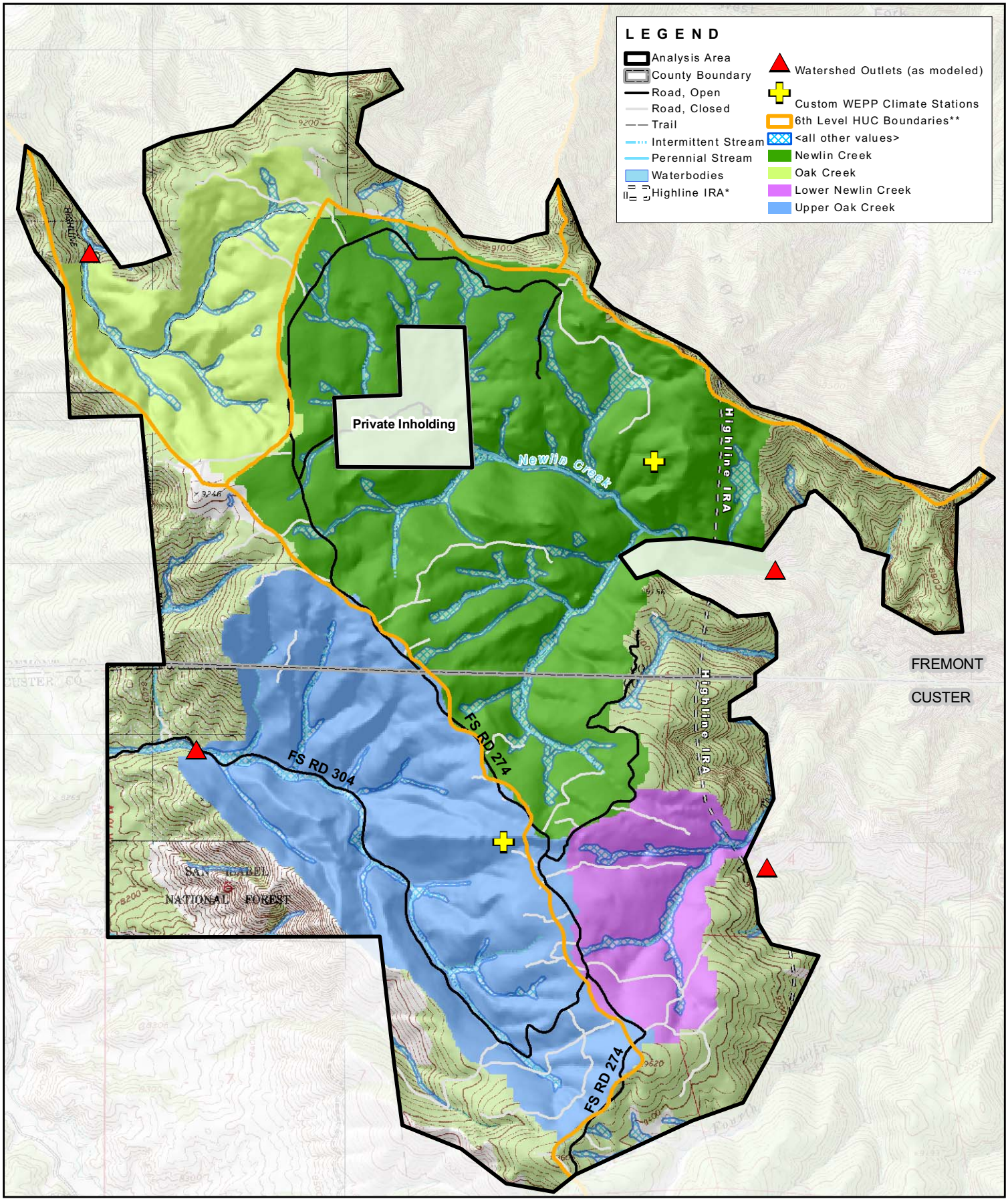
Soil and hydrology processes are inextricably linked; therefore, the environmental consequences are discussed together below. Potential project impacts are discussed both qualitatively and quantitatively. Quantitative discussions are based on model results from the Fuel Management module of the U.S. Forest Service's Water Erosion Prediction Project (WEPP FuME) model. The WEPP FuME model computes sediment yield attributable to various factors for a given hillslope.

The complete methodology and data results for this modeling effort are available in Appendix F.

For this quantitative analysis, the analysis area was divided into four watersheds (Map 12):

1. Lower Newlin Creek
2. Newlin Creek
3. Oak Creek
4. Upper Oak Creek

The four watersheds selected for modeling purposes do not identically correspond to the 6th level HUC boundaries. See Appendix F for a more detailed description of the rationale behind using slightly modified watershed boundaries.



0 0.25 0.5 1 Miles

MAP 12
WEPP ANALYSIS WATERSHEDS

LOCKE MOUNTAIN FUELS MANAGEMENT EA
San Carlos Ranger District

Portions of the Highline IRA are located in the analysis area east of the white dashed line.

Source Data: USFS Roads, NHD Streams and Waterbodies (24k), USGS 10m DEM, USFS Riparian Data, 6th Level HUC Boundaries

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November 12, 2008

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An ArcGIS extension of the WEPP tool was used to generate representative hillslopes for each 2nd and 1st order stream. A total of 34 representative hillslopes were selected to model with WEPP FuME. The selected hillslopes represented a random selection of 10% of the hillslopes generated for each watershed plus the steepest and longest slopes. The average yields from the selected representative hillslopes were used to estimate sediment yield under the different management conditions for each watershed. Approximately 65% of the analysis area was captured in the model results for the four modeled watershed. The results for the modeled area were then extrapolated to those portions of the analysis area outside of the four selected watershed boundaries (the remaining 35% of the analysis area). The WEPP FuME model was run 68 times; twice per transect to account for the different road densities between Alternative A (1.4 mi/mi^2) and Alternatives B and C (2.9 mi/mi^2). The results of the WEPP model are shown below in Tables 3-7 through 3-12. WEPP FuME predicts sediment yields based on soil texture, hill gradient, hill length, road density, wildfire, and treatment effects (prescribed fire or thinning). Based on inputs, the model gives a range of sediment yields from each of the contributing factors. The model actually computes a range of yields for the three following factors:

- Wildfire – may be low, moderate or severe
- Prescribed fire – may be low, moderate, or high
- Roads – classified as low access or high access

Depending on the scenario, the sediment yield caused by the pertinent contributing factors is summed to give the total sediment yield in tons/mi^2 of watershed.

Two classifications were used to estimate the potential contribution of the road network on erosion rates: low access and high access. Within each classification, the model computes a range of yields, from minimum to maximum. For analysis purposes, the “Low Access” minimum yield was used to represent current traffic conditions in the analysis area, which are primarily limited to light to moderate seasonal recreation use. In order to implement project activities, traffic on the analysis area roads would be notably increased to support the traffic associated with ongoing treatment operations, including mechanical thinning. To capture the differences in traffic and road use between the two alternatives (with only a single treatment type per unit, Alternative C would result in much less traffic on analysis area roads), the “High Access” maximum and the “Low Access” maximum were applied to Alternatives B and C, respectively. In many cases, the “Low Access” maximum exceeded the “High Access” minimum and was therefore selected as a more conservative measure of potential sedimentation as a result of project activities under Alternative C.

Explanation of Tables

Tables 3-21 through 3-26 present the predicted sediment yield rates from 34 hillslope transects in four modeled watersheds within the analysis area. The complete methodology and data results for this modeling effort are available in Appendix F. Alternative-specific and general discussions of the results are provided below.

For all transects, the contribution to total sediment of the Undisturbed Forest areas was 0 tons/mi/year. Thus, the background (or baseline) sedimentation rate is the result of contributions from the road network, and residual yield from historic wildfires.

Results are given for each of the modeled watersheds and then totaled for the modeled area.

The totals are then scaled to the entire analysis area to account for areas not directly captured in the modeled watersheds.

Each of Tables 3-22, 3-24, 3-26 and 3-27 shows a comparison of sedimentation response from the watershed for the three alternatives under three different wildfire scenarios:

1. Short Term – Wildfire occurs immediately following treatment;
2. Short Term – No wildfire; and
3. Long Term – Average conditions with wildfire FRI of 65 years.

The Immediate/Short-Term wildfire scenario is essentially the worst case anticipated for each alternative, assuming the event of a wildfire immediately (within one year) following treatment. The severity of the wildfire will be affected by the effectiveness of the alternative treatments proposed, so this is factored into the sum. Presumably, a more intense treatment will be more effective and would result in less severe fires and consequently reduced sedimentation. The sedimentation due to wildfire under the Immediate/Short-Term scenario is added to the sedimentation resulting from treatment, from the roads and access of heavy machinery, and exposure due to prescribed fires and thinning.

The No Wildfire/Short-Term scenario is essentially the same as the Immediate/Short-Term wildfire scenario, except that the contribution from Immediate/Short-Term wildfire is replaced by a residual wildfire contribution assuming that a wildfire has occurred at some regular interval in the past. The residual wildfire sedimentation rate in tons/mi^2/yr was computed as the sediment expected in the year of a wildfire divided by the average Fire Return Interval (FRI) of 65 years[1]. For estimation purposes, the No-Wildfire/Short-Term scenario wildfire rate used was that of a severe wildfire, assuming that past management has completely prevented major wildfires from occurring and therefore, the residual rate is that due to a severe wildfire.

Finally, the long-term average yield is the expected yield following treatment implementation and recovery. For this rate, the computed contribution of the proposed treatments is divided by the FRI (65 years). The wildfire contribution is considered as the reduced wildfire contribution divided by 65. These contributions are added to a road contribution, which is reduced from the most severe case, assuming some rehabilitation and revegetation of the temporary road networks occurs after treatment implementation and in the years following treatment..

3.7.2(a) Direct and Indirect Effects

Alternative A - No Action

Alternative A would have no direct effects on water and soil resources within the analysis area.

However, under Alternative A, hazardous fuels would continue to accumulate and the potential for a large stand-replacing wildfire would continue to increase. Alternative A would result in heavy ladder fuels, understory growth, and down and dead materials. Understory vegetation and down and dead materials would minimize the erosion effect from precipitation events, and would disrupt runoff to prevent extensive sediment transport into waterways. However, down and dead material accumulation near drainages could migrate into intermittent and perennial channels during high water runoff or other high intensity, short duration precipitation events.

[1] This is an approximation of the actual decay curve, which shows rapidly declining sedimentation due to fire in the years following until a residual baseline is reached (Elliot 2008).

Migration of debris into stream channels could be problematic if debris is transported downstream into culverts or catchment basins, resulting in washouts or flooding.

According to the FuME model, a high severity wildfire in any one or more of the modeled watersheds under Alternative A would result in major sedimentation yields. Under Alternative A, the sediment contribution of low access roads is negligible when compared with sediment delivery potential of high-severity wildfire. The averages of both variables' contribution to the overall sedimentation rate are shown, by watershed, in Table 3-21. When extrapolated across the entire analysis area, a high severity fire event would result in 5,843 tons of sediment exported from the analysis area in the year of the fire. Considering an average FRI of 65 years and consistent yearly sediment contributions from the road network, the long-term average sediment export from the analysis area would be 93 tons per year (Table 3-22).

Table 3-21. Alternative A: WEPP FuME Results.

Modeled Watershed	Wildfire (Tons/mi²)	Low Access Roads (min.) (tons/mi²)	Modeled Watershed Total (tons/mi²)	Watershed Area (mi²)	Exported in Year of Disturbance (tons)
Newlin Crk	481.8	0.30	482.1	2.42	1165.2
Lower Newlin Crk	1166.4	0.35	1166.8	0.41	477.8
Upper Oak Crk	1669.2	0.50	1669.7	0.64	1061.6
Oak Crk	753.9	0.40	754.3	1.45	1093.2
TOTAL for Modeled Watersheds				**4.91**	**3797.8**
Ratio of Total Analysis Area to Modeled Area					1.54
TOTAL For Entire Analysis Area				**7.556**	**5842.7**

Table 3-22. Alternative A: Short- and Long-Term Sedimentation Yields.

	Wildfire Short Term	No Wildfire Short Term	Average Long Term
Total Tons Exported from Modeled Watersheds	3797.8	N/A	60.2
Tons/mi² in Modeled Watersheds	773.3	N/A	12.3
Total Tons Exported from Analysis Area	5842.7	N/A	92.6

Additional potential effects of hazardous fuel accumulation *and* a stand-replacing fire event are discussed under Cumulative Effects, Section 3.7.2(b).

Alternative B - Proposed Action

The project activities or mechanisms that would directly affect hydrologic or soils resources in the analysis area include: roads (both existing and temporary), project implementation actions (e.g., hand lines), prescribed fire, and the removal of vegetation.

Increased use and travel on existing roads within the analysis area to accommodate treatment activities would increase erosion and sediment transport to streams, especially at stream crossings. Project Design Criteria (Section 2.4.2) would limit the proposed treatments in stream buffers and riparian zones. The temporary reopening of 11 miles of level 1 roads would temporarily increase road densities and the number of stream crossings in the analysis area, contributing to short-term increased erosion and sediment transport into waterways.

Prescribed fire handlines and draglines typically remove litter and topsoil down to mineral soil along fuel breaks and holding features. Exposing the mineral soil would increase erosion

susceptibility during precipitation events occurring during project implementation. Erosion control structures and revegetation efforts would minimize any long-term soil disturbance effects. Due to the pretreatment of vegetation by mechanical and hand treatment, follow-up prescribed fire treatments are likely to leave little remaining vegetation on the ground or in the understory in the short term. Although the ground would be relatively bare following implementation of Alternative B, the open ground is likely to revegetate more quickly than an area with down and dead materials or slash and other vegetative debris.

Low to moderate intensity prescribed fire would consume vegetation and litter down to the mineral soil. These prescribed fires intensity levels would preserve the existing root systems and would not cause excessive runoff or the creation of hydrophobic (water-repellant) soil conditions. The resulting soil erosion acceleration would be minor and localized; buffer vegetation would trap most sediment before entering intermittent and perennial streams. Where feasible, prescribed fire units would be prepared and/or manipulated mechanically prior to ignition. Pretreatment activities and prescribed burning would accelerate erosion, and mechanical treatment would potentially compact soil due to access by heavy machinery and log falling. Activities prone to causing soil compaction would not occur during periods when soils are wet (see Design Criteria, Section 2.4.2). Soils compacted by treatment activities will be tilled or otherwise loosened as part of post-treatment revegetation. Overall, the effects of prescribed fire treatments on hydrologic and soil resources would be soil loss and water quality impacts. However, with Project Design Criteria and the implementation of best management practices, including stream buffers and erosion control measures, these effects can be minimized.

The use of heavy machinery would be prohibited in areas with an Erosion Hazard rating of 3 or “high”. These areas would be limited to hand treatment or control burning only. Soil disturbance and compaction would, therefore, be minimized in these high hazard areas.

WEPP FuME results show that three variables have the potential to affect sedimentation under Alternative B. In descending order of impact, these variables are wildfire, prescribed fire, and roads. Mechanical thinning activities have no direct bearing on the potential sedimentation yield reported by the model. In this modeling scenario, mechanical thinning only affects sedimentation as it relates to the reduction in the potential for high severity wildfires. The road network and skid trails created to allow equipment access for mechanical thinning activities would affect sedimentation, but the thinned areas or act of thinning branches or falling trees do not otherwise produce any sediment. The results for mechanically thinned areas were therefore 0.0 tons/mi/year for all transects in all watersheds. These results are consistent with FuME modeling scenarios performed in other watersheds with similar soil and slope characteristics (Elliot 2008).

Prescribed fire use under Alternative B would account for 92 tons to the sediment yield in the year of disturbance. However, the potential sedimentation yield savings in a wildfire event following prescribed fire treatments far outweigh the short-term effects of implementation. In the long term, considering the reduction in wildfire risk, the yearly average long-term sedimentation rate would be reduced to 8.9 tons/year, or 9.6% of the yearly average expected under Alternative A (baseline conditions).

In this scenario, the increased road density under Alternative B had only a minor effect on future sedimentation potential. The highest potential road impact results were used because of the heavy traffic expected with the implementation of combination treatments and the greater amount of area proposed for mechanical treatments under Alternative B (Table 3-23 and Table 3-24).

The combination of prescribed fire and mechanical treatments under Alternative B would greatly reduce hazardous fuels in each of the watersheds and, subsequently, reduce the intensities of future wildfire events in the analysis area. In the event of a wildfire in the analysis area following successful implementation of Alternative B, post-treatment sediment yield would be approximately 7% of the sediment yield expected after a high severity fire event under Alternative A.

Considering an average FRI of 65 years and consistent yearly sediment contributions from the road network, the short- and long-term average yearly sediment export from the analysis area would be 207 and 8.9 tons, respectively (Table 3-24).

Table 3-23. Alternative B (Proposed Action): WEPP FuME Results.

Modeled Watershed	Low Intensity Wildfire (Tons/mi²)	Prescribed Fire (Tons/mi²)	Thinning (Tons/mi²)	High Access Roads (max.) (Tons/mi²)	Modeled Watershed Total (tons/mi²)	Watershed Area (mi²)	Exported in Year of Disturbance (tons)
Newlin Crk	21.0	6.9	0.0	2.3	30.2	2.42	72.9
Lower Newlin Crk	62.4	20.8	0.0	3.6	86.8	0.41	35.5
Upper Oak Crk	108.2	27.9	0.0	6.0	142.1	0.64	90.4
Oak Crk	38.4	11.5	0.0	4.0	53.9	1.45	78.2
TOTAL for Modeled Watersheds						**4.91**	**277.0**
Ratio of Total Analysis Area to Modeled Area							1.54
TOTAL For Entire Analysis Area						**7.556**	**426.2**

*Under Alternative B, all areas would be treated with prescribed fire (100% or factor of 1.0).
**Irr. = Irrelevant since all thinning results are 0.0.

Table 3-24. Alternative B: Short- and Long-term Sedimentation Yields.

	Wildfire Short Term	No Wildfire Short Term	Average Long Term
Total Tons Exported from Modeled Watersheds	277.0	134.6	5.8
Tons/mi² in Modeled Watersheds	56.4	27.4	1.2
Total Tons Exported from Analysis Area	426.2	207.0	8.9

In the long term, as treated areas and decommissioned roads are reestablished and/or rehabilitated, sediment transport into waterways would diminish. Alternative B would greatly reduce the potential sediment yield in the long term and would, therefore, provide major beneficial effects to soil and hydrologic resources.

Alternative C

The qualitative effects to hydrologic and soil resources under Alternative C would be similar to the effects described for Alternative B, with the exceptions noted below. The quantitative effects of Alternative C are shown in Tables 3-25 and 3-26.

Road rehabilitation activities, including improvements to existing roads and the temporary reopening of closed roads, would result in the same effects as described for Alternative B. However, the use of and travel on these roads is anticipated to be much lower due to the single treatment type proposed for each unit. As such, road erosion and sediment transport would be reduced as compared to Alternative B.

In all mechanical treatment units, Alternative C would result in heavy residual slash and ground cover following treatment activities. The residual slash and ground cover would minimize the effects of raindrop impact and surface erosion from precipitation events, and would disrupt runoff to prevent extensive sediment transport into waterways. This slash and ground cover would provide more surface erosion protection compared to Alternative B. However, slash accumulation near drainages could migrate into ephemeral drainages and intermittent channels. This accumulation could be problematic during high water runoff or during high intensity, short duration precipitation events if slash and debris were transported downstream into culverts or catchment basins. The accumulation of slash and debris in these areas would likely result in road washouts or flooding of other infrastructure or facilities. In addition, the slash and other vegetative debris will likely slow the revegetation efforts; the large amount of organic cover and the decomposing vegetation could act as a nitrogen sink, pulling nitrogen from the soil, making it less available for the newly established plants.

Where feasible, prescribed fire units would be prepared and/or manipulated mechanically prior to ignition. Pretreatment activities and prescribed burning would accelerate erosion and mechanical treatment would potentially compact soil; however, these activities would not occur during periods when soils are wet (see Design Criteria, Section 2.4.2). The overall long-term effect of prescribed fire treatments on hydrologic and soil resources is anticipated to be minor sediment transport.

For Alternative C, a lower potential road sedimentation result was used than in Alternative B because project related traffic would be more than average recreation traffic (as used in Alternative A), but would still be less than Alternative B due to less harvestable/mechanical area and because of the need to access each treatment units for only one type of treatment, mechanical or prescribed fire.

Under both road density scenarios, WEPP FuME assumes that the entire area is burned. However, as discussed in Section 2.4.5, Alternative C would only apply prescribed fire to certain areas within the analysis area (see Map 9). In order to better estimate the reduced potential sediment yield as a result of less prescribed fire under Alternative C, an area weighted average was used to calculate the sedimentation amounts (see also footnotes for Table 3-25). Prescribed fire activities in the modeled watersheds would account for approximately 53 tons of sediment yield in the year of disturbance under Alternative C (Table 3-25).

Table 3-25. Alternative C: WEPP FuME Results.

Modeled Watershed	Moderate Intensity Wildfire (Tons/mi²)	Prescribed Fire (area factor*) (Tons/mi²)	Prescribed Fire Contribution (Tons/mi²)	Thinning (Tons/mi²)	Low Access Roads (max.) (Tons/mi²)	Modeled Watershed Total (tons/mi²)	Watershed Area (mi²)	Exported in Year of Disturbance (tons)
Newlin Crk	92.3	6.9 (0.4)	2.7	0.0	1.1	96.1	2.42	232.4
Lower Newlin Crk	302.4	20.8 (0.3)	6.2	0.0	1.6	310.3	0.41	127.1
Upper Oak Crk	458.5	27.9 (0.8)	20.9	0.0	2.5	481.9	0.64	306.4
Oak Crk	139.5	11.5 (0.7)	8.1	0.0	1.8	149.3	1.45	216.4
TOTAL for Modeled Watersheds							**4.91**	**882.2**
Ratio of Total Analysis Area to Modeled Area							1.54	
TOTAL For Entire Analysis Area							**7.556**	**1357.3**

*Under Alternative C, treated areas would receive either prescribed fire or mechanical treatments. The prescribed fire factor represents the relative amount of prescribed fire treatment area within the individual modeled watersheds (e.g., A factor of 0.4 indicates that 40% of the modeled area would be treated with prescribed fire only).

Table 3-26. Alternative C: Short- and Long-term Sedimentation Yields.

	Wildfire Short Term	No Wildfire Short Term	Average Long Term
Total Tons Exported from Modeled Watersheds	882.2	99.9	15.2
Tons/mi² in Modeled Watersheds	179.6	20.3	3.1
Total Tons Exported from Analysis Area	1357.3	153.7	23.4

We assumed that the use of prescribed fire and mechanical treatments under Alternative C would lower future fire intensities because of the reduction in fuels. However, without the use of follow-up prescribed fire treatments in mechanical treatment areas, some residual slash and debris would remain on the ground as fuels in the short term. As such, the moderate fire intensity sedimentation value for future wildfires is justified under Alternative C.

Ultimately, Alternative C would result in some reduction of hazardous fuels in each of the watersheds and, subsequently, reduce the intensities of future wildfire events in the analysis area. In the long term, considering the reduction in wildfire risk, the yearly average long-term sedimentation rate would be reduced to 23.4 tons/year, or 25.3% of the yearly average expected under Alternative A (baseline conditions) (Table 3-26).

Prescribed fire and mechanical treatments under Alternative C would reduce hazardous fuels in each of the watersheds, although not to the extent that Alternative B reduces hazardous fuels, and subsequently, reduce the intensities of future wildfire events in the analysis area. In the event of a wildfire in the analysis area following successful implementation of Alternative C, post-treatment sediment yield would be approximately 23% of the sediment yield expected after a high severity fire event under Alternative A.

Considering an average FRI of 65 years and consistent yearly sediment contributions from the road network, the short- and long-term average yearly sediment export from the analysis area would be 154 and 23 tons, respectively (Table 3-26).

Comparison of Alternative Effects

Table 3-27 is a restatement of Tables 3-22, 3-24, and 3-26, rearranged for purposes of comparing the three alternatives.

Table 3-27. Comparison of Sedimentation Yields.

	Alt. A	Alt. B	Alt. C	Alt. A	Alt. B	Alt. C	Alt. A	Alt. B	Alt. C
	Wildfire Short Term			No Wildfire Short Term			Average Long Term		
Tons/mi^2 in Modeled Watersheds	773.3	56.4	179.6	12.3	27.4	20.3	12.3	1.2	3.1
Estimated Total Tons Exported from Analysis Area	5842.7	426.2	1357.3	92.6	207.0	153.7	92.6	8.9	23.4

In the event of a major fire immediately following treatment, the treatment with the most complete removal of fuels, Alternative B, will result in the least intense wildfire and, therefore, the least amount of sedimentation. Alternative A, shows the greatest sedimentation due to the probability of a fire being very severe.

In the more likely case that no wildfire occurs following treatment, the sedimentation would be expected to resemble the No-Wildfire/Short-Term scenario. The most intense treatment, Alternative B, results in the greatest sedimentation rates due to the intrusion of heavy machinery potentially causing major rutting in roads and the increased density of the network required for access.

Finally, over the long term, in nonwildfire years, it is expected that some residual of the treatment effects and the residual anticipated from less severe wildfires will result in sedimentation given as the Average-Long-Term scenario. Alternative A does not alter the likelihood of a severe wildfire event and has no treatment effect, so the No-Wildfire/Short-Term and long-term average scenarios are the same. Alternatives B and C reduce the risk of severe wildfires, and that reduced severity is reflected in the reduced sedimentation numbers.

Generally, Alternatives B and C reduce the sediment yield from the watershed in the long term and result in only marginal increases in the short term. In the short term, in the event of a wildfire, Alternatives B and C both result in a major reduction in the sediment yield from the watershed with respect to Alternative A.

Different assumptions could yield different results in the comparison between the alternatives. For instance, if the forest regenerates quickly, the long-term reduction of both Alternatives B and C will be less drastic. Similarly, the speed of forest regeneration will affect sediment yield from the treated areas, making the short-term increase and estimate long-term average impacts of treatment less severe. Variations in the effectiveness of treatment could narrow or widen the gap between Alternatives B and C for the long term. Different road network intensities would have the most notable impact on long-term sedimentation rates.

3.7.2(b) Cumulative Effects

Alternative A - No Action

Although hydrology and soil resources would not be affected in the short term, they may deteriorate in the long term as a cumulative result of nonaction and the subsequent increased potential for stand-replacing wildfire. The incremental contribution of nonaction when combined with a stand-replacing wildfire event would be long-term adverse moderate cumulative effects on hydrology and soil resources throughout the four analysis area watersheds.

Alternative A would result in the continued accumulation of hazardous fuels throughout the analysis area. In the event of wildfire under these conditions, the fire would likely burn extremely hot, killing microorganisms in the soils and ultimately reducing soil productivity. Valuable nutrients released by the fire would likely be carried away from the burn areas due to accelerated post-fire erosional processes. The resulting sediment loads within the analysis area watershed drainages would be substantial.

Fire events alter vegetative cover, thereby removing precipitation interception, reducing the amount of infiltration into the soil, and increasing the amount of water and sediment that is transported via surface flows. Natural revegetation of the site would occur slowly due to the extensive amount of topsoil loss; unhindered flow of surface water would exacerbate soil and subsoil losses, particularly in steep areas. New rills and gullies would form in the steeper areas with susceptible soil types, and would likely cause head cutting and large losses of subsoil down to bedrock.

Additionally, high intensity, stand-replacing fires often create hydrophobic conditions in soils, thus reducing infiltration. Increased soil runoff would be expected due to the lack of soil infiltration and soil water storage capacity.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative A, would result in cumulative effects to hydrology and soil resources.

Alternative B - Proposed Action

The lower risk for a high intensity, stand-replacing fire would reduce the chance that large sediment loads would enter streams and rivers downstream, such as the Arkansas River. Alternative B would ultimately result in more diverse forest conditions, mixed age stands, and a healthier understory that would likely better protect topsoil from mass losses and provide a better buffer against water quality effects. Future naturally ignited fires would likely be less intense and vegetation would recover faster, thereby protecting water quality and soil resources from loss. Overall, Alternative B would have beneficial cumulative effects to water quality and topsoil loss.

Alternative C

The cumulative effects of Alternative C would be slightly less than those described for Alternative B; the difference in the incremental contribution to cumulative effects would be proportionate to the difference in direct and indirect effects modeled by WEPP FuME as shown in Table 3-27.

3.8 RECREATION, ROADS, AND ACCESS

3.8.1 Affected Environment

The PSICC has one of the highest recreational use levels in USFS Region 2 due to its proximity to one of the four fastest growing population centers in the United States – the Denver/Colorado Springs metropolitan areas. Visitor use on the Forest in FY01 was estimated at close to four million visits, placing the PSICC in the top ten recreation forests nationally (USDA 2007f).

Recreation opportunities in the San Isabel National Forest are numerous. The 2002 National Visitor Use Monitoring (NVUM) project indicates that the top five recreation activities were viewing natural features, relaxing, viewing wildlife, pleasure driving, and hiking/walking – all of which are scenery-dependent activities. According to the PSICC NVUM, "scenery" or "attractiveness of the forest landscape" were the two most important attributes (out of 14 surveyed attributes) to the visitor's recreation experience. This was true for all three use area types inventoried: wilderness, developed day use sites, and general forest areas (USDA 2007f).

Recreation

There are four MAs in the analysis area, only one of which is specific to recreation: MA 2A, Semiprimitive Motorized Recreation Opportunities. MA direction is based on Recreation Opportunity Spectrum (ROS) objectives established by the Forest Plan. ROS provides a framework for defining the types of outdoor recreation opportunities available on the Forest (II-32). MA boundaries and the subsequent ROS zones are shown on Map 4.

There are no developed recreation facilities or authorized recreation special use permits in the analysis area. There are several private campgrounds and outfitters in and around Canon City and the Royal Gorge area. There are no visitor counts or survey data available for this specific area. Recreational use information is anecdotal, provided by Forest Service personnel, other users, and nearby residents.

Given that the analysis area provides no developed amenities, no major recreation attractions, and no trail networks, the Locke Mountain area is not considered a "destination" recreation area like nearby Pikes Peak or the Continental Divide National Scenic Trail; recreation in the analysis area consists primarily of dispersed uses. The majority of these uses typically occurs on weekends from mid-May to late September. Low use occurs in the remainder of the season, with limited access in the winter due to snow. In the summer and fall use seasons, a moderate amount of recreation use occurs in the analysis area related primarily to activities such as big-game hunting, off-road driving, nature and wildlife viewing, and wood gathering. Big game hunting is a major recreational activity in the analysis area, particularly during rifle seasons in late October. Equestrian use is also common in the area. Other secondary recreation activities that occur include day hiking, backpacking, mountain biking, and dispersed camping (Bauer 2008).

The only trail in the analysis area is the nonmotorized Lion Canyon Trail. The Lion Canyon Trail starts at Oak Creek Campground along Oak Creek Grade Road north of the analysis area. The trail travels approximately 2.1 miles, with an elevation gain of approximately 1,400 feet, to Locke Park, where it intersects with FDR 274 (also called the Highline Trail).

There is very little, if any, fishing activity along Newlin Creek within the analysis area. However, there is some hiking and fishing on Newlin Creek downstream of the analysis area in the vicinity of Florence Mountain Park (Bauer 2008).

FDR 274 is closed and gated during the winter, limiting access to foot travel. Some cross-country skiing and snowshoeing occur along the FDR 274 corridor. Winter use is limited and a large majority of this use occurs from residents living in proximity (Bauer 2008).

The PSICC Forest Plan indicates that tourist industries in communities adjacent to NFS lands rely heavily on recreation opportunities and the scenic qualities of the Forest. As such, the Forest Plan states that the desired future condition of the PSICC managed vegetation communities is to ensure the visual attractiveness of the Forest, thereby enhancing recreation

opportunities, including those associated with viewing and driving for pleasure. The PSICC Forest Plan also states that the Forest should "provide a broad spectrum of dispersed recreation opportunities in accordance with the established Recreation Opportunity Spectrum (ROS) classification for the management area" and to "close or rehabilitate dispersed sites where unacceptable environmental damage is occurring" (USDA 1984).

Roads and Access

There are approximately 10 miles of open Forest roads in the analysis area. FDR 274 runs from the southern portion of the analysis area north through Locke Park. FDR 304 enters the analysis area from the west. The roads are maintained to level 2 standards, which effectively prohibit passenger vehicle travel in the analysis area. Narrow road beds, exposed bedrock, drainage crossings, and tight curves are common along the majority of the routes. Currently, high-clearance, four-wheel drive vehicles are strongly recommended for access via FDR 274 and are imperative for access via FDR 304.

There are approximately 11 miles of decommissioned Forest roads in the analysis area (maintenance level 1). These roads were built for previous logging, fuels treatment, or other management activities, but have since been closed and rehabilitated. These roads extend from the main access routes to dead-ends throughout the analysis area. The longest closed road segment is approximately 0.8 mile. In some cases, the entrances (turn-offs) and former road beds are unapparent to the casual observer or recreational user because of successful rehabilitation efforts and mature vegetative cover along the road corridor. In other cases, some closed roads are apparent because of the earthen berms at the entrance, immature vegetation in the road corridor, or because of unauthorized OHV use around or over the entrance barricade.

OHV use is allowed on designated roads within the analysis area only. OHV use is not allowed; however, it is becoming increasingly popular and problematic. Unauthorized OHV use in the analysis area has created social trails and visible resource damage such as vegetation trampling, rutting, and erosion issues.

The Highline Inventoried Roadless Area (IRA) encompasses approximately 364 acres on the east side of the analysis area. IRAs consist of Forest Service lands that have been identified through government review processes as lands without existing roads that could be suitable for roadless area conservation as wilderness or other nonstandard protections The 2001 Roadless Area Rule prohibits new road construction and reconstruction in IRAs on NFS lands, and prohibits the cutting, sale, and removal of timber in IRAs, with the following exception:

> [For] the cutting, sale, or removal of generally small diameter trees which maintains or improves roadless characteristics (36 CFR 294.13(b)(1)):
>
> - To improve habitat for threatened, endangered, proposed, or sensitive species; or
> - To maintain or restore ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period (36 CFR 294.13(b)(1)(ii)).

See Section 2.3.3(e) for a brief discussion on the pending Colorado Roadless Rule.

3.8.2 Environmental Consequences

3.8.2(a) Direct and Indirect Effects

Alternative A – No Action

Recreation

As there would be no fuels treatment or other ground-disturbing activities, there would be no short-term direct effects to recreation as a result of Alternative A. Similarly, Alternative A would have no direct effects on the MA direction or ROS classifications established for the analysis area and, in the absence of a stand-replacing fire event, would not interfere with the desired future management condition of the area.

Alternative A would, in the long term, increase the potential or risk of stand-replacing fire events in the analysis area. Although increased potential or risk alone would not necessarily deter or diminish recreational use in the area, the expected detrimental effects of high intensity fire would certainly curtail use or adversely affect recreational experiences, as described in the Mason Gulch Fire example (see Section 1.2.3). Ultimately, the long-term effects of a stand-replacing fire event in the analysis area under Alternative A would be the cumulative result of past and reasonably foreseeable future actions or occurrences in the analysis area (e.g., rangewide declines in forest health, fire suppression, or epidemics); as such, these effects are discussed below under Section 3.5.2(b).

Roads and Access

There would be no effect to roads, access, or the use and perpetuation of OHV social trails as a result of Alternative A. There would be no effect to the Highline IRA as a result of Alternative A.

Alternative B – Proposed Action

Recreation

Adverse effects to recreation resources and opportunities as a result of project implementation activities would be short term and moderate.

Some recreational uses and opportunities would be temporarily displaced during implementation activities due to area, trails, or road closures; noise; smoke; increased haul road traffic or human presence (project personnel); or the treatment activities themselves (e.g., falling trees, use of fire). Under Alternative B, areas that are not constrained by slope, MSO protected habitat, or sensitive soils would be eligible for both mechanical and prescribed fire treatments. This would necessitate a minimum of two separate closures or displacement periods, one for the mechanical treatment and one for the follow-up fire treatment. Generally, area or access closures, noise, and treatment activity would be limited to several contiguous units, and would therefore not affect recreation opportunities throughout the entire analysis area at any given time.

The proposed treatments would result in short-term adverse effects to the scenic character of the analysis area and, subsequently, the recreational experience (see also Scenic Resources, Section 3.9). Recreational experience effects would range from minor to moderate, depending on the location and type of use. In non-forest cover types, such as meadows and park-like areas, minor effects to the recreational experience and opportunities would be short term, lasting for one to two growing seasons. However, in forested areas where regeneration is much slower and evidence of management activity is often more obvious, the recreational experience

effects would range from minor to moderate and last beyond the short-term period identified in Section 3.2. In the long term, effects to the recreational experience in these forested areas would be minor and beneficial, as the treatment would result in a trend towards scenic and recreational desired future conditions (see also Scenic Resources 3.10).

Additionally, the overall recreational experience would be adversely affected in the short term as a result of crew activity, unburned piles and slash, smoke, or heavy equipment present in the analysis area; these effects would be minor. Prescribed fire treatments would be implemented in the spring and fall seasons, thus reducing effects to summer recreational activities. Prescribed fire activities would have some short-term effects on fall hunting seasons, including limited or prohibited access, short-term smoke effects, and potentially, wildlife displacement as a result of fire treatments.

In the long term, treatment activities would result in minor beneficial effects to recreation. The clearing of understory vegetation would create additional camping or day use recreation opportunities. Additionally, vegetation clearing (both under- and overstory) would improve scenic and wildlife viewing opportunities, which may indirectly enhance hunting experiences in the analysis area.

The Proposed Action would not affect the ROS classification of the analysis area and would not conflict with the desired future conditions identified in the Forest Plan. The Proposed Action would enhance desired future conditions by resulting in trends towards scenic and recreational desired future conditions that would enhance the visitor experience, and would therefore result in long-term beneficial effects.

Roads and Access

The creation of temporary roads, or opening of decommissioned roads, would not change the long-term recreational use in the analysis area. However, the rehabilitation of the main access route (FDR 274) would, in the short term, appeal to a larger subset of users and potentially accommodate a wider range of vehicle types.

In general, the proposed road rehabilitation activities on FDR 274 (Section 2.4.3(a)) and successful implementation of the Design Criteria identified in Section 2.4.2 would result in beneficial long-term moderate effects to FDR 274 and overall access to the analysis area. Rehabilitation efforts, such as curve widening and regrading, would make access to the analysis area easier and potentially more appealing to some users. Although the rehabilitation efforts would not change the road classification (level 2), the improvements would enable access to a slightly larger pool of users and vehicle types. At this time, it is impossible to quantify the effect; however, minor access improvements are anticipated to extend beyond the short term.

Presently, decommissioned roads have substantial vegetative growth that would require several years to restore to a condition whereby they discourage illegal use. In the short term, swaths of disturbed ground and vegetation would be evident. These swaths would remain noticeable up to several years after rehabilitation and inadvertently encourage ongoing unauthorized OHV use, further perpetuating the network of social trails and adverse long-term moderate resource damage. Although the Design Criteria identified in Section 2.4.2, including locked gates, earthen berms, and restoration efforts, would deter the majority of OHV users from traveling off of open routes, these temporary roads would likely still receive some elevated level of unauthorized use even after rehabilitation.

Alternative B treatments in the Highline IRA would be consistent with the 2001 Roadless Rule exceptions and would not result in any new road construction in the roadless area. Cross-country vehicle travel would be permitted, but not encouraged, in the IRA but would not result in any permanent roads or travelways. Adverse effects of cross-country travel within the IRA would be short-term and negligible and would be limited to trampled vegetation and subsequent short-term visual impacts.

Alternative C

Recreation

Overall, effect mechanisms as a result of Alternative C would be similar to those described under Alternative B: smoke, noise, crew activity, and potential use displacement. However, the duration of effects would be noticeably less than Alternative B, as only one treatment type per unit would occur. Additionally, Alternative C proposes prescribed fire treatments on up to 3,091 acres (a -35% difference from Alternative B). As such, the frequency and duration of smoke effects to recreationists and potential area closures would be noticeably less. Seasonal burning effects would be the same as described under Alternative B.

Roads and Access

Effects to roads and access would be the same as described for Alternative B.

3.8.2(b) Cumulative Effects

Alternative A – No Action

Although existing recreation opportunities would be maintained in the short term, they may deteriorate in the long term as a cumulative result of nonaction and the subsequent decline in forest health, including increasing susceptibility to disease or beetle epidemics and/or increased potential for stand-replacing wildfire. The incremental contribution of nonaction, when combined with widespread forest mortality and/or a stand-replacing wildfire event, would be long-term adverse moderate cumulative effects on recreation in the analysis area due to degraded wildlife habitat and scenic resources and/or potential area closures.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative A, would result in cumulative effects to recreation resources.

Alternative B – Proposed Action

Considering the widespread outbreak of MPB, other disease epidemics in western forests, and rangewide decline in forest health (particularly aspen), the proposed fuels treatments would result in minor to moderate long-term beneficial cumulative effects to recreation in the analysis area. The proposed treatments would ultimately delay, diminish, or altogether impede the effects of reasonably foreseeable future epidemics or stand-replacing wildland fires in the analysis area, thereby preserving or enhancing available recreation opportunities and experiences.

When combined with reasonably foreseeable future grazing activities in the analysis area, the short-term direct effects of Alternative B, such as displacement, noise, or scenic degradation, would result in minor adverse cumulative effects such as diminished recreational experiences or temporary losses of opportunities in the analysis area. Cumulative effects would be most

noticeable when livestock are present. These effects are not expected to last beyond the short term.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative B, would result in cumulative effects to recreation resources.

Alternative C

The cumulative effects of Alternative C would be the same as described for Alternative B.

3.9 SCENIC RESOURCES

3.9.1 Affected Environment

This section describes the existing scenic resources of the analysis area, relevant management direction, visual absorption capacity, and viewer sensitivity to change in the areas that would be affected by project implementation. The following terms and definitions will be used to describe the existing conditions and to assess potential project effects:

- **Existing landscape character** refers to the analysis area's current scenic attributes (landform, water, cultural elements, and vegetation) combined with the cultural values that people assign to landscapes. Landscape character descriptions define a unit's "sense of place," or scenic expression, as well as provide a written baseline condition from which to monitor change in scenic resources in the future (USDA 1995).
- **Visual Absorption Capacity (VAC)** refers to the relative ability of a landscape to accept contrasting human modifications without a loss in character, or to accept and recover from manipulation (USDA 1995).
- **Viewer sensitivity** to change is determined by evaluating factors such as visibility of the site, proximity to sensitive land uses, the number and type of potential viewers, and the purpose of their visit to the analysis area.

The analysis area is located in Southern Parks and Rocky Mountain Range province of the Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow ecoregion (USDA 1995). The analysis area covers a variety of scenic landscapes due to the mix of vegetation communities and topography. Generally, there are four distinct landscape types present in the analysis area.

1. The west side is characterized by steep rocky slopes, deeply incised ravines, and shrub cover with sparse ponderosa pine. The aspects are generally west facing. Views of the Sangre de Cristo Mountains and the Wet Mountain valley provide exceptional scenic interest.
2. The central portion of the analysis area (FDR 274 and areas east to the Highline IRA boundary) is characterized by moderate slopes, intermittent and ephemeral drainages, and evidence of previous management activities including tree stumps and abandoned road corridors from previous logging efforts. Large stands of aspen (both young and mature), Douglas-fir, and mixed conifer occur throughout the central portion of the analysis area. Overlooks and viewpoints to areas outside the analysis area are limited due to tree cover and density.

3. The east and north perimeters of the analysis area are characterized by dense mature forests, steep slopes, and little evidence of previous human or management activities. Vista points and views to areas outside the analysis area are limited due to tree cover and density.
4. Locke Park and the northern meadows are characterized by open, rolling grasslands with some conifer encroachment. The Locke Park and meadow areas provide sweeping views within the analysis area and to areas outside the analysis area.

The high presence of aspen, diverse canopy species composition, topography, high elevation, and relatively high regeneration rates typically produces a high VAC on most east and north-facing slopes within the analysis area. On the drier, steeper, south and west-facing slopes where tree cover is sparse and regeneration rates are slower, the VAC is low to moderate.

The majority of the analysis area is located within foreground (within ¼ mile) views from the main Locke Mountain travelways, FDRs 274 and 304. The remaining portions of the analysis area are located in the middleground views (¼ mile to 4 miles) from FDR 274 and 304, and numerous other county or Forest Service roads, including FDR 6227 and 336 and CR 143, 255, and Oak Creek Grade Road. None of the analysis area occurs in the background viewshed (beyond 4 miles) from these corridors.

Traffic counts are not available for FDR 274 or 304. These roads and trails are often closed for six months or more due to winter weather conditions. From these primary travel corridors, the foreground scenery typically consists of forest in the lower and middle elevations through the central analysis area and grassland meadows or shrublands in the higher elevations in the vicinity of Locke Park. Landform is typically rolling to very steep on the analysis area perimeters. Shrublands on the western perimeter contain a combination of shrubs, grasses, bare mineral soil and rocks, and exhibit a range of colors from grey-green to reddish to dark green (when conifers are present). Grasslands in the Locke Park and meadow areas are more uniform and are usually tan to yellow-green in color. Lines are not always obvious, but when present are generally noted in the landscape as the sharp divide between conifer forest and grassland, and in some cases rolling ridgetops. Erosion from water flow has created small gullies at the foot of steeper dry hills and deeply incised ravines on the western edge of the analysis area. Most foreground areas are uniformly forest or grassland, although some meadow areas have conifers scattered throughout. The overall aesthetic experience varies from a sense of enclosure in the forested areas to a sense of openness in shrublands or grass meadows.

The middleground scenery is somewhat more uniform. Middleground views are typically dominated by dark green forest stands punctuated by occasional aspen regeneration, which exhibits a striking color contrast in the fall. Lines in this landscape are predominately along the numerous ridgelines of the rolling foothills. Vegetation on the north-facing slopes consists mainly of ponderosa pine, Douglas-fir, Colorado blue spruce, and aspen with occasional standing dead trees; on the drier, west and south-facing slopes ponderosa pine, Gambel's oak, and mountain mahogany are dominant with a background of rock and mineral soils.

As discussed in Section 3.8, many of the recreational activities occurring in the analysis area are scenery dependent, including but not limited to photography, hiking, and driving for pleasure. Generally, these users have a high sensitivity to scenic change. Other users, such as OHV users, hunters, and snowmobilers have a somewhat lower sensitivity to scenic change.

Many forest visitors value the dense nature of today's forests and are unaware that the forest they see is not in a sustainable condition or, arguably, natural condition. With the recent pine beetle epidemic in Colorado and Wyoming, large wildfire events across the west, and statewide aspen decline, the public in general and recreational users specifically are becoming more accustomed to modifications in the forest's scenic landscape. In some cases, forest health treatments, including thinning and salvage activities, are encouraged to protect or enhance scenic qualities in forests at risk of beetle infestation and/or catastrophic fire, despite the visual effects.

Management Direction

The PSICC Forest Plan establishes Visual Quality Objectives (VQOs) for each designated MA. As described in Section 1.4.3, there are four MAs in the analysis area. Approximate acreages, corresponding VQOs, and Forest Plan guidance for the management of scenic resources in each MA are provided in Table 3-28. Currently, all MAs within the analysis area meet or exceed the established VQOs.

Table 3-28. Visual Quality Objectives by Management Area.

Management Area	VQO(s)	VQO Descriptions	Forest Plan General MA Direction
2A/Semiprimitive Motorized Recreation Opportunities *830 acres*	**Partial Retention**	Management activities are not evident or remain visually subordinate. Past management activities, such as historical changes caused by early mining, logging, and ranching, may be present which are not visually subordinate but appear to have evolved to their present state through natural processes. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements of the landscape to improve visual variety is also used (III-107).	Design and implement management activities to provide a visually appealing landscape. Enhance or provide more viewing opportunities and increase vegetation diversity. FS System travel routes are Sensitivity Level I. Apply rehabilitation practices where the VQOs are not currently being met.
5B/Big Game Winter Range *1,360 acres*	**Modification**	Management activities are not evident, remain visually subordinate, or dominate in the foreground and middleground, but harmonize and blend with the natural setting (III-149).	Design and implement management activities to blend with the natural landscape.
7A/Wood-Fiber Production and Utilization *2,580 acres*	**Partial Retention** within foreground of arterial/collector roads and primary trails.* **Modification** in all other areas.	Management activities are not evident or remain visually subordinate along Forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middleground, but harmonize and blend with the natural setting. (III-169)	Apply rehabilitation practices where the VQOs are not currently being met.

Management Area	VQO(s)	VQO Descriptions	Forest Plan General MA Direction
9A/Riparian Management *Applicable Forest-wide within the aquatic ecosystem, riparian ecosystem, and ecosystems that remain within approximately 100 feet (measured horizontally) from both edges of all perennial stream and waterbodies.*	**Partial Retention**	The aquatic ecosystem may contain fisheries habitat improvement and channel stabilizing facilities that harmonize with the visual setting and maintain or improve wildlife or fish habitat requirements. The linear nature of streamside riparian areas permits programming of management activities which are not visually evident or are visually subordinate (III-203).	Design and implement management activities that sustain inherent visual values of riparian areas and blend with the surrounding natural landscapes (III-204).

*None of the National Forest System roads within the analysis area are considered to be arterial or collector roads per the USFS *Guidelines for Road Maintenance Levels* (USFS 2005); therefore, Modification is the only applicable VQO in MA 7A.

3.9.2 Environmental Consequences

3.9.2(a) Direct and Indirect Effects

Alternative A – No Action

The existing scenic character would be maintained in the short term; however, if hazardous fuels treatments are not implemented, the subsequent decline in forest health would increase the risk of large-scale wildfires that could result in long-term adverse effects to the scenic quality of the analysis area (these effects will be discussed further in the Cumulative Effects section). Similarly, sensitive viewers are unlikely to be affected in the short term, but may be adversely affected in the long term, as discussed above and in the Cumulative Effects assessment.

Alternative A does not directly conflict with the VQOs identified in the Forest Plan; however, it does not proactively advance the goal, objectives, or desired future conditions identified for the individual MAs.

Alternative B – Proposed Action

In the short term, Alternative B would result in moderate adverse effects to scenic character and sensitive viewers including, but not limited to: increased vehicular traffic and personnel presence, removal of mature vegetation, blackening of the landscape where burns occur, exposed stumps, increased road network, slash and slash piles (prior to burning), and diminished visibility during prescribed fire activities. The successful implementation of the Design Criteria identified in Section 2.4.2 would help to minimize these effects; however, highly sensitive viewers and/or uses would experience moderate adverse effects in the short term as a result of temporary scenic degradation.

In the long term, Alternative B would result in minor to moderate beneficial effects to scenic character and sensitive viewers including, but not limited to: openings in the canopy, increased light penetration, preservation or enhancement of meadow areas, improved health and diversity of vegetation, rejuvenation of aspen stands, additional wildlife use and potentially improved viewing opportunities, and additional viewpoints as a result of canopy openings or reduced conifer encroachment in meadow areas. Alternative B would return the forest to a more open

condition, closely mimicking historic conditions. Ultimately, some viewers may prefer a more densely forested landscape; however, in the long term, the majority of viewers and uses would benefit from the resulting scenic and aesthetic enhancements.

Areas treated through mechanical treatment and prescribed fire would appear natural after 2-3 growing season(s) and once slash piles are disposed of. The resulting vegetation would contain more open, park-like environments with increased ecological diversity and scenic interest. By opening up stands mechanically and through burning, aspen would be rejuvenated resulting in greater color, form, and seasonal change.

Established VQOs would continue to be met or exceeded in the long term.

Alternative C

The effects of Alternative C would be similar to those described for Alternative B, with the following exceptions:

Project related traffic and personnel activity would be noticeably less than in Alternative B due to the single treatment type proposed (no follow-up prescribed fire treatment).

The scenic character and sensitive viewer effects as a result of smoke and/or the blackened landscape following prescribed fire treatments would be greatly reduced from Alternative B (approximately -35% less area is proposed for prescribed fire treatment).

Similar to Alternative B, treated areas would appear natural after 2-3 growing seasons, particularly in prescribed fire treatment units. However, mechanical treatment units would require additional time for natural processes to dispose of or consume residual slash and debris. The resulting vegetation would contain more open, park-like environments with increased ecological diversity and scenic interest. By opening up stands mechanically and through prescribed fire treatments, aspen would be rejuvenated resulting in greater color, form, and seasonal change.

Established VQOs would continue to be met or exceeded in the long term.

3.9.2(b) Cumulative Effects

Alternative A – No Action

Although the existing scenic character would be maintained in the short term, it may deteriorate in the long term as a cumulative result of nonaction and the ongoing decline in forest health, particularly aspen forests, increasing susceptibility to disease or beetle epidemics, and/or increased potential for stand-replacing wildfire. High-intensity or stand-replacing fires in the analysis area would likely result in severe, if not lethal, effects to mature vegetation. Recovery or regeneration after such high-intensity events typically occurs at much slower rates than low- or even moderate-intensity events. The incremental contribution of nonaction, when combined with these factors would be long-term adverse moderate cumulative effects on scenic character and viewer sensitivity in the analysis area.

Scenic degradation as a cumulative result of nonaction and stand-replacing fires in the analysis area would not be consistent with the Partial Retention or Modification VQOs identified in the previous section.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative A, would result in cumulative effects to recreation resources.

Alternative B – Proposed Action

Considering the widespread outbreak of MPB, other disease epidemics in western forests, and rangewide declines in forest health (particularly aspen dieback), the proposed fuels treatments would result in minor to moderate long-term beneficial cumulative effects to scenic resources in the analysis area. The proposed treatments would ultimately delay, diminish, or altogether impede the effects of reasonably foreseeable future epidemics or stand-replacing wildland fires in the analysis area, thereby preserving or enhancing scenic resources.

However, when combined with reasonably foreseeable future grazing activities in the analysis area, the short-term direct effects of Alternative B would result in minor adverse cumulative effects to sensitive user groups, scenic character, and scenic quality in general. Cumulative effects would be most noticeable when livestock are present. These effects are not expected to last beyond the short term.

There are no other past, present, or reasonably foreseeable future actions or occurrences in the analysis area that would result in effects such that, when combined with the effects of Alternative B, would result in cumulative effects to recreation resources.

Alternative C

The cumulative effects of Alternative C would be similar to those described for Alternative B, but slightly less perceptible overall because of the smaller amount of prescribed fire proposed (i.e., blackening of the landscape and personnel and equipment on site for a shorter duration, presumably).

3.10 VEGETATION AND WETLANDS

3.10.1 Affected Environment

Major plant community types within the Locke Mountain project analysis area are shown on Map 5. These communities are broadly defined here as grasslands, shrublands, and forest types. Refer to the Wildland Fire and Hazardous Fuels section (Section 3.11) for detailed information on the fire ecology and characteristics of all major cover types in the analysis area. Although forest types are discussed below, this section is largely intended to focus on herbaceous and shrub species, including sensitive plants, noxious weeds, and riparian plant communities.

Grasslands at Locke Mountain are dominated by a variety of grass species, including timber oatgrass (*Danthonia parryi*), various species of fescues (*Festuca thurberi* and others), wheatgrasses (*Pascopyrum smithii* and others) and needlegrasses, including needleandthread (*Hesperostipa comata*). There are also several upland species of sedges (*Carex* spp.) in the Locke Mountain grasslands. The grasslands are distributed through the southwestern quarter of the analysis area, and more broadly across the northern half of the area in a mosaic with forested community types. These mountain grasslands cover approximately 480 acres of the analysis area.

Shrublands at Locke Mountain include Gambel's or scrub oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus montanus*), common juniper (*Juniper communis*), chokecherry (*Padus virginiana*), buffaloberry (*Sheperdia canadensis*), and kinnikinnick (*Arctostaphylos uva-ursi*). The shrublands are distributed in similar locations as those described for the mountain grasslands of the analysis area. Shrublands occupy approximately 581 acres of the analysis area.

Aspen (*Populus tremuloides*) forests are distributed in the south-central part of the analysis area along FDR 274, and then more widely across the northern quarter of the analysis area. Aspen forest covers approximately 817 acres in the analysis area. Aspen may be in decline over some portions within the analysis area. Aspen forest is being encroached upon by conifers in some areas. It may have been weakened by extended drought, and is likely under attack by a variety of pathogens and insects.

Douglas-fir (*Pseudotsuga menziesii*) forests in the Locke Mountain analysis area include two types: a cool and moist Douglas-fir forest on north and east-facing slopes; and warm and dry Douglas-fir forests occupying west and south-facing slopes. Douglas-fir covers approximately 1,162 acres in the analysis area. Douglas-fir in the analysis area may be suffering, to varying degrees, from tussock moth, spruce budworm, and/or dwarf mistletoe.

Engelmann spruce (*Picea engelmannii*) is distributed throughout the analysis area and primarily occurs in those areas demarcated as cool-moist mixed conifer on Map 5; Douglas fir, Colorado blue spruce, white fir, and aspen are commonly associated with Engelmann spruce. As stated in Section 2.2.1(b), R2VEG did not indicate that spruce-fir was a dominant cover type in the analysis area, such that it would appear as a stand alone cover type on Map 5 or in tables organized by cover type. However, field visits and groundtruthing efforts by both USFS and USFWS personnel have confirmed that this forest type is indeed present throughout the analysis area and is a considerable component in some stands, particularly in those areas identified by R2VEG as cool-moist mixed conifer and Douglas-fir.

Limber pine (*Pinus flexilis*) forests occupy sites on the northeastern, eastern, and southern slopes of the analysis area, being especially dominant on the crest of ridgelines. Limber pine covers approximately 193 acres in the analysis area. In addition to this conifer species, other dominant species in the limber pine community include other conifer species, such as white fir (*Abies concolor*), Douglas-fir, blue spruce (*Picea pungens*), and ponderosa pine.

Pinyon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*) forest covers approximately 99 acres. The distribution of the pinyon-juniper forest at Locke Mountain is confined to the western edges of the analysis area.

Ponderosa pine (*Pinus ponderosa*) forest is estimated to cover 854 acres within the Locke Mountain analysis area. This forest community type is distributed widely in the northern third of the analysis area, as well the central portion of the analysis area along FDR 274, and at the southern edge of the analysis area. Ponderosa pine in the analysis area may be suffering from MPB and dwarf mistletoe.

There are 10.5 miles of intermittent streams in the project analysis area and an additional 0.9 mile of perennial stream (Newlin Creek). Newlin Creek flows east-southeast through the northern half of the project analysis area and constitutes a "water of the United States." Intermittent streams on the western half of the project analysis area drain west to Oak Creek. Oak Creek flows to the north and east of Locke Park, with all perennial portions of the stream

located outside the analysis area. Wetlands within the analysis area consist of two primary types: riparian wetlands associated with streams in the project analysis area; and slope wetlands that are palustrine emergent systems, which receive a portion (if not a preponderance) of their water budget from ground water and/or spring flows. As of 2008, the analysis area has not been mapped by the National Wetland Inventory (NWI) and no formal wetland delineation was conducted as part of this analysis. Therefore, approximate wetland locations were determined by a review of riparian vegetation data for the area. No wetland delineation has been conducted as part of this EA. There are a total of 332 acres of mapped riparian vegetation within the analysis area, some portion of which is likely definable as wetland.

Noxious Weeds

Colorado statewide and Fremont and Custer county noxious weed lists are provided in Appendix G. “Noxious" means that the species in question is both nonnative and invasive (can out-compete and exclude other types of vegetation); the term “noxious” has a legal connotation with the Colorado Department of Agriculture. Most noxious weed species found in Colorado originated in Europe and/or Asia, and were unintentionally introduced into the United States as a contaminant in crop seed or on farm machinery (Larimer County Weed Control District 2008). Some were intentionally introduced as ornamental plants, forage, or plants used as wind breaks or for soil stabilization.

Noxious weeds can affect nearby native vegetation, including 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 such as hand-pulling, hoeing, mowing, or herbicide application may also inadvertently affect adjacent vegetation. The 2006 PSICC *Invasive Species Action Plan* provides guidance for identifying and annually treating noxious weed populations.

The only species known to have significant populations in the analysis area is Canada thistle (*Cirsium arvense* [*Breea arvensis*]). Canada thistle is listed on both the state (B-list) and Fremont and Custer county weed lists. State B-list weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species (Colorado Dept. of Agriculture 2008 and Colorado Weed Management Association 2008).

Canada thistle commonly invades disturbed areas, but it may invade native plant communities, open meadows (including wetlands), and ponderosa pine savanna (Rutledge and McLendon 1998). Canada thistle is adapted to a wide range of soil types and environmental conditions (FEIS 1998). It is best adapted to rich, heavy loam, clay loam, and sandy loam, with an optimum soil depth of 20 inches (FEIS 1998, Rutledge and McLendon 1998). It can also tolerate saline soils (up to 2% salt) and wet or dry soil (Rutledge and McLendon 1998). However, it does not tolerate waterlogged or poorly aerated soils. Canada thistle usually occurs in 17 to 35-inch annual precipitation zones or where supplemental soil moisture is available (Beck 1996).

Map 13 depicts general locations of Canada thistle infestations in the analysis area, as mapped by USFS. No other significant populations of state-listed noxious weeds have been documented in the analysis area.

Generally, the analysis area has low noxious weed occurrences due to high elevation and the relatively low disturbance levels. Common mullein (*Verbascum thapsus*) and cheatgrass (also known as downy brome) (*Bromus tectorum*) also occur in the analysis area, but are not

especially prolific or threatening to native communities. Both species are on the state C-list; common mullein is also listed on the Custer County weed list.

Potential Conservation Areas

There are multiple Colorado Natural Heritage Program (CNHP) designated Potential Conservation Areas (PCAs) located within the vicinity of the Locke Mountain analysis area. These PCAs are delineated by CNHP in an effort to protect populations or occurrences of biologically significant resources. PCAs may include a single occurrence of a rare element or a suite of rare elements or significant features. The goal of the delineation process is to identify a land area that can provide the habitat and ecological processes upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; as well as current and potential land uses. The proposed boundary does not automatically exclude all activity. It is hypothesized that some activities would cause degradation to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

The PCAs in the vicinity of the Locke Mountain analysis area include Curley Peak, East Bear Gulch, Grape Creek, Lion Canyon, and Locke Park. The Locke Park PCA is described by the CNHP as an area of very high biodiversity significance based on the occurrence of the globally imperiled (G2/S2) plant species, Degener beardtongue (*Penstemon degenerii*).

Special Status Species

Federally Listed Species

No federally listed threatened, endangered, candidate, or proposed species of plants were determined to occur or to have suitable habitat in the Locke Mountain project analysis area. The Penland alpine fen mustard (*Eutrema penlandii*) is a threatened species considered to have the potential to occur on San Isabel National Forest, but its distribution is limited to alpine environments. For this reason it is not included in this review.

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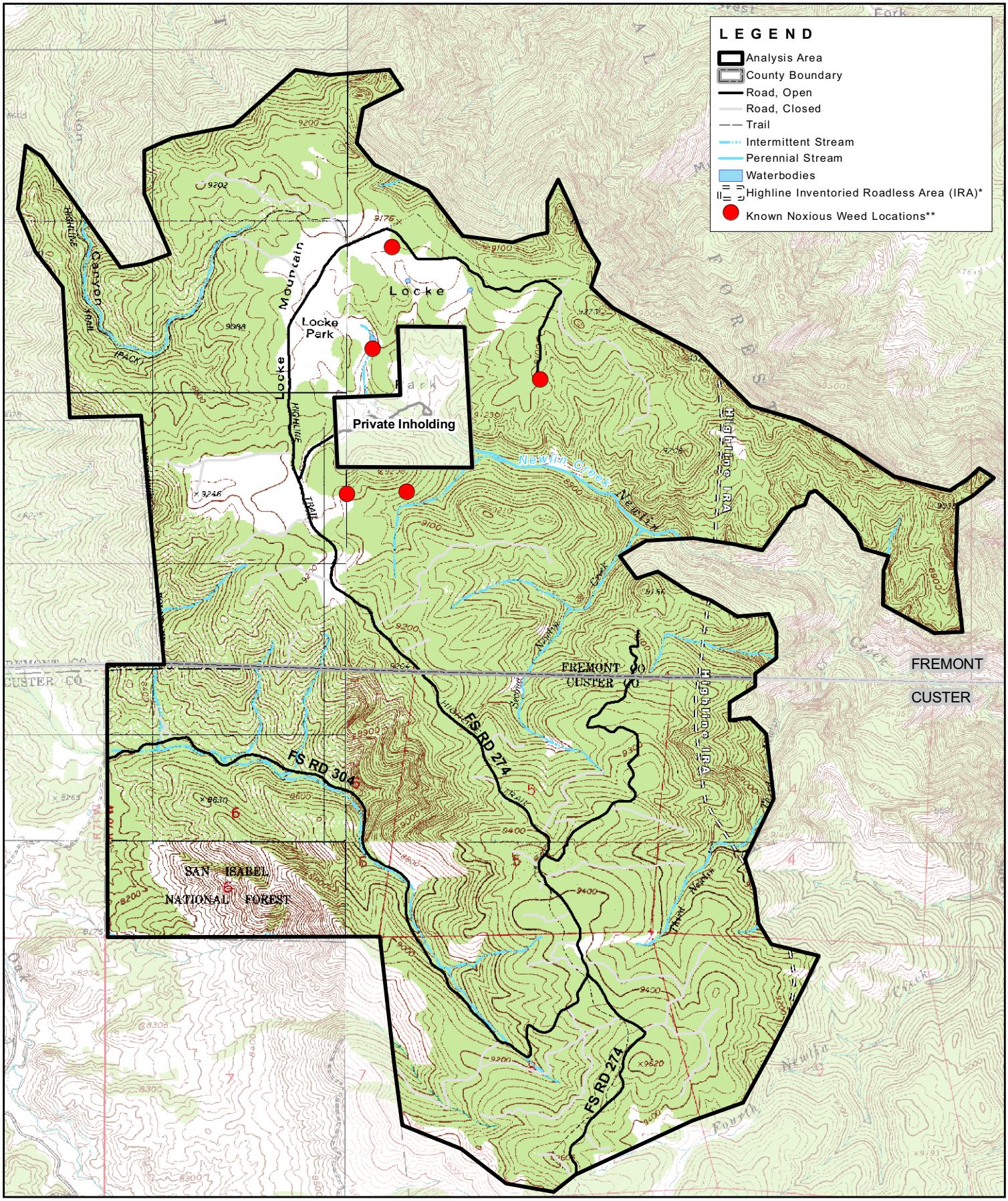

0 0.25 0.5 1 Miles

*Portions of the Highline IRA are located in the analysis area east of the white dashed line.

**This map shows only those infestations of Canada thistle within the analysis area that had been mapped as of October 2007. Other unmapped infestations may be present within the analysis area.

Source Data: USFS Roads, NHD Streams and Waterbodies (24k), USFS Locke Mountain Weed Locations

MAP 13
NOXIOUS WEEDS

LOCKE MOUNTAIN FUELS MANAGEMENT EA
San Carlos Ranger District

EDAW | AECOM

November 12, 2008

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Forest Service Sensitive Species

The following table (Table 3-29) and accompanying text provides detail on plant species from the Region 2 Regional Forester's Sensitive Species List, which have been positively identified on or are determined to have suitable habitat on the San Isabel National Forest. The table further specifies which species are included in or are excluded from the Locke Mountain analysis area.

Species with documented occurrences in the analysis area or that have potentially suitable habitat in the analysis area are discussed in further detail in following sections.

Table 3-29 Region 2 Forest Service Sensitive Species - San Isabel National Forest.

Species Common Name	Species Scientific Name	Potential to Occur	Rationale for Exclusion	Habitat Description and Range in Colorado
Altai cotton-grass	*Eriophorum altaicum* var. *neogaeum*		**HAB**	Alpine wetlands; 9500-14,000 ft; Eagle, Gunnison, Hinsdale, La Plata, Park, Saguache, and San Juan counties.
Arizona willow	*Salix arizonica*		**ODR**	Meadows, springs, seeps, riparian areas and wetlands; 8,300-10,800 ft; Conejos County.
Autumn willow	*Salix serissima*		**ODR, HAB**	Wetland areas including marshes, fens, and bogs; 7,800-10,200 ft; Custer, Park, Larimer and Routt counties.
Blueberry willow	*Salix myrtillifolia*		**ODR, HAB**	In fens from foothills to alpine; 9,300 ft; Park County.
Brandegee's buckwheat	*Eriogonum brandegei*		**ELE**	Pinyon-juniper or sagebrush, often on grayish limestone soils; 5,700-7,600 ft; Chaffee, El Paso, Fremont, and Park counties.
Chamisso's cottongrass	*Eriophorum chamissonis*		**HAB**	Alpine wetland.
Clawless draba	*Draba exunguiculata*		**HAB, ELE**	Alpine on rocky and gravelly slopes or fell fields, usually on granitic substrates; 12,000-14,000 ft; north-central Colorado including Lake, Park, and Summit counties.
Colorado Springs evening primrose	*Oenothera harringtonii*		**HAB, ELE**	Grasslands; 4,700-6,100 ft; El Paso, Fremont, Huerfano, Las Animas, and Pueblo counties.
Colorado tansy-aster	*Machaeranthera coloradoensis*		**ODR**	Mountain parks, slopes & rock outcrops & dry tundra; 8,500-12,500 ft; Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Saguache, & San Juan counties.
Degener's beardtongue	*Penstemon degeneri*	√		Pinyon-juniper, ponderosa pine woodlands, & montane grasslands with coarse gravelly or rocky reddish

Species Common Name	Species Scientific Name	Potential to Occur	Rationale for Exclusion	Habitat Description and Range in Colorado
				soil with igneous bedrock, rock slab cracks; 6,000-9,500 ft; Fremont & Custer counties.
Dwarf milkweed	*Asclepias uncialis*		**HAB, ELE**	Plains, short-grass prairie, outwash mesas and gravelly side-slopes; 4,000-6,500 ft; Baca, Fremont, Huerfano, Las Animas, and Pueblo counties.
Forkleaved moonwort	*Botrychium furcatum*		**HAB**	This is an unpublished species. It has been documented on the Salida District of San Isabel NF.
Giant helleborine	*Epipactis gigantea*		**HAB**	Seeps, springs, riparian areas and wetlands; 4,800-8,000 ft; western Colorado, also Chaffee, El Paso, Fremont, and Park counties.
Globe Gilia	*Ipomopsis globularis*		**ELE, HAB**	Alpine ridgetops, and gravelly, calcareous soils; 12,000-14,000 ft; Lake, Park, and Summit counties.
Golden columbine	*Aquilegia chrysantha* var. *rydbergii*		**ODR**	Along streams and in rocky ravines in mountains; 5,200-8,500 ft; El Paso and Fremont counties.
Gray's Peak whitlow-grass	*Draba grayana*		**ELE, HAB**	Alpine and subalpine on tundra, gravelly slopes or fell fields; 11,500-14,000 ft; central Colorado, including Chaffee, Clear Creek, Huerfano, and Park counties.
Greenland primrose	*Primula egaliksensis*		**ODR, HAB**	Wet meadows, streambanks, willow carrs, fens, and on hummocks; 9000-10,000 ft; Park County.
Hall or plains rough fescue	*Festuca hallii*		**ODR**	Alpine and subalpine grasslands and meadows; 11,000-12,000 ft; Larimer County.
Iowa or Prairie moonwort	*Botrychium campestre*		**ODR, HAB**	Dry, gravelly hillsides; 3,700 – 10,800 ft. Colorado distribution is unclear. Yuma Co. and the central mtns.
Kotzebue's grass of Parnassus	*Parnassia kotzebuei*		**ELE, ODR**	Alpine and subalpine, in wet rocky areas, amongst moss mats and along streamlets; 10,000-12,000 ft; north-central and southwestern Colorado, including Park and Summit counties.
Lesser bladderwort	*Utricularia minor*		**ODR**	Shallow water of subalpine ponds; 5,500 - 9,000 ft; north-central and west-central Colorado.
Lesser panicled sedge	*Carex diandra*		**ODR**	Wet meadows and subalpine willow carrs; 7,400-9,000 ft; Boulder, Grand, Jackson, and Larimer counties.
Lesser yellow lady's slipper	*Cypripedium parviflorum*	√		Moist forests and aspen groves; 7,400-8,500 ft; Clear Creek, Custer, El Paso, Huerfano, Jefferson, Las

Species Common Name	Species Scientific Name	Potential to Occur	Rationale for Exclusion	Habitat Description and Range in Colorado
				Animas, Park, Pueblo, and Teller counties.
Livid sedge	*Carex livida*		**HAB, ODR**	Fens and wetlands; 9,000-10,000 ft; Jackson, Larimer, and Park counties.
Narrow-leaved moonwort	*Botrychium lineare*		**ODR**	Disturbed sites, grassy slopes among medium height grasses, along edges of streamside forests, alpine areas & aspen forests; 7,900-9,500 ft; Boulder & El Paso counties.
Narrowleaf peatmoss	*Sphagnum angustifolium*		**HAB, ODR**	From strongly acidic fens with high iron and other ions. Records from South Platte Ranger District and near Twin Lakes.
Northern blackberry	*Rubus arcticus* ssp. *acaulis*		**ODR**	Wetlands in willow carrs and mossy streamsides; 8,600-9,700 ft; Clear Creek and Park counties.
Park milkvetch	*Astragalus leptaleus*		**ODR**	Moist swales and meadows; South Park to the Wet Mountain Valley; 7,500-10,000 ft; Park, Fremont, and Custer counties.
Porter feathergrass	*Ptilagrostis porteri*		**HAB, ODR**	Hummocks in fens and willow carrs; 9,200 - 12,000 ft; El Paso, Lake, Park, and Summit counties.
Rock-loving neoparrya	*Neoparrya lithophila*		**ODR**	Pinyon-juniper woodlands, rocky places, montane grasslands and openings, and sometimes on Dry Union formation; 7,000 - 10,000 ft; Chaffee, Conejos, Fremont, Huerfano, Mineral, Rio Grande, and Saguache counties.
Rocky Mountain cinquefoil	*Potentilla rupincola*		**ODR**	Subalpine or montane granitic outcrops amongst ponderosa or limber pine; 6,900 - 10,500 ft; Boulder, Clear Creek, Larimer, and Park counties.
Roundleaf sundew	*Drosera rotundifolia*		**HAB**	Amongst sphagnum on the margins of ponds, fens, and floating peat mats; 9,100-9,800 ft; Gunnison and Jackson counties; also, a new collection from "North Park".
Sageleaf willow	*Salix candida*		**HAB, ODR**	Fens and pond and stream edges in foothill/montane wetlands; 8,800-10,600 ft; Gunnison, Hinsdale, Lake, La Plata, Larimer, and Park counties.
Siberian sea thrift (pink)	*Armeria maritima* ssp. *sibirica*		**HAB**	Grassy tundra slopes, on wet, sandy, or spongy organic soils; 11,900-13,000 ft; Park & Summit counties.

Species Common Name	Species Scientific Name	Potential to Occur	Rationale for Exclusion	Habitat Description and Range in Colorado
Selkirk's violet	*Viola selkirkii*	√		Forests from montane to subalpine; 6,000 - 9,100 ft; Douglas, El Paso, and Larimer counties.
Simple bog sedge	*Kobresia simpliciuscula*		**HAB**	Alpine areas including tundra, fens, moist gravel, and glacial outwash; Park and Clear Creek counties.
Slender cottongrass	*Eriophorum gracile*		**ODR, HAB**	Montane and subalpine wetlands, wet meadows and pond edges; 8,100-12,000 ft; Jackson, Las Animas, and Park counties.
Smith whitlow-grass	*Draba smithii*		**ODR**	Upper montane, subalpine and alpine, 8,000-11,000 ft; Custer, Las Animas, Mineral, and Saguache counties.
Smooth northern-rockcress	*Braya glabella*		**HAB, ELE**	Sparsely vegetated slopes above timberline, especially on calcareous substrates; 12,000-13,000 ft; Chaffee, Gunnison, Park, and Pitkin counties.
Tundra buttercup	*Ranunculus karelinii*		**ELE, HAB**	Alpine slopes and summits amongst rocks and scree; 12,000-14,100 ft; central Colorado, including Chaffee, Clear Creek, Gunnison, Lake, Park, & Summit counties.
Weber's monkeyflower	*Mimulus gemmiparus*		**ODR**	Granitic seeps, slopes, and alluvium in open sites within spruce-fir and aspen forests; 8,500-10,500 ft; Grand, Jefferson, Larimer, and Park counties.
White adder's-mouth orchid	*Malaxis brachypoda*		**ODR**	Riparian areas, amongst mosses; 7,200 - 8,000 ft; El Paso & Jefferson counties.

[1]**Status Codes**: **E**=federally listed endangered; **T**=federally listed threatened; **C**= federally proposed/candidate for listing; and **S**=Forest Service sensitive

[2]**Exclusion Rationale Codes**: **ODR**=outside known distributional range of the species and/or no element occurrence of the species in the analysis area; **HAB**= no habitat present in analysis area; **ELE**= outside of elevational range of species

Degener's beardtongue (Penstemon degeneri)

Degener's beardtongue is a perennial herb in the figwort family (Scrophulariaceae), flowering in June and July, and fruiting in late July. It is found in pinyon-juniper woodlands, montane grasslands and mountain meadows, on rocky soils with igneous bedrock (Spackman et al. 1997) at elevations ranging from 6,000-9,500 feet. Degener's beardtongue is often associated with Parry's oatgrass (*Danthonia parryi*), prairie sagewort (*Artemisia frigida*), mountain goldenbanner (*Thermopsis montana*), and mountain muhly (*Muhlenbergia montana*). Degener's beardtongue is endemic to central Colorado where it is found in Fremont, Chaffee, and Custer counties. Degener's beardtongue is ranked G2 by NatureServe (2007) and S2 (critically imperiled) by CNHP due to its limited distribution. Documented sites for Degener's beardtongue are within the Wet Mountains (McNab et al. 2005), and perhaps the largest known population is located across Locke Park within the analysis area. Threats to Degener's beardtongue include unregulated motorized recreation, invasive species, road maintenance, and succession. It may need fire to maintain open site conditions. This species' seeds may be long-lived in the seedbank (Beatty et al. 2004).

Lesser yellow lady's-slipper (Cypripedium parviflorum)

Lesser yellow lady's-slipper is a perennial herb of the orchid family (Orchidaceae) that inhabits subalpine wetlands (wetland indicator status for the species is rated as FACW by USDA Natural Resources Conservation Service) as well as a wide variety of habitats in the lower montane zone, including aspen groves and moist ponderosa pine/Douglas-fir forests. It flowers from May to July and fruits from June to August. The species is widespread in North America, growing in Alaska and Canada as well as most of the northern and eastern states. It reaches its southern Rocky Mountain distribution in Colorado. Although widespread, it is uncommon in most of its range; and populations are widely scattered in Colorado where the species is known from ten counties at a narrow elevation range of 7,400-8,500 feet. Lesser yellow lady's-slipper is ranked G5 by NatureServe (2007). It is tracked by CNHP and is ranked S2. Sites for lesser yellow lady's-slipper are within the Sangre de Cristo Range and Wet Mountains (McNab et al. 2005). It is listed in the CITES Appendix II list, restricting international trade. Threats include overcollecting, livestock grazing, timber harvest operations, fire suppression, unregulated recreation, invasive species, and habitat conversion. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. There are no documented occurrences of lesser yellow lady's-slipper in the analysis area; however, suitable habitat for this species is present.

Selkirk's violet (Viola selkirkii)

Selkirk's violet is a perennial herb in the violet family (Violaceae) that grows in aspen forests, moist woods, and thickets. Selkirk's violet ranges from British Columbia to Greenland and south to Washington and New Mexico. In Colorado, it is found at elevations ranging from 8,500-9,100 feet and flowers during May-June. In Colorado, it is known from only three areas: Rocky Mountain National Park, where it was last seen in 1965; the Rampart Range, where it was rediscovered in 2005; and on the PSICC, where it was discovered in the Wet Mountains in 2006. Selkirk's violet is ranked as G5 by NatureServe (2006). It is tracked by CNHP and is ranked S1 due to the limited number of occurrences. Selkirk's violet (*Viola selkirkii*) has recently been identified in the Newlin Creek watershed just below the analysis area boundary. This occurrence has not yet been recorded into the CNHP database. The Colorado populations are disjunctive from the greater range of the species. The nearest other populations are in the Black Hills of South Dakota.

3.10.2 Environmental Consequences

3.10.2(a) Direct and Indirect Effects

Alternative A – No Action

Alternative A would have moderate long-term direct and indirect adverse effects on grassland communities. These effects would include continuation of natural processes such as succession, insect and disease epidemics, and naturally ignited wildfire. The health of grasslands in the analysis area may be adversely affected and continue to decline due to the practice of fire suppression, encroachment by forest species into grasslands, and the invasion of these grasslands by exotic grasses and noxious weed species. Fire behavior in grasslands would occur as low to moderate intensity surface fire.

Alternative A would result in moderate long-term adverse effects to shrublands in the analysis area. Specifically, there may be a continuation of the decline in overall forest health, including

shrubland communities. The growth and recruitment of native shrub species and the overall diversity of native shrubs may decrease over time with No Action. Fire behavior in shrublands would occur as low to moderate intensity surface fire.

Alternative A would result in moderate long-term adverse effects to aspen forest in the project analysis area. In many areas, conifer encroachment would continue and aspen may experience decline and mortality due to pathogens and insects; in other areas, aspen could regenerate if new openings are created by MPB mortality.

Alternative A would result in a continuation of the decline in forest health, including Douglas-fir forest. Dwarf mistletoe in Douglas-fir would expand. Mortality from spruce budworm would increase the amount of dead fuel buildup. Under Alternative A, fire behavior in Douglas-fir stands would vary between low to moderate intensity surface fires where more open stands exist, to high intensity high severity crown fires where high fuel loading and denser stands exist. As discussed in Section 3.11, in the absence of large-scale fire, white fir and other thin-barked, fire intolerant species would continue to expand into ponderosa pine stands. Overall, the effects of Alternative A on Douglas-fir forest would be moderate, long term, and adverse.

Alternative A would result in the continuing decline in forest health, including limber pine, pinyon-juniper, and ponderosa pine forest types. MPB mortality could result in a loss of ponderosa pine habitat and increase the amount of dead fuel buildup. Development of a ponderosa pine seedling and sapling understory would continue. Dwarf mistletoe in ponderosa pine would expand. Under Alternative A, fire behavior in ponderosa pine stands would vary between low to moderate intensity surface fires where more open stands exist, to high intensity high severity crown fires where high fuel loading and denser stands exist.

In the short term, Alternative A would have no effect on the rate of spread or establishment of noxious weed species. Noxious weeds would continue to establish as weed seeds may be carried along NFS roads (such as FDR 274) through the analysis area, by recreational vehicles, ATVs, and horses. Camping in the area may also be a source of new weed seeds.

There would be no direct effects to wetland resources as a result of Alternative A. Effects to wetland resources as a result of Alternative A are discussed under the Cumulative Effects section below.

Special Status Species

Under Alternative A, there would be no direct effects to any RFSS plant species. However, indirect and cumulative effects are likely. Cumulative effects are discussed in Section 3.10.2(b).

Under Alternative A, populations of Degener's beardtongue would experience long-term minor to moderate adverse effects. Adverse effects would be the result of continued encroachment by shrubs, conifer trees, and potentially weedy species, such as annual grasses. Continued encroachment would increase competition for nutrients, water, light, and other necessary resources utilized by Degener's beardtongue. Additionally, Alternative A may result in a long-term change in fire regime resulting in stand-replacement fires that could be lethal to individuals and populations of Degener's beardtongue.

Under Alternative A, populations of lesser yellow lady's-slipper and Selkirk's violet would experience long-term minor to moderate adverse effects. Adverse effects would be the result of loss of suitable habitat as a result of declining forest health, aspen mortality, and/or pathogens

and insect epidemics. Indirectly, Alternative A would result in additional down and dead material on the forest floor and ultimately, better interception of precipitation by keeping soils from direct exposure to raindrops and snowmelt in the short term. On the contrary, under Alternative A, populations of lesser yellow lady's-slipper and Selkrik's violet would also experience long-term minor to moderate adverse effects. Adverse effects would be the result of tree and shrub encroachment into suitable habitat areas, including aspen groves; declining aspen health; and continued fire suppression. As conifers or shrubs encroach into suitable habitat areas, the resulting understory structure and composition would not provide enough light for the lesser yellow lady's slipper or Selkirk's violet.

Alternative B – Proposed Action

This Alternative features 374 acres of meadow enhancement, and 92 acres of prescribed fire in grassland communities. Meadow enhancement treatment would typically involve mechanical removal of encroaching conifer species from a meadow's edge and interior, then scattering and burning or piling and burning the resultant slash. The use of prescribed fire in the grasslands is also being proposed as a means to enhance regeneration and vigor of native species.

Alternative B would result in minor short-term adverse effects in grasslands, including the direct effect of vegetation removal for temporary road rehabilitation for access to treatment areas. In addition to the removal of vegetation, there would also be trampling of some amount of vegetation by heavy machinery and work crews. With this temporary disturbance, there is a probable outcome of noxious weed invasion in newly cleared and disturbed areas. Overall, however, Alternative B would result in moderate long-term beneficial effects to grasslands. The use of prescribed fire would help stimulate growth and competitive vigor in the native vegetation of the analysis area. This would reduce the number of noxious weeds and nonnative species in this cover type, and increase the quality of forage for wildlife in the analysis area.

Alternative B would involve 51 acres of prescribed fire use in the shrubland cover type of the analysis area. The preparation and operation of the prescribed fire treatment may result in minor short-term adverse effects to shrublands. These effects would include trampling of shrubs by field crews and heavy machinery. Overall, Alternative B would result in moderate long-term beneficial effects to shrublands in the Locke Mountain analysis area. Prescribed fire would burn off the above ground live material and stimulate root growth. Prescribed fire would ultimately improve the growth and competitive vigor of the native shrubland species, and improve the forage value of shrubs for analysis area wildlife.

Under Alternative B, aspen forest would receive four separate treatments, including 196 acres of fuelwood harvest, 54 acres of meadow enhancement in the stands, 467 acres of mechanical thinning, and 7 acres of prescribed fire. Meadow enhancement would be accomplished as described under the grasslands Alternative B description (mechanical removal followed by prescribed fire). The processes of fuelwood harvest, meadow enhancement, mechanical thinning, and prescribed fire would result in minor short-term, primarily indirect adverse effects due to field crews and machinery maneuvering to implement treatments. Soil compaction may occur, which would increase run-off in the treatment area and would ultimately result in indirect impacts to plants and water infiltration. Other impact examples include the accidental trampling of native shrubs while positioning machinery in a forest stand for fuelwood harvest. Overall, Alternative B would result in long-term moderate beneficial effects due to the reduction of conifer encroachment into aspen stands, vigorous sprouting of aspen following prescribed fire, the creation of different age classes in the stands, and enhancement of wildlife habitat.

Under Alternative B, Douglas-fir forest would receive three separate treatments, including 628 acres of fuelwood harvest, 29 acres of meadow enhancement in the stands, and 223 acres of mechanical thinning. The effects of fuelwood harvest, meadow enhancement, and mechanical thinning would likely result in minor short-term, direct and indirect adverse effects on Douglas-fir forests. These adverse effects would be the result of work crews and heavy machinery accidentally trampling or otherwise disturbing vegetation in the vicinity of the treatment as they are maneuvering to perform the treatment operation. These losses would be countered with the overall moderate long-term beneficial effects of Alternative B. These beneficial effects would include reduction in diseased trees, reduction in ladder fuels and heavy fuel loads that could lead to crown fires, and enhancement of wildlife habitat.

Under Alternative B, limber pine forest would receive 102 acres of mechanical enhancement treatment.

Under Alternative B, pinyon-juniper forest would receive two separate treatments, including 3 acres of mechanical thinning and 12 acres of prescribed fire. Prescribed fire would be used to create openings within the pinyon pine and juniper stands to improve habitat for wildlife, such as bighorn sheep. The desired result would be a mosaic pattern in the overstory of pinyon-juniper stands.

Under Alternative B, ponderosa pine forest would receive three separate treatments, including 478 acres of fuelwood harvest, 122 acres of mechanical thinning, and 37 acres of prescribed fire. Prescribed fire would be used to maintain stands of ponderosa pine in their current condition, while reducing hazardous fuel accumulations and returning fire to the ecosystem. The desired result would be a mosaic where a targeted percentage of the understory (duff, needles, grass, and small trees) vegetation is burned.

Both of the action alternatives would require mechanical treatments and prescribed fire. The practices of yarding, skidding, and temporary road construction would disturb soils and existing vegetation, and would create disturbances susceptible to noxious weed invasion. The treatment areas would be monitored, and any new infestations found would be treated according to the PSICC Invasive Species Action Plan.

Alternative B would enhance wetland resources in the analysis area and would result in indirect, long-term, and beneficial effects. These effects would include the enhancement of riparian shrub complexes and meadows adjacent to the riparian wetland areas. The use of prescribed fire and mechanical treatments in shrublands and grasslands would stimulate growth and competitive vigor in the native species. This should reduce the number of noxious weeds and nonnative grasses, as well as reduce conifer encroachment in these cover types. The quality of forage for wildlife in the analysis area wetlands and adjacent landscapes would subsequently increase.

Special Status Species

Overall, Alternative B would result in beneficial effects to the RFSS species known or with potential to occur in the analysis area by ensuring suitable grassland or other forest habitat conditions. In grasslands, prescribed fire would benefit sensitive plant populations by releasing nutrients and by restoring or maintaining open canopy conditions. Project Design Criteria (Section 2.4.2) would minimize effects as a result of trampling, pile burning, or other direct disturbance such as the operation of machinery and equipment. However, some individual

plants may be adversely affected by heat or flames during prescribed fire activities. Recovery from such effects would vary by individual; however, some mortality is expected.

Alternative B would have effects on Degener's beardtongue comparable to those expected in grass-and shrubland populations throughout the analysis area. Specifically, the use of meadow enhancement and prescribed fire activities in suitable Degener's beardtongue habitat would result in short-term moderate adverse effects to populations of this species. These effects may include accidental crushing of the plant by machinery or project personnel, or it may involve lethal fire effects to some individuals. Overall, however, the use of mechanical treatments to remove encroaching shrubs and small trees and the use of prescribed fire are expected to stimulate improved health and vigor in these populations, thereby resulting in long-term minor to moderate beneficial effects.

Alternative B would have long-term indirect beneficial effects to lesser yellow lady's-slipper. These beneficial effects would be realized through habitat enhancement. Specifically, efforts to treat encroaching conifers in aspen stands, and the use of mechanical treatment and prescribed fire in ponderosa and Douglas-fir stands would increase the health and vigor of these forest types, enhancing the suitable habitat for lesser yellow lady's-slipper.

Similar to the lesser yellow ladies'-slipper, Alternative B would have long-term indirect beneficial effects to Selkirk's violet. The use of fuelwood harvest, mechanical thinning, and prescribed fire would all result in long-term beneficial effects to suitable habitat for the Selkirk's violet.

Alternative C

The treatments proposed under Alternative C are identical to those of Alternative B, only varying in terms of acreage of the treatments (due to site constraints) and the use of only a single treatment type. Effects to vegetation, including special status species, as a result of Alternative C would be similar to those described for Alternative B, with the following exceptions:

Direct disturbance (i.e, trampling or crushing by vehicles, machinery, or project personnel) would be slightly less under Alternative C because of the use of only one treatment type per unit and the need to enter or access each treatment unit only once. Alternative C would result in less direct mortality and, subsequently, less opportunity for noxious weed invasion in disturbed areas. Conversely, Alternative C would also result in less beneficial effects to some species that are fire or disturbance dependent because of the use of only one treatment type.

The effects to wetland resources under Alternative C would be very similar to those described under Alternative B.

Determinations of Effect – Alternatives B and C

The environmental consequences to special status plant species in the analysis area are anticipated to be minor overall. The only special status species with documented occurrence in the analysis area is Degener's beardtongue. Lesser yellow ladies'-slipper and Selkirk's violet are thought to have suitable habitat in the project analysis area. Degener's beardtongue may increase its distribution under certain treatment options, such as prescribed fire. Alternative A (No Action) would have adverse effects on the species due to the lack of any change in future management protocol, whereas Alternatives B and C may actually increase the species' suitable habitat.

A determination of **may adversely impact individuals, but not likely to result in a loss of viability in the analysis area, nor cause a trend toward federal listing** for *Cypripedium parviflorum*, *Penstemon degeneri* and *Viola selkirkii* is based on the following rationale (Table 3-30):

- A relatively large population of *Penstemon degeneri* has been verified in the Locke Mountain analysis area.
- Occurrences of *Cypripedium parviflorum* and *Viola selkirkii* could have been overlooked during surveys, leading to direct or indirect effects to the species; however, these effects would be localized and would not be of sufficient intensity or scale to cause a significant effect to any of the species.

Table 3-30. Determinations of Effect for Sensitive Plant Species.

Species Scientific Name	Species Common Name	Status Code	Alternative A	Alternative B	Alternative C
Cypripedium parviflorum	Lesser yellow lady's-slipper	S	MAII	MAII	MAII
Penstemon degeneri	Degener beardtongue	S	MAII	MAII	MAII
Viola selkirkii	Selkirk's violet	S	MAII	MAII	MAII

STATUS CODES: S=FS sensitive

STATUS CODES: MAII=may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend toward federal listing.

3.10.2(b) Cumulative Effects

Alternative A – No Action

When combined with a stand-replacing fire, the indirect effects of nonaction (primarily hazardous fuel accumulation) would result in moderate adverse cumulative effects to sensitive plant species and suitable habitat. A high-intensity wildfire would result in direct mortality of some individuals and would potentially destroy or diminish the seed stock for these species. Other necessary habitat elements, such as stable soils or shading, would also likely be damaged or destroyed, further contributing to reestablishment difficulties.

When combined with the potential effects of insect or disease epidemics, stand-replacing wildfire, and/or reasonably foreseeable grazing activities in the meadow and grassland areas (areas with known occurrences or suitable habitat for Degener's beardtongue), the indirect effects of nonaction, including continued conifer encroachment into grassland and meadows and hazardous fuel accumulation, would result in moderate long-term adverse cumulative effects to the species and its habitat, locally. Cumulative effects may include the loss of suitable habitat due to stand-replacing fire or conifer encroachment, and the loss of individual plants due to trampling by livestock.

The advancement of forest epidemics or blights, such as MPB, spruce budworm, and dwarf mistletoe, would further contribute to the decline in forest health and vigor, particularly in ponderosa pine and Douglas-fir cover types. Cumulatively, this would result in minor to moderate adverse effects to suitable lesser yellow lady's slipper habitat.

The combination of heavy fuel loads, declining forest health, and a stand-replacing fire would result in moderate cumulative effects to wetland resources in the analysis area. Under these circumstances, a high-intensity fire event could result in increased runoff and sedimentation into

wetland areas. Wetlands and riparian areas may also be directly affected by high-intensity fire. High-intensity wildfire may result in the lethal effects to willows, riparian gallery forest, and even some herbaceous wetland species such as sedge stands. Furthermore, minor to moderate cumulative adverse effects would be expected in the long term if high-intensity or stand-replacing wildfire occurred in the analysis area resulting in increased erosion, runoff and/or sedimentation into suitable riparian habitat areas.

Alternative B - Proposed Action

Overall, Alternative B would result in no cumulative effects to sensitive plant populations or habitat in the analysis area. Although Alternative B would result in beneficial indirect effects to sensitive plant populations, including the removal of encroaching conifers and the reintroduction of fire to the landscape, the potentially detrimental effects of reasonably foreseeable future activities such as recreational use and grazing, would ultimately negate these benefits by increasing the susceptibility to noxious weed invasion or trampling. As such, it is likely that Alternative B would result in no measurable cumulative effects or changes in these populations.

Alternative C

The cumulative effects of Alternative C would be the same as described for Alternative B.

3.11 WILDLAND FIRE AND HAZARDOUS FUELS

3.11.1 Affected Environment

Fire Ecology of Dominant Vegetation Types

The dominant timber vegetation types in the analysis area are (in order of dominance) Douglas-fir (36%), ponderosa pine (18%), and aspen (17%). Other timber cover types present include spruce/fir (percent cover negligible), limber pine (4%) and pinyon-juniper woodland (2%). Open grass- and shrublands comprise the remainder of the analysis area (23%). Scattered, small inclusions of limber pine, shrubs, rock, and bare ground exist throughout the analysis area. Each of these cover types is shown in Map 5.

Ponderosa pine is found in the lower elevations of the analysis area, often as pure stands or with other conifers. Ponderosa pine stands are located primarily on southern aspects in the analysis area. Trees greater than 9-inch dbh characterize most stands, but there is a consistent understory invasion of white fir less than 6-inch dbh present as well.

Ponderosa pine is better adapted to survive surface fires than other conifers in its range, particularly when it occurs in widely spaced stands, which was probably more common before the fire suppression era. These fires were low intensity ground fires that helped to “clean up” the forest by reducing understory shrubs, shade-tolerant trees, and dead fuel accumulations. Ponderosa pine evolved under a regime of frequent fires, mostly of low severity, but it is likely that more infrequent, mixed severity fires occurred in this area as well. This type of fire behavior thinned small trees, especially less fire tolerant species such as firs, and maintained these forests in a more open structure. Removal of fire from ponderosa pine stands has allowed encroachment of white fir, Douglas-fir, and other fire intolerant conifers into areas historically dominated by ponderosa pine. Over time, these stands have become denser and understory fuels have accumulated along with small trees that create ladder fuels. Now when wildfires burn in these dense stands under dry conditions, the abundant fuel quickly allows the development of intense fire behavior, including torching and spotting; and with increasing wind speeds, the

potential exists for passive crown fires or even active crown fires where canopy fuels are dense enough to support it.

Douglas-fir becomes dominant at higher elevations throughout the analysis area. Douglas-fir is typically found on cool moist sites such as north-facing slopes. However, it can be found intermixed with ponderosa pine and limber pine on drier sites.

In the pole and sapling stages, Douglas-fir is susceptible to fire damage as the bark is thin and resin-filled. Trees develop fire-resistant bark in approximately 40 years on moist sites. Mature trees can survive moderately severe surface fires because the lower bole is covered by thick, corky bark that insulates the cambium from heat damage. However, low limbs and regeneration create ladder fuels that make passive and active crown fire possible (FEIS 1998).

Mature Douglas-fir is generally less fire resistant than ponderosa pine. During pre-settlement times, frequent fire often maintained ponderosa pine rather than Douglas-fir on drier sites, as Douglas-fir did not reach fire resistant size before the next fire event. On moist sites, Douglas-fir growth is rapid enough that some reach fire-resistant size before the next fire event, allowing open stands to develop. In some grasslands and savannahs, fire has restricted Douglas-fir to rocky microsites with sparse herbaceous fuels. Fire suppression has allowed Douglas-fir to spread from these fire-safe sites and form extensive pole-sized stands in mountain grasslands (FEIS 1998).

In the higher elevation area of the central part of the project, aspen is dominant or intermixed with ponderosa pine and Douglas-fir. Aspen stands vary in their size and density in the analysis area, but decline in aspen stand vigor has occurred because of conifer invasion. Aspen benefit from disturbance, such as fire, which removes competing conifers and triggers sprouting in burned aspen. Fire suppression has likely caused a reduction in the size and health of aspen stands compared to pre-suppression era conditions. Canopy gaps created or maintained by fires have been allowed to mature, excluding aspen and decreasing its presence in the analysis area.

Aspen stands do not readily burn, especially when they are young and healthy. Slow burning, low severity surface fires are typical. Decadent aspen stands contain more conifers and are more likely to burn than younger stands. An understory of conifer species increases the flammability of aspen stands. Many of the aspen stands in the analysis area are more typical of this situation, with invading conifers, and are likely outside their historic range of variability.

Engelmann spruce is very fire sensitive and is generally killed even by low-intensity fires (Uchytil 1991). Postfire reestablishment is via wind-dispersed seeds which readily germinate on fire-prepared seedbeds (Uchytil 1991). Engelmann spruce-subalpine fir forests usually develop in cool, moist locations and experience fire-free intervals averaging 150 years or more (Arno 1980).

The lower elevations in the western portion of the analysis area consist primarily of pinyon pine-juniper woodland and shrubland areas, mostly comprised of Gambel's oak and mountain mahogany. Large grassy meadows interspersed with shrub and conifer species are scattered throughout the analysis area; the largest area of grass cover is in Locke Park on the north end of the analysis area.

Fire opens pinyon-juniper stands, increases diversity and productivity in understory species, and creates a mosaic of stands of different sizes and ages across the landscape. In addition, fire maintains the boundaries between woodlands and adjacent shrub- or grasslands.

Rocky Mountain juniper grows alone or in combination with Pinyon pine. It typically grows on dry sites with little understory vegetation. Due to its thin bark and compact crown, trees up to 3-4 feet (0.9-1.2 m) tall are easily killed by fire. Since the species grows slowly, trees are especially susceptible to fire for their first 20 years approximately. As trees mature, they develop thicker bark and a more open crown, allowing them to survive surface fires if the low, spreading branches do not carry fire to the crown. A severe fire, however, may damage or kill such trees. High volatile oil content, especially in the lower branches, also makes the trees more flammable (FEIS 1998).

Mature Colorado pinyon trees are short with open crowns, but they 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. Stand structure also affects fire susceptibility; 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 pinyon survives fire because it is seldom exposed to lethal heat (FEIS 1998).

Gambel oak occurs as clones of shrubs in dense patches 3-20 feet (0.91-6.1 m) tall, often with a central thicket rising above the others (Simonin 2000). Variability in form corresponds with relative levels of water stress; stunted shrubs are present on xeric sites, with moderate-sized trees found in wetter locations. Gambel oak is a fire-adapted species. It responds to fire by vegetative sprouting from the lignotuber and rhizomes. Tree forms may survive low-severity fire. Fire usually stimulates sprouting of Gambel oak after top-kill, increasing density of previously open stands and merging scattered stands into continuous thickets (Simonin 2000).

Curlleaf mountain-mahogany has thick bark and may survive "light" fires. Sprouts following fire are rare and short lived. Most often curlleaf mountain-mahogany is killed by fire, and regeneration is by seedling establishment (FEIS 1998).

Fire Regime Condition Class

Fires are characterized by their intensity, the frequency with which they occur, the season in which they occur, their spatial pattern or extent, and their type. Combined, these attributes describe the fire regime. Fire regimes for vegetation in the analysis area have been altered from historic conditions due to past and current fire suppression policies, grazing, and logging activities; the overall effect has been the creation of denser forest stands that may be more susceptible to mixed and high severity fires. Historic fire regimes for the primary cover types in the analysis area are shown in Table 3-31.

Table 3-31. Typical Fire Regimes for Vegetation Types in the Analysis Area.

Vegetation	Current FRCC	Historical Frequency & Severity
Grass and Shrublands	I,II	High frequency (0-35 year) & low to mixed severity
Ponderosa Pine	I,II	High frequency (0-35 year) & low to mixed severity
Aspen	I	High frequency (0-35 year) & low to mixed severity
Pinyon Pine-Juniper Woodland	II,III	High frequency (0-35 year) & stand replacement
Limber Pine	II,III	Low frequency (35-200 year) & mixed severity
Mixed Conifer, including Douglas-fir	III	Low frequency (35-200 year) & mixed severity

Source: Hann et al. 2008

In addition to the increased density present in forest and shrublands throughout the western U.S, there is also greater forest homogeneity and greater fuel continuities than in the past. The Locke Mountain analysis area, specifically, has increased surface fuel loads, increased ladder fuels, and denser stands of small diameter tree species. The result is decreased diversity, altered nutrient cycling processes, and a much greater potential for resource-damaging disturbance events, such as insect and disease epidemics and/or large, stand-replacing fires.

Several small fires have occurred in the analysis area in the recent past. The Locke Mountain fire in May 2002 burned approximately 16 acres, mostly in ponderosa pine stands with smaller amounts of Douglas-fir and junipers. Burn intensity was variable with low intensity fire, a mosaic of moderate intensity fire surface and crown fire, and high intensity crown fire where the winds and slope aligned. Crown fire mostly occurred on slopes with dense canopy stands. Other small fires have occurred in the immediate vicinity; all were approximately within ¼ to 10 acres in size.

The FRCC is an expression of the departure of the current vegetative condition from the historical fire regime. It is used as a proxy for determining the probability of severe fire effects, such as the loss of key ecosystem components (soil, vegetation structure, species) or alteration of key ecosystem processes (nutrient cycles, hydrologic regimes). Subsequently, the FRCC is an index of hazards to the status of many components (e.g., water quality, fish status, wildlife habitats, etc.).

As used here, the potential of ecosystem effects reflects the probability that key ecosystem components may be lost if a fire were to occur within the study area. It should be noted that key ecosystem components can be represented by virtually any attribute of an ecosystem (for example, soil productivity, water quality, floral and faunal species, large-diameter trees, snags, etc.) (Hann et al. 2008). FRCC is used to qualitatively rank the potential of fire effects on key ecosystem components; FRCC category definitions are presented in Section 1.2.4.

More than 90 years of research show that four factors working in concert can result in the type of catastrophic wildfires witnessed in 2000 and 2002: weather, an abundance of fuel, lack of moisture, and terrain characteristics. Of these four factors, only fuel abundance can be directly influenced through human intervention; treatments to reduce fuels can significantly modify fire behavior and severity and reduce environmental damage caused by fire (FEIS 1998). Protecting large landscapes requires land managers to develop large scale fuels treatment patterns that reduce the potential for catastrophic fire and promote healthy forests (FEIS 1998).

3.11.2 Environmental Consequences

3.11.2(a) Direct and Indirect Effects

Alternative A – No Action

Alternative A would not immediately alter the distribution of cover types, composition or structure, or reduce accumulated fuels both on the surface and in the canopy layer. Natural processes, such as succession, insect and disease outbreak, and other disturbance would continue. Ultimately, Alternative A would result in an areawide trend to FRCC 2 and 3.

In the absence of large scale fire, white fir and other thin-barked, fire intolerant species would continue to expand into ponderosa pine stands, expanding the stand's current extent and dominance.

Continued attempts at fire exclusion would encourage an increase in white fir density, at the same time contributing to stand density. This increase in both horizontal and vertical fuel arrangement would increase the chance for high-intensity, stand-replacing crown fires.

Continued fire exclusion, coupled with drought conditions, would result in major increases in surface fuel loads. Continued regeneration of shade tolerant, nonfire adapted species (like Douglas-fir) would promote ladder fuels with continuous vertical fuel arrangement, thus increasing active fire potential.

Aspen would continue to decline as conifers encroach into aspen stands. Competition from conifers would reduce the available nutrients and water on a given site. Aspens are in decline rangewide; the absence of fire or other forest treatment would exacerbate decline locally. Stand damage could also occur from a change in fire behavior; although pure aspen stands are quite resistant to fire, the introduction of small conifers would create more intense fire behavior that would easily damage the thin-barked aspen trees.

Without fire or other proposed fuels treatments, encroachment of conifers (such as pinyon pine, juniper, and other woody species) would continue into meadows and natural openings. As encroachment continues, fire behavior in the event of a wildland fire would be more severe, thus reducing any potential they might offer as natural firebreaks and control features or safety zones for firefighters.

Alternative A provides little incentive for cooperative fire safety programs with private landowners, as elimination or deferment of proposed treatments can discourage landowners from fire safety practices on their own properties.

Overall, Alternative A would result in no short-term effects. However, the long-term effects of fire suppression and fuel accumulation would result in major adverse effects in the event of a wildland fire. The ecosystems would continue to further depart from historic fire regimes. The characteristics of those ecosystems would change, typically in a negative direction, losing key species that are dependent on fire and being replaced with generalist and nonnative species that are more adept at colonizing these areas. Extreme fire behavior would increase as fuel loads continue to accumulate. Low intensity surface fires would be replaced by higher intensity, passive, and active crown fires. This, in turn, would affect the soil and the ability to support stand regeneration.

Alternative A would not result in beneficial changes from the current conditions. It would not meet the intent of current management practices and is in direct conflict with forestwide efforts to reduce wildfire hazard. It would result in increased fire hazard and diminished firefighter safety as vegetation becomes more dense; trees and shrubs continue to decline in vigor; mortality from insects and disease continues to increase; and standing, dead, and down fuels accumulate.

Alternative B – Proposed Action

Under Alternative B, treatments would focus on the restoration of historical vegetation patterns. Ultimately, Alternative B would result in an areawide trend towards FRCCs 1 and 2. Prescribed fire is one of the most effective ways to move ecological processes and stand conditions towards more historical conditions. Prescribed fire, as proposed, would result in a mosaic

pattern throughout the vegetative cover with varied intensity. This would promote age-class and species diversity throughout the area.

A combination of mechanical and fire treatments would reduce stand density to create more open stand conditions dominated by fire tolerant species, such as ponderosa pine and Douglas-fir. White fir regeneration, a product of fire suppression, would be inhibited. Thinning and other treatments would improve stand structure and composition and improve forest health and stand diversity.

Meadows and grasslands would be enhanced by the mechanical thinning and removal of encroaching trees, including pinyon pine and juniper. The use of prescribed fire after mechanical thinning would help to remove thatch layers that have restricted sunlight from reaching the understory. It would also stimulate dormant seeds and nutrients would be returned to the site, helping to naturally fertilize the area. Low-intensity fire would also reduce the fuel loading that has accumulated on the ground in the absence of regular fire return intervals.

The desired condition achieved through Alternative B treatments would result in a lower risk of stand replacing fires. Vegetative manipulation would reduce thick white fir and promote development of a stand structure of more open canopies where grasses and forbs and early successional species, such as aspen, would occur in the understory and in created openings.

Aspen, a desired forest component, would be retained as much as possible and post-treatment conditions would favor its ability to persist. Aspen stands would be able to expand in size over time because of thinning conifers stands and removal of encroaching conifers. These aspen stands would work in conjunction with natural openings, created openings, thinned conifer stands, and other landscape features to provide a network of reduced fuels and canopy cover across the analysis area. Openings would effectively link aspen stands, natural openings, and other features into fuelbreaks.

Implementation of the proposed action would meet the desired conditions for fuel and fire behavior and allow for efficient and safe suppression of most wildland fire ignitions. Prescribed fire treatments would be conducted under a tight window of appropriate weather constraints, and would require a burn plan. Wildfires could also be controlled through initial attack in all but the most severe weather conditions. Firefighter safety would be enhanced and the cost of suppressing future fires could be lowered.

Fire behavior would be affected in those areas where mechanical treatments and prescribed fire are proposed. Under Alternative B, fire behavior in grass and brush would occur as a low to moderate intensity surface fire. The mechanical fuels treatments would assist in reducing stand density, though they may increase fuel loading in the short term until prescribed fire operations have consumed residual slash and debris. A combination of mechanical thinning and prescribed fire treatments would assist in reducing fire intensity and severity in the treated stands.

Alternative B would provide incentive for cooperative fire safety programs with private landowners.

The proposed action would result in beneficial effects on fuel conditions and fire behavior. Implementation of the proposed action would have the greatest effect in decreasing the risk of large, high intensity fires, and changing stand conditions to that of greater health and resiliency.

Alternative C

Alternative C would result in effects similar to those described for Alternative B, with the following exceptions:

The primary difference in effects is that Alternative C would not reintroduce fire to the entire landscape. Some vegetation would never return to historical conditions without fire disturbance. It is impossible to achieve the many effects of burning through mechanical methods only. Mechanical thinning would remove overstory trees but would not reduce the surface fuel loads. In some cases, fuel loading may actually increase as a result of mechanical thinning (i.e., slash) and may be difficult to dispose of by any methods other than fire.

Grasslands need fire to reduce thatch buildup and to stimulate new growth. This can only be accomplished with regular fire return intervals.

Alternative C would provide some incentive for cooperative fire safety programs with private landowners.

3.11.2(b) Cumulative Effects

Alternative A – No Action

The indirect effects of nonaction, primarily hazardous fuel accumulation, when combined with the effects of historic fire suppression, future insect or disease epidemics, and/or future wildfire events would result in a moderate contribution to overall fire hazard, declining forest health, and departure from historic conditions. The intensity of these cumulative effects (i.e, minor, moderate, etc.) would increase as the fire return interval increases.

In the event of a future wildfire, the lack of historic or frequent fire activity in most stands throughout the analysis area, combined with the increased fuel load and understory development under Alternative A would cumulatively result in damaging crown fires, dangerous and erratic fire behavior, and high-severity burning or even lethal impacts.

When combined with past, present, and reasonably foreseeable future actions, Alternative A would perpetuate the FRCC trend towards Condition Classes 2 and 3. These effects would, at the very least, conflict with the goals and objectives of CWPP or other Forest Service fuels reduction projects, and may ultimately diminish the effectiveness of such projects on adjacent or nearby lands, including private lands.

Alternative B – Proposed Action

Cumulatively, the effects of Alternative B and other fuels projects would move large and potentially contiguous areas toward more favorable historic conditions and Condition Class 1.

Alternative B, when combined with CWPP or other Forest Service fuels reduction and forest health projects, would result in a minor contribution to overall effectiveness of these treatments.

Alternative C

The cumulative effects of Alternative C would be similar to those described for Alternative B, but slightly less beneficial due to lower use of prescribed fire in Alternative C.

3.12 ECONOMIC ANALYSIS

Net implementation costs associated with the action alternatives include timber harvest and stewardship contracts, road construction and rehabilitation, prescribed fire activities, and pre-treatment resource surveys.

Each of the alternatives would affect nonpriced values that are not quantified in the analysis shown in Table 3-32. Nonpriced values include forest health, scenic character, wildlife habitat, recreation opportunities, and benefits of fuel reduction. Given the importance of recreation and tourism to local and state economies and increasing development in the WUI, nonpriced values may, in some cases, outweigh the costs and benefits of priced values. A summary of the primary nonpriced values are shown in Table 3-32.

Table 3-32. Comparison of Nonprice Values

Nonpriced Value	Alternative A No Action	Alternative B Proposed Action	Alternative C
Reduce risk of large, high intensity fires and the resulting erosion that could exacerbate soil and water quality problems.	No benefit. Risk not reduced, risk would continue to increase as fuel load builds in the forest.	Risk of high intensity fires would be reduced. Threat to WUI communities would be lessened. Watershed damage and erosion would be decreased.	Risk of high intensity fires would be reduced somewhat, but not as much as Alternative B because there would be limited reintroduction of prescribed fire and short-term increase in fuel loading due to slash and treatment debris.
Provide habitats for MIS, special status species, and other wildlife.	Minimal benefits. Habitat conditions for most species would continue to degrade as beetle infestation continues to grow. Risk of high intensity wildfire would continue.	Creating more open forest conditions would improve habitat for most MIS and special status species over the long term. The risk of habitat loss from large, high intensity wildfire would decrease.	Similar to Alternative B but less habitat conversion would be created. Therefore, risk of habitat loss would be greater than Alternative B but less than Alternative A. Snags would need to be created mechanically.
Restore the forest to more sustainable, historical conditions that are more resistant to fire, insects, and disease.	No benefit. Forest conditions would not be improved. Forest would remain susceptible to fire, insects, and disease.	Forest conditions would be improved by a combination of mechanical thinning treatments and burning prescriptions.	Similar to Alternative B but less area would be treated. Limited change in fuel loading due to lack of prescribed fire. Treatment would not move towards true historic conditions.
Promote and restore aspen sustainability/viability within the analysis area (as well as the Wet Mountains on a larger scale).	No benefit. Aspen sustainability would not be improved. Aspen would remain susceptible to fire, insects, and disease and continue to decline.	Aspen sustainability would be improved by thinning, cutting, and/or burning in existing and remnant aspen stands.	Similar to Alternative B but less area would be treated. Less sprouting and regeneration without the use of prescribed fire.

The following cost analysis (Table 3-33) has incorporated the following assumptions:

- Treatments would occur in relatively small units (50 acres or less). Therefore, this estimation method does not capture the potential cost savings of economies of scale. (For example, treatments in larger units would theoretically cost less to implement.)
- Consistent with the alternative descriptions, the costs presented below assume that Alternative B would be implemented by contractor or professional timber crews and Alternative C would be implemented by USFS crews.

- The estimates for Alternative C do not capture USFS equipment rental costs or road rehabilitation costs. For the purposes of this estimate, it was assumed that if Alternative C were implemented, the USFS would likely still contract the removal and hauling of timber to a professional crew. In this case, road rehabilitation costs would be the responsibility of the hauler.
- Alternatives B and C assume that up to 40% of the total constrained areas could be treated with pre-fire hand treatments and that, because of pre-fire treatments, the prescribed fire costs for these acreages would be less than prescribed fire costs in areas that did not receive pre-treatment.

Table 3-33. Estimated Implementation Costs.

Treatment Type	Alternative B	Alternative C
Prescribed fire only	$64,250	$46,900
Mechanical thinning*	$693,600	$163,750
Mechanical enhancement*	$127,500	$22,000
Meadow enhancement	$108,200	$94,200
Harvest and public fuelwood*	$1,757,700	$446,500
Constraint area (Pre-fire hand treatments & prescribed fire)	$1,151,400	$1,332,640
TOTAL COSTS	**$3,902,650**	**$2,105,990**

*These treatments would be followed by prescribed fire under Alternative B.

3.13 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects are those environmental consequences of an action that cannot be avoided, either because modifying the action would change the nature of the project or effective mitigation through project design is not feasible. Pursuant to NEPA Sec. 102 [42 USC § 4332] (2)(C)(ii), this analysis must identify those alternative actions that would result in unavoidable adverse effects.

The adverse effects of implementing the proposed treatments (Alternatives B and C) would be minimized through the use of project Design Criteria (Section 2.4.2). However, some adverse effects cannot be avoided. For example, there may be some decrease in long-term soil productivity because of topsoil disturbance during vegetation removal and prescribed burning operations. Additionally, changing the forest structure to that with more openings would adversely affect those wildlife or plant species that depend upon a more closed structure. Visitors would also notice some disturbance to the landscape, and visible disruption would occur during treatment, including noise, dust, wood debris, and smoke.

3.14 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Pursuant to NEPA Sec. 102 [42 USC § 4332] (2)(C)(iv), this analysis must identify alternative actions that would result in trade-offs between short-term uses and long-term productivity.

For this Federal action, “short term” is defined as within the 3-5 year implementation period. Long term is defined as any time period beyond the implementation period.

It is assumed that (1) the short-term goals and objectives of the project would not conflict with the long-term operational goals and management, and (2) the long-term operational goals and management would not significantly deviate over time. The management actions detailed in this

document are intended to reverse or prevent any deterioration of the environment that is occurring under the current management conditions, or that is likely to occur as a result of continued management conditions. Therefore, this project would not result in a loss of short-term uses or long-term productivity of the natural and social environment.

Long-term productivity refers to the capability of the forest to produce and provide resources into the future. Successful implementation of project Design Criteria (Section 2.4.2) would minimize the effect on long-term productivity of the forest, including soil productivity, vegetation, water resources, recreation opportunities, scenic value, and wildlife habitats. Short-term project uses or effects on these resources would not affect overall long-term productivity. The lower risk of high intensity wildfire that would result from implementation of either action alternative would ensure long-term productivity of all forest resources in the analysis area.

3.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Pursuant to NEPA Sec. 102 [42 USC § 4332] (2)(C)(v), this analysis must identify alternative actions that would result in the irreversible and/or irretrievable commitments of resources.

Irreversible commitments are those that cannot be reversed, such as species extinction, mining ore, or logging old growth forest, which would take hundreds of years to recover. Such decisions are considered irreversible when their implementation would affect a resource such that its useful renewal could occur only over a period of time longer than the useful life of the project, at exorbitant expense, or because they would cause the resource to be destroyed or removed. Irreversible commitments of resources on Federal lands are typically attributed to major infrastructure construction projects, such as the use of Federal lands for the original construction of dams, reservoirs, or associated conveyance features.

Both of the action alternatives would result in the irreversible commitment of fossil fuel resources during construction activities. The quantification of fossil fuel resources irreversibly committed is not possible at this time. However, it is anticipated that the amount would be locally minor and globally negligible. Otherwise, there would be no irreversible commitments of resources as a result of project implementation.

Irretrievable commitments of resources result in the loss of production or use of resources as a result of a decision where the resource commitments represent a moratorium on other site-specific uses or opportunities for the useful life of the associated project. For example, if a paved highway is constructed through a forest, the timber productivity of the cleared right-of-way is lost for as long as the highway remains. The construction of the highway represents an irretrievable loss in exchange for the benefits of the highway.

Both action alternatives would cause an irretrievable commitment of the timber resources that are removed for sale or other disposal. Once treatments have occurred and wood products have been removed, those timber resources could not be retrieved. The same is true for vegetation resources that are burned in prescribed fires. However, new vegetation would eventually replace that which had been burned or otherwise removed.

Any soil lost to erosion would also be considered an irretrievable commitment of the soil resource. There would be a short-term irretrievable loss of productivity in landings, skid trails, and slash piles. Design Criteria (Section 2.4.2) would be used to minimize loss of soil

productivity. Conversion of wildlife habitats would be irretrievable because the quality of these habitats would be changed for the long-term for many species.

Although implementation of Alternative A may have adverse effects on wildlife and fish habitat, soils, hydrology, or vegetation resources, it is not expected to affect the existing conditions so severely that the resource detriment would be considered irretrievable.

3.16 COMPARISON OF ALTERNATIVE EFFECTS

Table 3-34 provides a summary of effects for each alternative. All of the effects described above are not reiterated below. Instead, Table 3-34 identifies where notable similarities and distinctions exist between the alternatives.

Table 3-34. Comparison of Alternative Effects.

Resource(s)	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Air Quality	• No direct effects to air quality. • However, cumulatively, due to the abundance of fuels in the area, future wildfire events would be likely to release increasingly large quantities of PM_{10} emissions resulting in adverse short-term effects ranging from minor to moderate.	• Adverse short-term minor effects to air quality in the immediate vicinity of the analysis area as a result of prescribed fire activities. • Adverse short-term negligible effects from road and travelway dust and exhaust emissions generated by project vehicles and machinery. • Alternative B treatments would ultimately delay, diminish, or altogether impede the air quality effects of reasonably foreseeable future stand-replacing wildland fires and the subsequent high-volume PM_{10} emissions in the analysis area, thereby preserving local air quality conditions in the long term. • Cumulatively, PM_{10} or smoke generated during treatment activities would have no measurable effect on regional air quality, including Front Range nonattainment areas.	• Adverse short-term term minor effects to air quality in the immediate vicinity of the analysis area as a result of prescribed fire activities; however, prescribed fire would be used on approximately 35% fewer acres than Alternative B. As such, smoke and/or visibility impacts under Alternative C would be noticeably less. • Adverse short-term negligible effects from road and travelway dust and exhaust emissions generated by project vehicles and machinery. • Long-term effects would be the same as described for Alternative B. • Cumulative effects would be the same as described for Alternative B.
Fish and Wildlife	• No direct effects to any species, including sensitive species, or their habitats. • Increased potential for habitat alteration or destruction in a wildland fire event due to fuel accumulation. • Effect determinations for all Federally listed species would be “may affect, not likely to adversely affect”. • Habitat conditions for most species would continue to degrade as meadows, aspen, and forest openings are lost to canopy closure and conifer encroachment. • Aspen sustainability would not be improved.	• Some adverse short-term minor to moderate effects to particular species as a result of disturbance or temporary displacement during project implementation. • Proposed treatments would advance Forest Plan goals by promoting habitat diversity, enhancing habitats necessary for sensitive species, and improving forage for big-game species. • Reduced risk of stand-replacing wildfire and reintroduction of fire to the landscape would benefit many species and their habitats. • Creating more open forest conditions would	• Adverse short-term effects as a result of project implementation would generally be less than Alternative B. • Proposed treatments would advance Forest Plan goals by promoting habitat diversity, enhancing habitats necessary for sensitive species, and improving forage for big-game species. • Reduced risk of stand-replacing wildfire and partial reintroduction of fire to the landscape would benefit some species and their habitats. • Creating more open forest conditions would

	Aspen would remain susceptible to fire, insects, and disease and continue to decline. • Increased potential for impacts to riparian and aquatic habitats in the event of a stand-replacing fire. • Alternative A would not advance Forest Plan goals and management direction identified in Table 3-4. • 0 acres of lynx Denning habitat would be converted to unsuitable habitat in the short-term due to patch cuts • 0 acres of lynx Winter habitat would be converted to unsuitable habitat in the short-term due to patch cuts • 0 acres of lynx "Other" habitat would be converted to unsuitable habitat in the short-term due to the use of prescribed fire in Douglas-fir and/or spruce-fir stands. • 0 acres of MSO Restricted Habitat would be converted to unsuitable habitat in the short-term due to patch cuts.	improve habitat for most MIS and special status species over the long term. • The risk of habitat loss from large, high intensity wildfire would decrease. • Aspen sustainability would be improved by thinning, cutting, and/or burning in existing and remnant aspen stands. • Conifer removal and prescribed fire use in meadows and shrublands would stimulate meadow and opening habitats and improve forage quality for big-game species (e.g., elk and deer). • The use of patch cuts would promote clump habitat for Abert's squirrel and would mimic natural disturbance patterns. • 46-76 acres of lynx Denning habitat would be converted to unsuitable habitat in the short-term due to patch cuts • 24-40 acres of lynx Winter habitat would be converted to unsuitable habitat in the short-term due to patch cuts • Up to 129 acres of lynx "Other" habitat would be converted to unsuitable habitat in the short-term due to the use of prescribed fire in Douglas-fir and/or spruce-fir stands. • 73-122 acres of MSO Restricted Habitat would be converted to unsuitable habitat in the short-term due to patch cuts.	improve habitat for most MIS and special status species over the long term. • The risk of habitat loss from large, high intensity wildfire would decrease. • Aspen sustainability would be improved only by thinning and cutting in existing and remnant aspen stands; burning would only occur in those stands that are not eligible for mechanical treatments. • Conifer removal and prescribed fire use in meadows and shrublands would stimulate meadow and opening habitats and improve forage quality for big-game species. • The use of patch cuts would promote clump habitat for Abert's squirrel and would mimic natural disturbance patterns. • The use of only a single-treatment type in Alternative C may result in less short-term impact to lynx and MSO prey habitat and overall American marten habitat conditions immediately after implementation than after Alternative B by leaving slash and debris (i.e., hiding cover) on the ground. However, in the long-term, residual slash and debris may impede the growth of browse species necessary to support lynx prey populations. • 27-44 acres of lynx Denning habitat would be converted to unsuitable habitat in the short-term due to patch cuts • 15-26 acres of lynx Winter habitat would be converted to unsuitable habitat in the short-term due to patch cuts • Up to 17 acres of lynx "Other" habitat would be converted to unsuitable habitat in the short-term due to the use of prescribed fire in Douglas-fir and/or spruce-fir stands. • 42-70 acres of MSO Restricted Habitat would be converted to unsuitable habitat in the short-term due to patch cuts.

Hydrology and Soils	• No direct effects on hydrology and soils. • Alternative A would result in heavy ladder fuels, understory growth, and down and dead materials. Understory vegetation and down and dead materials would minimize the erosion effect from precipitation events and would disrupt runoff to prevent extensive sediment transport into waterways. • However, there is potential for excessive down and dead material to migrate into stream channels and cause flooding, culvert blowouts, washouts, etc. • In the long term, Alternative A would result in increased potential for high intensity fires that would sterilize soils, create hydrophobic conditions, and/or severely alter vegetation cover and precipitation interceptions. • In the short term, Alternative A could result in catastrophic sedimentation yields if a high intensity fire event occurred in the analysis area.	• Adverse short-term negligible to minor increase in erosion and sedimentation as a result of road rehabilitation, and increased use of and travel on roads in the analysis area and prescribed fire activities. • Localized soil erosion acceleration in prescribed fire units would be adverse, short term and minor. Erosion acceleration would be the result of exposed mineral soil and the loss of mature vegetation cover or well-developed duff/litter layer. • The removal of slash and debris (through burning) would expose soils to more raindrop or precipitation impacts. • Alternative B reduces the long-term potential for major erosional events (as a result of stand-replacing fires). • Alternative B would result in higher short-term sedimentation yields than Alternative C but would, in the long term, result in the lowest potential sedimentation yields of the three alternatives.	• Road rehabilitation activities would result in the same adverse short-term effects as discussed in Alternative B; however, the use of and travel on these roads is expected to be lower than Alternative B because only one treatment type is proposed. • Soil erosion acceleration as a result of exposed mineral soil would be minimized due to the single treatment type proposed. Duff/litter and understory vegetation would be maintained (compared to Alternative B). • Leaving slash and debris on the ground would minimize the erosion effect from precipitation events, and would disrupt runoff to prevent extensive sediment transport into waterways. • However, there is potential for down and dead material to migrate into stream channels and cause flooding, culvert blowouts, washouts, etc. • Alternative C would result in the lowest short-term impacts of the two action alternatives; however, the long-term benefits would not be as substantial as under Alternative B. • All other impacts would be the same as or similar to Alternative B.
Recreation and Roads and Access	• No direct effects to recreation or roads and access. • No effect on ROS classifications.	• Adverse short-term moderate effects on recreational opportunities and experience as a result of implementation activities (e.g., noise, personnel presence, temporary closures, slash, smoke, etc.); in most cases, two separate disturbance periods would occur: one for mechanical treatments and one for follow-up fire treatments. • No effect on ROS classifications. • Beneficial long-term minor effects as a result of new camping or day use opportunities in cleared areas. • Improved accessibility in the short term as FDR 274 would be rehabilitated to	• Adverse short-term moderate effects on recreational opportunities and experience as a result of implementation activities (see Alternative B for examples); however, Alternative C would, in most cases, require only one disturbance period in each treatment area as there are no follow-up fire treatments proposed. Duration of impacts would be noticeably less than Alternative B. • All other impacts are the same as described for Alternative B.

		accommodate project equipment and would likely accommodate a wider range of passenger vehicles. • Potential for increased unauthorized use on closed roads (even after successful implementation of Design Criteria) until vegetation in the closed road corridors matures. • No new temporary or permanent roads would be constructed in the IRA; however, some cross-country vehicle access may be necessary to implement treatments.	
Scenic Resources	• No direct effects on scenic resources. • Scenic degradation as a cumulative result of nonaction and stand-replacing fires in the analysis area would not be consistent with VQOs.	• Adverse short-term moderate effects to scenic character and sensitive viewers as a result of personnel presence, removal of mature vegetation, blackening of landscape following prescribed fire, and/or diminished visibility during prescribed fire activities. • Beneficial long-term minor to moderate effects to scenic character and quality as a result of new openings in the canopy, new viewpoints, increased light penetration, rejuvenation of aspen stands, and improved wildlife viewing opportunities. • In the long term, established VQOs would continue to be met or exceeded.	• Effects would be similar to those described for Alternative B; however, short-term effects (e.g., personnel presence, blackening of the landscape) would be noticeably less due to the single treatment type proposed. • In the absence of follow-up fire treatments, mechanical treatment areas would require additional time for natural processes to dispose of or consume residual slash and debris. • In the long term, established VQOs would continue to be met or exceeded.
Vegetation and Wetlands	• No direct effects on vegetation or wetlands. • In the long term, nonaction would perpetuate conifer encroachment into grasslands, meadows, and aspen stands. • Continuing decline in forest health. • No effect on the rate of spread of noxious weed species.	The following bullets summarize project impacts overall, impacts vary by species – see Section 3.10.2 for more precise comparison. • Adverse short-term minor effects to vegetation resources as a result of road rehabilitation, trampling, and removal of mature vegetation. • Short-term increase in the potential for noxious weed infestations due to ground disturbances. • Beneficial long-term moderate effects to all cover types, including sensitive species.	• Effects would be similar to those described for Alternative B; however, direct disturbances would be slightly less due to the single treatment type proposed. • Short-term increase in the potential for noxious weed infestations due to ground disturbances.
Wildland Fire and Hazardous Fuels	• No direct effects. • No hazardous fuels or wildfire risk reduction.	• Alternative B would result in an area-wide trend towards FRCCs 1 and 2.	• Effects would be similar to Alternative B; however, some vegetation types would not

	• Alternative A would perpetuate the trends towards FRCCs 2 and 3. • Continued decline in aspen stands, competition from conifers, and meadow encroachment. • Continued hazardous fuel accumulation and, in the long term, increased potential for high intensity or stand-replacing fires. • No incentive for cooperative fire safety programs.	• Patch cuts and mosaic pattern would promote age-class and species diversity. • Reduction in stand density would create stand conditions more conducive to fire tolerant species. • Meadow, grassland, and aspen habitat enhancements. • Risk of high intensity fires would be reduced. • Threat to WUI communities and the City of Florence's municipal watershed would be lessened. Watershed damage and erosion would be decreased. • Provides some incentive for cooperative fire safety programs.	revert to more historic conditions without fire disturbance. • Risk of high intensity fires would be reduced somewhat, but not as much as Alternative B because there would be limited reintroduction of prescribed fire and short-term increase in fuel loading due to slash and treatment debris. • Fuel loading would temporarily increase as a result of slash and debris generated by thinning and harvest activities without follow-up fire treatments. • Similar to Alternative B but less area would be treated. Limited change in fuel loading due to lack of prescribed fire. Treatment would not move towards true historic conditions. • Similar to Alternative B but less area would be treated. Less sprouting and regeneration without the use of prescribed fire. • Provides some incentive for cooperative fire safety programs.
Project Economics	• No direct costs.	• Implementation costs would be approximately $3.9 million.	• Implementation costs would be approximately $2.1 million.