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Environmental Assessment

North Trout Creek Forest Health and Hazardous Fuel Reduction Project

Salida Ranger District, San Isabel National Forest
Chaffee County, Colorado

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USDA Forest Service
Pike and San Isabel National Forest
Comanche and Cimarron National Grasslands
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Those wishing to comment on the project should provide the following information: name, address, phone number (if possible), title of the document being commented upon, and specific facts or comments along with supporting reasons that should be considered in reaching a decision.

Comments should be mailed to NORTH TROUT CREEK EA, Salida Ranger District, 325 West Rainbow Blvd., Salida, CO 81201 before March 16, 2007. You may contact Mr. Sam Schroeder at (719) 539-3591 for more information.

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ACRONYMS AND ABBREVIATIONS

ATV all terrain vehicle

BA basal area

BE/BA Biological Evaluation/Biological Assessment

BMP best management practices

CEQ Council on Environmental Quality

CVU Common Vegetation Unit

CWD coarse woody debris

dbh diameter at breast height

DFC desired future conditions

EA environmental assessment

FSH Forest Service Handbook

FSR Forest System Road

FWS Fish and Wildlife Service

GPS global positioning system

HFRA Healthy Forest Restoration Act

IDT Interdisciplinary Team

LAU Lynx Analysis Unit

LCAS Lynx Conservation Assessment & Strategy

MA Management Area

MIS management indicator species

MPB mountain pine beetle

NEPA National Environmental Policy Act

NHPA National Historic Preservation Act

OHV off-highway vehicle

ORV off-road vehicle

PSICC Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands

RAMP Range Allotment Management Plan

TEPS Threatened, Endangered, Proposed, and Sensitive species

TSI Timber Stand Improvement

WCP Water Conservation Practices

WIZ Water Influence Zone

1.0 PURPOSE OF AND NEED FOR ACTION

The Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

The Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands (PSICC) Land and Resource Plan (Forest Plan) as amended (October, 1984) provides long-term management direction for the project area. Management direction is expressed in terms of both Forest Direction and Management Area (MA) Direction.

1.1 INTRODUCTION

The North Trout Creek project area (project area) is generally east, northeast of Buena Vista in Chaffee County, Colorado (Map 1.0 Vicinity Map). It consists of approximately 15,315 acres. It is primarily located within the Fourmile Creek and Trout Creek sixth-level watersheds; both are tributaries to the Arkansas River. A small portion of the project area is located within the Salt Creek sixth-level watershed (Park County), tributary to the South Platte. The elevation on the project area ranges from 8,000 to 10,700 feet. The topography of the area varies from rolling hills to steep, rugged forested terrain. The forested areas are a mosaic of ponderosa pine, Douglas-fir, lodgepole pine, limber pine, bristlecone pine, piñon-juniper, aspen, and spruce-fir. Non-forested areas include meadows, shrublands and rock outcrops. The area is managed for multiple-use.

The following sections describe the existing condition, purpose and need, and desired future condition for the project area.

1.2 PURPOSE AND NEED FOR ACTION, EXISTING CONDITION, & DESIRED FUTURE CONDITION

1.2.1 Existing Condition

The project area has been subdivided into three areas (northern, central and southern) to better describe the existing and desired future conditions (Map 1.1). Recreation, insect and disease activity, hazardous fuel accumulations, and wildlife management are the primary factors that currently influence the area's management and existing condition.

Outdoor enthusiasts use the project area extensively, especially in the central and southern areas. Some activities occurring in the area include dispersed camping, hunting, off-highway vehicle (OHV) use, mountain biking, and hiking. Recreation occurs in the area throughout the year and peaks in the summer and fall with camping and hunting. The southern area has a management emphasis on rural and roaded-natural recreation opportunities. The overall project area contains approximately 5.5 miles of

closed non system roads, approximately 27.5 miles of National Forest System roads (FSR), and approximately 11.5 miles of system trails.

In the late 1990's, mountain pine beetle (MPB) populations grew rapidly and killed many ponderosa pine trees in the Arkansas River Valley. Bark beetles and other insect infestations including defoliators, and diseases, such as dwarf mistletoe, are part of the natural ecological processes. Host trees in these forests have co-existed with native insects in Colorado for thousands of years. As discussed in a recent review of available research by Romme et al. (2006), these forests have experienced similar insect infestations in the past and are a natural occurrence that can be expected periodically. Romme et al. identified four interacting factors that may have contributed to recent outbreaks in Colorado. These factors include: 1) long-term drought which stresses trees and makes them more vulnerable to insects; 2) warm summers, that further stress the trees and may accelerate growth of insects; 3) warm winters, which enhance survival of insect larvae; and 4) abundant food (trees) for the insects in Colorado's extensive and dense forests.

By 2000, mountain pine beetles had moved into the area near Trout Creek, Fourmile Creek, and Sevenmile Creek. Drought and high stand density reduced the trees ability to withstand MPB attacks. Since the early 1900's, ponderosa pine forest tree densities have increased significantly in dry ponderosa pine forests in southern Colorado and elsewhere in the Southwest, largely as a result of fire suppression. By 2004, the number of live ponderosa pines had been reduced in the project area's northern portion. Currently, MPB activity occurs in the southern and central areas, but has not caused the wide spread mortality evident in the northern area.

FIGURE 1.1 PICTURES OF MOUNTAIN PINE BEETLE ACTIVITY IN THE NORTHERN PORTION OF THE PROJECT AREA.

Ponderosa pine mortality from MPB increased the number of snags and amount of down woody debris, opened the canopy, especially in the northern area, and increased grass growth. This increase in fuels has elevated the potential for high intensity wildfire. The project area averages approximately ten fires per year, caused by both humans and lightning.

Current habitat conditions are having negative impacts on many desirable wildlife species including Abert's squirrels, bighorn sheep and mule deer. Mature ponderosa

pine mortality has decreased Abert's squirrel (Forest Service Management Indicator Species [MIS] and ponderosa pine obligate) habitat. A relatively closed canopy of piñon pine near Limestone Ridge has reduced bighorn sheep use in the southern area. Decadent shrubs (i.e., mountain mahogany) in the central and southern areas have reduced the quality of mule deer winter range.

Current habitat conditions are desirable for some species including several cavity dependant species (such as woodpeckers), elk, lynx, and other wildlife. High tree mortality provides critical forage, shelter, and important habitats for a multitude of wildlife species in the form of snags and logs. In addition, a more open canopy increases grass and forb production for elk and deer use; mixed fir, spruce, and higher elevation aspen stands contain higher quality Canada lynx habitat.

Table 1.1 shows the vegetation types with approximate acres in the project area.

TABLE 1.1 VEGETATION TYPES WITH APPROXIMATE ACRES IN THE PROJECT AREA

Vegetation Types	Acres	Vegetation Types	Acres
Aspen	1,480	Limber pine	290
Blue spruce	685	Lodgepole pine	510
Bristlecone pine	145	Meadow/shrubs	3,545
Cottonwood	15	Piñon-juniper	2,430
Douglas-fir	2,645	Ponderosa pine	3,185
Spruce-fir	385	Total	15,315

1.2.2 Need for Action

The needs this project are designed to meet are: 1) hazardous fuel reduction, 2) reduction of tree density and creation of openings in the forest canopy, 3) protection and/or improvement of wildlife habitat, and 4) improvement of the condition class of the watershed, including reintroduction of the natural fire regime, where possible.

1.2.3 Purpose of the Project

The purpose (objective) of this project is to: 1) reduce the risk of high intensity wildland fire and restore and maintain healthy, diverse, fire adapted ecosystems to provide improved resilience and sustainability, 2) reduce the threat of high intensity wildland fires to adjacent private property and structures, 3) treat vegetation so that growth and vigor of residual trees are maintained or increased to favor the development of large tree forest structure, and 4) maintain and enhance habitat for Canada lynx, mule deer, elk, bighorn sheep, and Abert's squirrel.

1.2.4 Desired Future Condition (0 – 10 Years Post Treatment)

Entire Project Area:

Forests have acceptable levels of insect and disease populations, realizing insect and disease populations have an important role and place in the natural ecological processes. Stands are healthy and vigorous and provide a future seed source (Forest Plan, pg. III – 82 and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems: A Cohesive Strategy).

Forests have diverse age structure, diverse species composition, old-growth communities, openings, standing snags, and down woody debris across forested areas and a vigorous understory of native grasses, forbs and shrubs where light allows (Forest Plan, pgs. III - 12).

Where conditions are suitable, fire is used to maintain non-hazardous levels of fuels, reduce the hazardous effects of unplanned wildland fires, improve wildlife habitat, and meet resource objectives (Forest Plan, Amendment No. 6 and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems: A Cohesive Strategy).

Wildlife habitat and its effectiveness meet or exceed Forest Plan standards for elk, bighorn sheep, and threatened and endangered species (Forest Plan, pg. III-32). Bighorn lambing and caving, fawning, and winter range areas for elk and mule deer are protected during appropriate periods of the year (Forest Plan, pg. III – 29 & 32 and July 2005 Amended Calculation Standards).

Structural diversity of vegetation that are dominated by forested ecosystems and forest cover types and that provide variety of shape, crown closure, age, and interspersion are maintained or improved (Forest Plan, pg. III – 2 & 138).

Ponderosa pine stands have a variable structure that includes an open park like appearance with naturally occurring clumps that provide wildlife habitat. In addition, within ponderosa pine forests, habitat conditions for Abert's squirrel (MIS) is maintained and improved by providing at least one clump (one-tenth acre in size of 9 to 22 inch diameter at breast height [dbh] trees with a basal area [BA] of 180 - 220 with interlocking canopies) per six acres (Forest Plan, pgs. III – 29 & 32).

Snags, coarse woody debris (CWD), and recruitment trees are well distributed across the landscape in sufficient quantity and quality to support species dependent upon these habitats and is consistent with its likely availability under natural disturbance regimes (Forest Plan, pg. III – 12 and Lynx Conservation Assessment & Strategy [LCAS] Ruediger et al. 2000).

Habitat conditions support dense horizontal understory cover including mature, multistoried conifer vegetation and patches of aspen with dense conifer understory and high densities of snowshoe hares (LCAS).

Canada lynx denning habitat is available in spruce-fir stands, stands are not affected by human impacts, and the juxtaposition of lynx denning and foraging habitat is maintained or improved within the project area (LCAS).

Past management activities are not readily visible and areas are vegetated and roads are closed (Forest Plan, pgs. III – 72 and 74). Public and road use are managed to provide for habitat needs of elk (MIS) including road closures and area closures to maintain habitat effectiveness (Forest Plan, pg. III – 124 & 143).

Satisfactory range conditions are maintained on the rangelands (Forest Plan, pg. III – 40).

Noxious weeds are managed/treated in the following priority: 1) leafy spurge and Russian and spotted knapweed; 2) invasion of new plant species classified as noxious farm weeds; 3) infestation in new areas; 4) expansion of existing infestations of Canada and musk thistle, and other noxious farm weeds; and 5) reduce acreage of current infestations (Forest Plan, pg. III – 40).

Areas of soil disturbance are rehabilitated and re-vegetated to achieve a natural appearance and maintain water quality; erosion has been reduced (Forest Plan, pg. III – 19 & 51).

Water quality is maintained or improved to meet State and Federal water quality standards (Forest Plan, pg. III – 51).

Soil productivity is maintained, human-caused soil erosion is minimized and integrity of associated ecosystems is maintained through the following:1) roads and trails have adequate cross drainage to reduce sediment transport energy, bridges and culverts are removed, ditches eliminated, roadbeds outsloped, ruts and berms removed, permanent drainages installed, and protective vegetative cover established on all temporary roads, 2) soil compaction is minimized, 3) tractor-built firelines are placed on contour where possible and designed to avoid highly erodible sites, 4) soil disturbance caused by human use is restored to soil loss tolerance levels commensurate with the natural ecological processes for the treatment area (Forest Plan, pg. III – 72).

Riparian areas are maintained or improved (Forest Plan, pg. III – 73).

The ecological and hydrological integrity of springs, both developed and undeveloped, is maintained (Interdisciplinary Team [IDT]).

Northern Area (Map 1.1):

Overall, ponderosa pine forests have an average BA of 60 square feet per acre; in portions of this area stands have a BA of less than 60 square feet per acre due to MPB mortality. Stands not infested with the MPB remain. Young ponderosa pine regeneration is evident in areas where previously heavy MPB mortality occurred and protected from livestock damage (Forest Plan, pgs. III – 40 to 45).

Lodgepole pine stands have opening with regeneration (IDT).

Aspen communities exist with diverse age structures, regeneration, openings, standing snags and down woody debris across aspen areas; a vigorous and diverse native grass, forb and shrub understory is present (Forest Plan, pg. III - 14).

Fuel loads have been reduced to meet resource and hazardous fuel objectives, and reduce the threat of wildfire to private structures (Forest Plan, Amendment No. 6 and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems: A Cohesive Strategy).

Central Area (Map 1.1):

Ponderosa pine forests have an average BA of 60 square feet per acre. Stands of advanced regeneration can be found (Forest Plan, pgs. III – 40 to 45).

Aspen communities exist with diverse age structures, regeneration, openings, standing snags, and down woody debris across aspen areas; vigorous and diverse native grass, forb and shrub understory is present (Forest Plan, pg. III - 14).

Habitat capability is maintained for MIS (elk, Abert's squirrel, and brook trout) at least 80% of potential in MA 4B and 60% of potential in MA 2B areas (Forest Plan, pgs. III - 137 and III - 119).

Southern Area (Map 1.1):

Current stands of ponderosa pine are maintained. Ponderosa pine forests have an average BA of 60 square feet per acre. Stands of advanced regeneration can be found (Forest Plan, pgs. III – 40 to 45).

Habitat capability is maintained for MIS (elk, Abert's squirrel, and brook trout) at least 80% of potential in MA 4B and 60% of potential in MA 2B areas (Forest Plan, pgs III - 137 and III - 119).

Piñon-juniper stands have a variable structure that includes a dense overstory mixed with open, grassy areas that provide wildlife habitat (Forest Plan, pg. III – 32).

Designated dispersed recreation camping sites exist that are attractive and attract visitors to the area (IDT).

1.3 FOREST PLAN DIRECTION

National Forest System lands will be managed to comply with laws, regulation, direction in the Forest Service Manual, Executive Orders, and Regional Acceptable Work Standards (Forest Plan, III – 11).

The PSICC Land and Resource Plan as amended (October, 1984) provides long-term management direction for the project area. Management direction is expressed in terms of both Forest Direction and Management Area Direction.

Forest Plan goals are statements describing a desired condition to be realized sometime in the future. Tiered under these goals are Forest Plan Direction and Standard and Guidelines. General Direction Statements specify the actions, measures, or treatments (management practices) to be done when implementing the activity or the condition expected to exist after the general direction is implemented. Standards and Guidelines outline the acceptable limits.

These directions tier in the following order:

1. Forest Plan Goals and Objectives

2. General Direction Statements

3. Standards and Guidelines

4. Management Area General Direction

5. Management Area Standards and Guidelines

Summarized below are the Forest Plan goals associated with this project and the overall Management Area Direction and the general direction for the MA related to this project.

1.3.1 Forest Plan Goals (related to this project)

Provide a broad spectrum of developed and dispersed recreation opportunities in accordance with identified needs and demands (Forest Plan, pg. III – 3).

Increase diversity for wildlife and habitat improvement (Forest Plan, pg. III – 4).

Increase winter range habitat capacities for deer and elk (Forest Plan, pg. III – 4).

Improve fish habitat on suitable streams and low elevation ponds and lakes (Forest Plan, pg. III – 4).

Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool (Forest Plan, pg. III – 4).

Implement an integrated pest management program emphasizing silvicultural management of timber stands to prevent and control insect infestations and disease (Forest Plan, pg. III – 4).

Perpetuate the aspen type (Forest Plan, pg. III – 4).

Improve the health and vigor of all vegetation types (Forest Plan, pg. III – 4).

Evaluate, protect and enhance cultural resources on the National Forests and Comanche and Cimarron National Grasslands for future education and enjoyment (Forest Plan, pg. III - 4).

Enhance and/or preserve scenic values along heavily traveled roads, use areas and trails through management activities (Forest Plan, pg III – 4).

Protect riparian areas and wetlands from degradation (Forest Plan pg III-5).

Protect surface resources and environmental quality in accordance with laws and regulations (Forest Plan, pg. III – 5).

Conserve water and soil resources and prevent significant or permanent impairment of land productivity (Forest Plan, pg. III – 5).

Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages, and prevent loss of human life (Forest Plan, pg. III – 5).

1.3.2 Management Areas

See Map 1.2 for the location of the following management areas within the project area.

MA 2B Emphasis on rural and roaded-natural opportunities

Management emphasis is for rural and roaded-natural opportunities. Motorized and non-motorized recreation activities such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling, and cross-country skiing are possible. Conventional use of highway-type vehicles is provided for in design and construction of facilities. Motorized travel may be prohibited or restricted to designated routes, to protect physical and biological resources.

Visual resources are managed so that management activities maintain or improve the quality of recreation opportunities. Management activities are not evident, remain visually subordinate or may dominate, but harmonize and blend with the natural setting. 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 use.

The harvest method by forest cover type is clearcutting in aspen and lodgepole pine, shelterwood in interior ponderosa pine, mixed conifer and Englemann spruce-subalpine fir.

MA 4B Emphasis on habitat for management indicator species

Management emphasis is on the habitat needs of one or more management indicator species. Species with compatible habitat needs are selected for an area. The goal is to optimize habitat capability, and thus numbers of the species. The prescription can be applied to emphasize groups of species, such as early succession dependent or late succession dependent, in order to increase species richness or diversity.

Vegetation characteristics and human activities are managed to provide optimum habitat for the selected species, or to meet population goals jointly agreed to with the State Fish and Wildlife agencies. Tree stands are managed for specific size, shape, interspersion, crown closure, age, structure, and edge contrast. Grass, forb, and browse vegetation characteristics are regulated. Rangeland vegetation is managed to provide needed vegetation species composition and interspersed grass, forb, and shrub sites or variety in age of browse plants.

A full range of tree harvest investments in other compatible resource uses may occur but will be secondary to habitat requirements. Management activities may dominate in foreground and middle ground, but harmonize and blend with the natural setting.

MA 4D Emphasis on aspen management

Management emphasis is on maintaining and improving aspen sites. Other tree species, if present, are de-emphasized. Aspen is managed to produce wildlife habitat, wood products, visual quality, and plant and animal diversity. Aspen clones are maintained. On larger areas, a variety of aspen stand ages, sizes, shapes, and interspersion are maintained. Both commercial and noncommercial treatments are applied. Even-aged management is practiced and is achieved by clearcutting. Diversity objectives are achieved by varying the size, age, shape and interspersion of individual stands. Management activities in foreground and middleground are dominant, but harmonize and blend with the natural setting. Individual treatments generally are smaller than 40 acres.

Some temporary or seasonal road and area use restrictions are implemented to prevent disturbance of wildlife or improve hunting and fishing quality.

MA 5B Emphasis on big game winter range

Management emphasis is on forage and cover on winter range. Winter habitat for deer, elk, bighorn sheep, and mountain goats is emphasized. Treatments to increase forage production or to create and maintain thermal and hiding cover for big game are applied. Tree stand treatment can be clearcut, shelterwood, single tree selection, or group selection. Commercial and noncommercial stand treatments occur. Specific cover-opening ratios, and stand designs are maintained. Treatments to grass, forb, browse, and noncommercial tree species include seeding, planting, spraying, burning, falling and mechanical chopping or crushing. A variety of browse age classes are maintained. Continuous forest cover is maintained on some sites.

Management activities are not evident, remain visually subordinate, or dominate in the foreground and middleground but harmonize and blend with the natural setting.

Short term roads are obliterated within one season after intended use. Existing local roads are closed and new motorized recreation use is managed to prevent unacceptable stress on big game animals during the primary big game use season.

MA 6B Emphasis on livestock grazing

The area is managed for livestock grazing. Range condition is currently at or above the satisfactory level. Intensive grazing management systems are favored over extensive systems. Range condition is maintained through use of forage improvements practices, livestock management, and regulation of other resource activities. Periodic heavy forage utilization occurs. Investment in structural and nonstructural range improvements to increase forage utilization is moderate to high. Structural improvements benefit, or at least do not adversely affect wildlife. Conflicts between livestock and wildlife are resolved in favor of livestock. Nonstructural restoration and forage improvement practices available are seeding, planting, burning, fertilizing, pitting, furrowing, spraying, crushing, and plowing. Cutting of encroaching trees may also occur.

Management activities are evident but harmonize and blend with the natural setting.

MA 9A Emphasis is on Riparian Area Management

Management emphasis is on the management of all of the component ecosystems of riparian area. These components include the aquatic ecosystem, the riparian ecosystem (characterized by distinct vegetation), and adjacent ecosystems that remain within approximately 100 feet measured horizontally from both edges of all perennial streams and from the shores of lakes and other still water bodies. All of the components are managed together as a land unit comprising an integrated riparian area, and not as separate components.

Forest riparian ecosystems are treated to improve wildlife and fish habitat diversity specified silvicultural objectives. Both commercial and noncommercial vegetation treatments are used to achieve multi-resource benefits. Livestock grazing is at a level that will assure maintenance of the vigor and regenerative capacity of the riparian plant communities. Vehicular travel is limited on roads and trails at times when the ecosystem would be unacceptably damaged.

1.4 KEY ISSUES

The key issues are separated into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those:

1. outside the scope of the proposed action
2. already decided by law, regulation, Forest Plan, or other higher level decision

3. irrelevant to the decision to be made
4. conjectural and not supported by scientific or factual evidence

Sec. 1501.7 of The Council on Environmental Quality (CEQ) NEPA regulations require the delineation of significant and non-significant issues: "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

During the scoping period for the North Trout Creek Forest Health and Hazardous Fuel Reduction Project, the Forest Service identified the following significant issues:

User Conflicts: Coordinate timing of treatments to avoid conflicts with heavy recreational use and wildlife needs. Identify shared property boundaries between National Forest System lands, State lands, and private property.

Recreation: Retain large groups of trees along roads for dispersed camping to provide shade, cover, and aesthetics. Maintain visual quality along the Midland Trail and at trail heads.

Riparian: Conduct treatments to minimize impact to streams, rivers and naturally wet areas, and their corresponding riparian communities.

Roads: Physically close, obliterate, and/or gate temporary roads when treatments are finished. Enforce road closures.

Vegetation Management: Efforts made to reduce the susceptibility of ponderosa pine trees to MPB attack should not ignore other forest health issues, but should also consider: 1) maintaining healthy forest processes, 2) maintaining or increasing landscape scale age diversity, and 3) maintaining or increasing landscape scale wildlife and plant species diversity.

Wildlife: Protect, promote and maintain mature ponderosa pine trees for Abert's squirrel habitat. Promote healthy ponderosa pine stands for the future. Protect important habitats for a variety of wildlife species that require specialized habitats (e.g., snag and CWD clumps). Address impacts to MIS within the project area. Enhance current habitat for big horn sheep and mule deer.

Canada Lynx: Maintain areas currently providing potential lynx foraging and denning habitat within the project area. Follow LCAS guidelines.

Fire Management: Restore and maintain fire return intervals by vegetation type. Reduce hazardous fuels near houses using mechanical means, where practical. Build and improve relationships with the public on the use of prescribed fire. Prioritize treatment areas based on those areas where homeowners are currently or committed to completing defensible space on their lands.

Cultural & Heritage Resource: Protect historic, cultural and paleontological resources.

Smoke & Air Quality: Minimize impacts from smoke due to prescribed fire activities.

Noxious Weeds: Prevent the occurrence of noxious weeds in "weed free" areas; limit additional spread of noxious weeds in known areas.

Livestock Grazing: Protect range improvements during treatments. Coordinate with range management on timing of activities to prevent conflicts.

Non-significant issues & reasons why:

Access/motorized travel:

Issue: Leave trails intact and remaining open the majority of the time. Reason: This issue is covered under the Fourmile Travel Management Plan.

Roadless areas:

Issue: No treatment within roadless areas. Reason: No roadless areas exist with the project area.

Fire Management:

Issue: Re-introduce fire in high elevation forests through fire-use management. Reason: Current PSICC land management plans do not allow fire-use management within the forest.

1.5 DECISION FRAMEWORK

Given the purpose and need of the project, the deciding official reviews the proposed action and the other alternatives in order to make the following decision:

Should vegetation be maintained or altered with mechanical treatments and/or prescribed fire?

1.6 PUBLIC INVOLVEMENT

From April 1, 2004 through January 1, 2007, the proposal was listed in the Schedule of Proposed Actions; on March 23, 2004, during the scoping period, the proposal was provided to the public and other agencies for comment. In addition, as part of the public involvement process, the agency submitted a press release to local papers notifying the public of the project proposal and sponsored a field trip to the project area for interested members of the public. The field trip took place on July 1, 2004. A copy of the scoping letter, the press release and field trip notes are located in the project record.

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Several alternatives, including the Proposed Action, were developed for the project. The following sections describe each alternative, present the design criteria common to all action alternatives, and compare each of the alternatives.

The proposed project would follow all laws and regulations including the Forest Plan, Region 2 Best Management Practices for Noxious Weeds, Colorado Forest Stewardship Guidelines: Best Management Practices (BMP), and Watershed Conservation Practices (WCP) Handbook (FSH 2509.25, Chapter 10). It would also follow management decisions made in the Fourmile Travel Management Plan and current range allotment management plans for the area.

2.1 ALTERNATIVES

Three alternatives are proposed for the North Trout Creek Forest Health and Hazardous Fuel Reduction Project:

Alternative 1: No Action

Alternative 2: Proposed Action

Alternative 3

The design criteria listed below apply to Alternatives 2 and 3.

Design Criteria:

1. Protect current improvements including the Midland Trail, Homestake water transmission line, bulletin boards, signs, fences, and spring developments. Range improvements would be protected and replaced, if damaged by treatment.
2. If chipping is used as a means of disposal, chips would be distributed so that the chip layer is a maximum of 2 inches in depth; otherwise the chips would be hauled off site.
3. Wood chips may be used on identified cultural sites to retard erosion and increase effective moisture, encouraging the growth of grasses and small forbs that act as stabilizing agents. The depth of the chips would be determined by the Zone Archeologist. The Zone Archeologist would supervise and monitor these activities.
4. A cultural resource survey would be completed prior to all ground disturbing activities.
5. All eligible archeological sites, including a minimum of 30 to 50 foot buffer (depending on slope and fuel loading), would be avoided and protected from damage by equipment traveling in the area and pile burning activities. The Zone Archeologist would determine the buffer and mark the area.

6. The Zone Archeologist would identify areas where prescribed fire is not allowed, to avoid impacts to eligible sites. In areas with eligible sites, the Zone Archeologist would assist in identifying staging areas to avoid impacts to sites.
7. If heavy fuel loads exist on any of the archeological sites for which avoidance is stipulated, then those fuels may be removed with an Archeologist present.
8. If artifacts, features, or other indications of previously unrecorded heritage resources are identified in the course of ground-disturbing activities, all work in the vicinity of those materials would cease and the Zone Archaeologist would be notified immediately.
9. Timing of prescribed fire treatments would be coordinated with the Rangeland Management Specialist pre and post burning to avoid conflicts with permittees and stress on vegetation.
10. Seasonal logging restrictions would be implemented for the entire project area from December 1 through April 15 for elk winter range protection. Low frequency activities, such as prescribed burning and removing decks from open roadways (Shields and McGee Gulch) may be approved by the Wildlife Biologist on an as needed basis prior to implementation.
11. Nesting birds and raptor sightings would be reported to the Wildlife Biologist and appropriate protection measures would be implemented.
12. If new site information regarding threatened, endangered, and sensitive species is located during the course of ground disturbing activities all work in the vicinity of those species would cease and the appropriate specialist would be notified.
13. An activity exclusion area would be marked by the Wildlife Biologist and avoided around known active raptor nests from March 1 through September 30.
14. If treatments are proposed within any raptor territory, the Wildlife Biologist would work with managers to determine treatment specifications for protection of that site.
15. A minimum 100-foot buffer on either side of perennial and intermittent streams and ephemeral areas would define the Water Influence Zone (WIZ) as specified in the WCP Handbook (FSH 2509.25, Chapter 10). The WIZ includes the geomorphic floodplain, riparian ecosystem, and inner gorge.
16. Treatments would follow the WCP Handbook (FSH 2509.25, Chapter 10).
17. Mechanical thinning treatments would not occur inside the WIZ as delineated by a Fishery Biologist or Hydrologist. If the area has not been delineated, then treatments would occur outside a 100-foot buffer from all perennial and intermittent streams and ephemeral draws. The 100-foot WIZ also applies to all lakes, ponds, kettles, and other forms of standing water. Some activities such as prescribed burning and hand treatments may be allowed in the WIZ, but only after consultation and concurrence with the Hydrologist or Fishery Biologist.
18. Prescribed burning would be allowed to migrate into the WIZ from adjacent slopes, but would not be encouraged to do so; ignition of prescribed fire would not occur in the WIZ.
19. Heavy equipment and vehicles would be kept out of the WIZ, streams, swales, and lakes, except to cross at designated points, building crossings, conduct restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil. Before heavy equipment or vehicles would be allowed to cross streams, the Fishery Biologist or Hydrologist would be consulted and determine where crossings would occur or be constructed, and to specify any stipulations necessary to minimize negative impacts on aquatic resources.

20. Heavy equipment or vehicles would not be allowed in streams during fish spawning, incubation, and emergence periods. For brook trout, spawning and incubation occur in September and October.
21. Avoid soil disturbing activities during periods of wet soils. Apply travel restrictions to protect soil and water.
22. If a unit has previously been mechanically thinned or treated, no salvage treatment will take place after prescribed fire treatments occur.
23. Protect or provide for one Abert's squirrel nest tree clump (0.1 acre of 9 to 22 inch dbh ponderosa pine with a BA of 180 to 220, if available, and interlocking canopy) per six acres in ponderosa pine forests (Forest Plan, pg. III – 29). In addition ponderosa pine trees showing sign of Abert's squirrel feeding or nesting activity would be retained as wildlife trees. This direction would be written into timber prescriptions and the prescribed fire plan. For prescribed fire, protection measures include avoiding the torching of ponderosa pine clumps and Abert's squirrel feed trees.
24. Mechanical treatments would be excluded in established Abert's squirrel control plots.
25. Implementation and effectiveness monitoring would be conducted by an interdisciplinary team. Snag, down woody material, and other stand conditions would be monitored pre, during, and post treatment to ensure desired conditions are achieved. The following snags and CWD guidelines would be followed:

    Snags and Coarse Woody Debris
    In forested areas, maintain greater than or equal to 40 snags/recruitment trees per five acre average; retain the largest sizes and numbers available (all stages of development). These should consist of at least 30 snags and/or down logs per five acres and 10 recruitment snags (live trees) per five acres. Guidelines for snags include:
    - Retain all soft snags (class 3, 4, and 5) except for safety hazards (Forest Plan, pg. III – 12) to the greatest extent reasonable and practical.
    - Retain hard snags (when they are present) greater than or equal to 12 inches dbh or as large as available.
    - If above existing snag levels are not available, provide for green recruitment snag trees sufficient to bring snag/recruitment snag levels up to the above mentioned levels in a well distributed manner of both clumps and individual trees, favoring largest available trees. Trees with defects (e.g. "wolfy" appearance, dead tops, forked tops, cankers, heartrot, knarls, diseases, broken tops and large limbs) would be selected when possible as follows:
        - Provide for the above number of recruitment snags (live trees).
        - Create new snags by prescribed fire plan design or other means, as necessary to meet the minimum snag numbers specified above.
        - Protect reserved snags/down logs from fuelwood cutting, mechanical treatment and prescribed fire treatment to the greatest extent reasonable and practical.
26. FSR 309, 311 and 376 would be closed by existing gates from December 1 through April 15, as stated in the Fourmile Travel Management Plan. These roads would be available for administrative access where it does not conflict with Design Criteria #10.

27. Gates and/or barricades would be installed on temporary roads and existing closed roads to restrict use by the public during operations and until final road closures occur.
28. In forested areas, a 200-foot untreated buffer on each side of the road would be maintained along 75% or more of system roads to discourage and minimize OHV use and to maintain visual screening for wildlife. Mechanical treatment would not take place in the buffer, but prescribed fire may be allowed; hazard trees may be mechanically removed.
29. Access routes would be designated within public firewood areas.
30. Only administrative and permitted access would be allowed on new temporary roads and previously closed roads.
31. Temporary roads used during the project activities would be closed by ripping and seeding with a native seed source, then signed to inform the public vegetative restoration is in progress. Road closures would occur within six months after completion of the treatment(s) in that unit.
32. To reduce risk of spreading noxious weeds, heavy equipment would be cleaned and inspected prior to entering the project area. Treatment areas would be monitoring pre and post treatment for noxious weeds. Weed locations would be sent to the Noxious Weeds Coordinator and scheduled for treatment.

The following sections discuss each of these alternatives.

2.1.1 Alternative 1: No Action

The No Action alternative (Map 2.1) is used as a baseline to compare and analyze the other action alternatives. It is defined as a continuation of existing management practices. It considers what may occur if the proposed project does not occur. Current management plans would continue to guide management of the project area, including the Fourmile Travel Management Plan and current range allotment management plans.

Forest stands and habitat conditions would continue their current trends. Tree growth would continue to be suppressed in dense stands; the development of different stand structure and age classes would continue to be limited. MPB may continue to cause high mortality in the remaining ponderosa pine stands converting them to early seral stages.

In the short-term, a high number of snags would be present within the project area; long-term, the number of snags would likely decrease as the MPB activity lowers. Current snags (due to MPB mortality) would rapidly fall (3 to 5 years) due to wind and rot at the base of the trees. As snags fall, they would provide CWD that would provide high quality habitat for a variety of wildlife species, contribute to organic material, and nutrient recycling. This would also increase the hazardous fuel accumulation in the project area.

2.1.2 Alternative 2: Proposed Action

This alternative would use mechanical thinning, salvage timber harvesting, and prescribed fire to improve fire regime condition class and reduce hazardous fuels within the project area. Treatment activities would include: 1) salvage timber harvesting in ponderosa pine and mixed conifer stands infested with insect and disease, 2) thinning

treatments in ponderosa pine and mixed conifer stands to reduce stand density and create openings (patch cuts) in mixed conifer and piñon-juniper stands to promote natural regeneration and improve wildlife habitat, and 3) prescribed burning to reduce residual slash, improve stands in condition class 2 and 3, maintain stands currently in condition class 1, and create open areas in piñon pine, juniper and shrublands to improve wildlife habitat. See Map 2.2 for the location of treatments for Alternative 2.

Alternative 2 would follow current management direction established under the Fourmile Travel Management Plan and current range allotment management plans.

Approximately 6.6 miles of new temporary road would be created (Map 2.3); approximately 10.9 miles of existing closed roads (Map 2.3) would be reopened for temporary use; and approximately 1.0 mile of temporary stump roads would be used for use under this alternative. No new system roads would be created. The temporary and existing closed roads would be closed following implementation. See the Road Plan, Appendix A for road closure methods for temporary and existing closed roads.

Treatment Types

Prescription A: Prescribed Fire (approximately 5,100 acres)

The objective of prescribed fire is to reduce hazardous fuel accumulation, promote regeneration (grasses, forbs, shrubs, and trees) and reintroduce fire into fire-dependent ecosystems.

The prescribed fire units would be delineated using natural fuel breaks, roads, handline, and wetline; mechanical thinning may be completed prior to ignition to improve holding features. No product removal would occur. Aerial ignition (ping-pong ball, helitorch), hand ignition (drip torches, fusees) and/or all terrain vehicle (ATV) ignition may be used. Fire managers would work with resource specialist to determine if handlines need to be rehabilitated.

A prescribed fire plan and appropriate smoke permits would be completed and approved prior to burning. The prescribed fire plan would address such items as unit delineation, weather parameters, necessary holding resources, sensitive areas (i.e. power lines, highways, and improvements), public safety, and smoke concerns. Prescribed burning of individual units would likely be completed in 2 to 3 days, with residual smoke lasting 3 to 5 days.

Pile burning would take place in areas where broadcast burning is not desired or where fuels must be reduced prior to broadcast burning. The average size of hand piles is 6 feet long x 6 feet wide x 6 feet high. The average size of mechanical piles is 6 long feet x 6 feet x 10 feet high. The burning of the piles usually takes place in the winter months.

Ponderosa pine & Douglas-fir: In stands not designated for mechanical treatments (salvage, thinning), prescribed fire would be used to maintain stands of ponderosa pine and Douglas-fir in their current condition, reduce hazardous fuel accumulations, and

return fire to the ecosystem. The desired result would be a mosaic of approximately 50 to 80% of the understory (duff, needles, grass, and small trees) vegetation burned.

Light mechanical preparation work may be needed to ensure the prescribed fire is maintained within the prescription set forth in the prescribed fire plan. Examples of preparation work include: 1) limbing trees to a height of approximately 6 to 10 feet (primarily along firelines and at critical holding points), 2) construction of handline and/or ATV dragline, to mineral soil, as a boundary between burn units, 3) bucking and removing large concentrations of dead and down material from beneath larger live trees and snags (dead and down material would be moved to open areas within the unit), and 4) falling snags near holding lines to ensure control of the prescribed burn. Where available, natural and existing fuel breaks would be used.

Piñon-juniper: Prescribed fire would be used to create openings within the piñon pine and juniper stands to improve habitat for wildlife, such as bighorn sheep. The desired result would be a mosaic pattern in the piñon-juniper stands of less than 25% of the overall stand burned (overstory).

Mechanical thinning may be needed to allow the prescribed fire to carry in a controlled fashion. Examples of thinning include: 1) limbing trees and 2) falling and limbing trees. Additional light mechanical preparation work may be needed to ensure the prescribed fire is maintained within the prescription set forth in the prescribed fire plan. Examples of preparation work include: 1) construction of hand line as a boundary between burn units, 2) bucking and removing large concentrations of dead and down material from beneath larger trees (dead and down material would be moved to open areas within the unit), and 3) falling snags near unit boundaries to maintain control of the prescribed burn. Where available, natural and existing fuel breaks would be used.

Meadows & shrublands: Prescribed fire would be used to improve the health of the rangeland and improve the forage. The desired result would be a mosaic pattern in the meadows and shrubland of approximately 50 to 75% of the vegetation burned.

Preparation work may be needed to ensure the prescribed burn is maintained within the prescription set forth in the prescribed fire plan. Examples of preparation work include the construction of handlines, to mineral soil, and the removal of brush. Where available, natural and existing fuel breaks would be used.

Prescription B: Salvage, Thinning, & Prescribed Fire (approximately 3,000 acres)

Ponderosa pine: Dead stands of ponderosa pine and ponderosa pine trees infected with insect and disease that are in excess of the required snag and CWD numbers needed within treatment areas (see Design Criteria #25) may be harvested and removed from the area. In areas of heavy MPB activity, infested trees would be removed and remaining trees may be thinned, if needed, to maintain the residual mature stand. Methods of removal include but are not limited to chainsaws, harvesters, skidders, dozers and log trucks.

Stands of healthy ponderosa pine (stands that have minimal or no insect or disease infestation) may be thinned to reduce overall stand density and improve the health and vigor of the remaining ponderosa pine. Feed trees, nest trees and clumps around trees used by Abert's squirrels would be retained. A 60-acre control plot has been established within the project area; mechanical treatment (i.e., harvest of trees) would be excluded from this plot (Design Criteria # 24).

After harvesting is complete, the slash and hazardous fuels in the area may be reduced through fuelwood gathering and/or prescribed fire. Prescribed fire includes pile burning, broadcast burning or a combination of both. See the section on prescribed fire for more details.

The desired result would be less than 40% canopy closure The BA would be an average of 50 square feet over the treatment area, incorporating areas with heavier thinning (more open) and areas that are greater than 180 square feet BA with interlocking canopy (see Design Criteria #23). Existing regeneration needed for desired stocking levels would be protected where practical.

Mixed conifer (ponderosa pine & Douglas-fir mix): Dead stands of ponderosa pine and Douglas-fir that are in excess of the required snag and CWD numbers needed within treatment areas (see Design Criteria #25) may be harvested and removed from the area. In areas of heavy MPB activity, infested trees would be removed and remaining trees may be thinned, if needed, to try and maintain the residual mature stand. Remaining stands may be thinned to reduce stand density. Methods of removal include but are not limited to chainsaws, harvesters, skidders, dozers and log trucks.

After harvesting is complete, the slash and hazardous fuels in the area may be reduced through fuelwood removal and/or prescribed fire. Prescribed fire includes pile burning, broadcast burning or a combination of both. See the section on prescribed fire for more details.

The desired result would be less than 40% canopy closure. The BA would be an average of 60 square feet over the treatment area, incorporating areas with heavier thinning (more open) and areas that are greater than 180 square feet BA with interlocking canopy (see Design Criteria #23). In areas with residual aspen stands the objective of the treatment would be to stimulate the regeneration of aspen. Large diameter trees, minor species and five-needled pines would be favored for retention. Existing regeneration needed for desired stocking levels would be protected where practical.

Lodgepole pine: Lodgepole pine that are in excess of the required snag and CWD numbers needed within treatment areas (see Design Criteria #25) may be harvested and removed from the area. Lodgepole pine stands would be harvested to: 1) create small openings of less than ten acres (patch cuts) and 2) thin the trees in between the openings. .Openings would be created to promote natural regeneration in the area and increase structural diversity. Methods of removal include but are not limited to chainsaws, harvester, skidders, dozers and log trucks.

After harvesting is complete, the slash and hazardous fuels in the area may be reduced through fuelwood removal and/or prescribed fire. Prescribed fire includes pile burning, broadcast burning or a combination of both. See the section on prescribed fire for more details.

The desired result would be less than 40% canopy closure and would maintain an average stand density of 80 square feet BA. Existing regeneration needed for desired stocking levels would be protected where practical.

Prescription C: Salvage & Thinning (approximately 600 acres)

Mixed conifer (ponderosa pine & Douglas-fir): This treatment would occur on north facing slopes where prescribed fire treatments (broadcast burning) are not desired. In these stands the main vegetation type is predominantly Douglas-fir with scattered ponderosa pine.

Mixed conifer stands would be harvested to remove dead and dying ponderosa pine and Douglas-fir that are in excess of the required snag and CWD numbers needed within treatment areas (see Design Criteria #25). In areas of heavy MPB activity, infested trees would be removed and remaining trees may be thinned, if needed, to try and maintain the residual mature stand. Remaining stands may be thinned to reduce stand density. Methods of removal include but are not limited to chainsaws, harvesters, skidders, dozers and log trucks.

Stands of healthy ponderosa pine (stands that have minimal or no insect or disease infestation) may be thinned to reduce overall stand density and improve the health and vigor of the remaining ponderosa pine. Feed trees, nest trees and clumps around trees used by Abert's squirrels would be retained. A 60-acre control plot has been established within the project area; mechanical treatment (i.e., harvest of trees) would be excluded from this plot (Design Criteria #24).

In dominant mixed conifer stands that have a residual aspen understory the objective of the treatment would be to stimulate the regeneration of aspen. Large diameter aspen, both live and dead, would be retained to maintain wildlife habitat and diversity in the stands. Methods of removal include, but are not limited to chainsaws, harvesters, skidders, dozers and log trucks.

Fuelwood sales may be used to reduce fuel loadings. In areas with heavy, residual hazardous fuels, pile burning may used. Slash from timber sales may also be chipped or lopped and scattered. See the section on prescribed fire for more details on pile burning.

The desired result will be less than 40% canopy closure. The BA will average 60 square feet over the treatment area, incorporating areas with heavier thinning (more open) and areas that are greater than 180 square feet BA with interlocking canopy (see Design Criteria #23).

Piñon-juniper: This treatment would occur in piñon-juniper stands to create opening for wildlife. The openings within the stand would be at least 10 to 20 acres in size (patch cuts). Cut material would be lop and scatter throughout the unit.

Prescription D: No Treatment (approximately 5,200 acres)

These are acres that have been reviewed and no treatment is desired at this time due to slope, access, and current vegetation conditions.

2.1.3 Alternative 3

This alternative is similar to Alternative 2. The primary difference between Alternative 2 and Alternative 3 is the location of specific treatment prescriptions and the number and miles of temporary roads created, and existing closed roads reopened for temporary use. The difference in the miles of roads and treatment prescription was based on the following considerations brought forth from both internal and external scoping: slope steepness, access, continuity of the vegetation, and natural fuel breaks for prescribed fire. See Table 2.1 for a comparison of the action alternatives by treatment and Table 2.2 for a comparison of the action alternatives by road types and miles.

Alternative 3 would follow current management direction established under the Fourmile Travel Management Plan and current range allotment management plans.

Mechanical thinning, salvage timber harvesting, and prescribed fire would be used to improve fire regime condition class and reduce hazardous fuels within the project area (Map 2.4). Types of treatments include: 1) salvage timber harvesting in ponderosa pine stands infested with insect and disease, 2) thinning treatments in mixed conifer stands to reduce stand density and create openings in mixed conifer to promote natural regeneration, and 3) prescribed burning to reduce residual slash, improve stands in condition class 2 and 3, maintain healthy stands currently in condition class 1, and create open areas in piñon-juniper stands and shrublands to improve wildlife habitat. Areas located in high elevation spruce-fir would be recommended for fire use should future management direction allow.

Approximately 6.0 miles of new temporary road would be created (Map 2.5); approximately 10.6 miles of existing closed roads would be reopened (Map 2.5) for temporary use; and approximately 1.0 mile of temporary stump roads would be used for use under this alternative. No new system roads would be created. The temporary and existing closed roads would be closed following implementation. See the Road Plan, Appendix A for road closure methods for temporary and existing closed roads.

Treatment Types

The description of the treatment types are the same as described in Alternative 2. The difference between the two action alternatives is the number of acres treated and location of those treatment units. Acres per treatment type for Alternative 3 are:

Prescription A: Prescribed Fire - approximately 6,800 acres

Prescription B: Salvage, Thinning, & Prescribed Fire - approximately 2,600 acres

Prescription C: Salvage & Thinning - approximately 700 acres

Prescription D: No Treatment - approximately 4,800 acres

2.2 COMPARISON OF ALTERNATIVES

Table 2.1 summarizes the number of acres by treatment type that is proposed for the two action alternatives. Table 2.2 summarizes the miles of roads including temporary roads that will be used and/or created by each action alternative; it does not include current system roads.

TABLE 2.1 COMPARISON OF ACTION ALTERNATIVES BY ACRES

Treatment Type	Alternative 2 – Proposed Action (Approximate Acres)	Alternative 3 (Approximate Acres)
Prescribed Fire	5,100	6,800
Salvage, Thinning & Prescribed Fire	3,000	2,600
Salvage & Thinning	600	700
No Treatment	5,200	4,800
Total Acres	13,900	14,900

* all numbers were rounded up to the nearest 100.

TABLE 2.2 COMPARISON OF ROADS NEEDED FOR EACH ACTION ALTERNATIVE.

Type of Roads	Alternative 2 – Proposed Action (Approximate Miles)	Alternative 3 (Approximate Miles)
Existing Closed Road	10.9	10.6
New Temporary Road	6.6	6.0
Temporary Stump Road	1.0	1.0

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Alternative 4: Approximately 50,000 acres would be treated using commercial timber sales, public fuelwood sales, and prescribed burning to: 1) treat ponderosa pine stands infested with insect and disease, 2) thin stands of ponderosa pine, 3) lodgepole pine and mixed conifer stands, and 4) reduce hazardous fuel accumulations. The project area included areas located on both the north and south sides of Highway 24/285.

The alternative was eliminated from consideration due to the large area it covered. Resource specialists within the Forest Service determined that the necessary field work

needed for the analysis was unfeasible for such a large area within a reasonable time frame.

Alternative 5: Harvesting would be limited to areas with MPB infestations. Slash and hazardous fuels would be reduced using prescribed fire. The only treatments would be salvage and prescribed fire.

This alternative was eliminated because it would not improve the health of the remaining forested stands nor improve wildlife habitat in areas, such as piñon-juniper stands and grass.

Alternative 6: This alternative would only use prescribed fire to treat hazardous fuel accumulations and improve forest health conditions. Prescribed fire would help to reduce hazardous fuels in limited areas with lighter fuel loads and would re-introduce fire into portions of the watershed. Mechanical treatments would only be used to complete preparation work for prescribed burning.

This alternative was eliminated because it would not reduce hazardous fuels in the majority of the project area; areas with the heaviest fuel loading would not be treated under this alternative due to the high likelihood of escape during prescribed fire operations.

Alternative 7: This alternative would only use mechanical thinning to treat hazardous fuel accumulations and improve forest health.

This alternative was eliminated because mechanical thinning would reduce hazardous fuel but would not re-introduce fire into the watershed, maintaining the health and diversity of fire adapted ecosystems.

2.4 MITIGATION MEASURES

Mitigation measures are post analysis actions added and analyzed to further reduce environmental impacts; analysis will show how mitigation measures help to reduce impacts. Design criteria (Section 2.1 Alternatives) are pre analysis actions designed into the action alternatives to reduce impacts.

Mitigation measures maybe identified in specialist reports and brought forward into this section.

2.4.1 Soils

1. If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows.
2. For pile burning, piles would be burned with at least one inch of rain in the prior 48 hours, in winter when there is a minimum of one inch of snow on the ground, or when soils beneath the piles are frozen.

2.4.2 Hydrology

Prescription A: Prescribed Fire

1. Properly dispose of slash and other debris associated with light mechanical preparations. Keep slash and debris out of riparian areas including perennial streams.

Prescription B: Salvage, Thinning & Prescribed Fire

1. All mitigations listed for Prescription A apply.
2. Control erosion from designated skid trails and landing .

Prescription C: Salvage and Thinning

1. All mitigations listed for Prescription A apply.
2. All mitigations listed for Prescription B apply.

2.4.3 Cultural and Heritage Resources

Adverse effects would be eliminated through avoidance; beneficial treatments would be tailored for each specific situation as to not damage or alter the integrity of the historic property.

2.4.4 Recreation

The annual Collegiate Peaks Marathon run happens in early May and bisects the Lenhardy Road (FSR 376) west of FSR 376 A. Logging activity on this short section of the FSR 376 would be halted during the day of the running event.

Landings would avoid heavily used dispersed recreation sites.

2.5 MONITORING PLAN

Monitoring includes both Forest-level and project-level analysis and evaluation. Forest-level monitoring is discussed at length in the Forest Plan and is not reiterated here. Project-level monitoring is the focus of this section of the EA.

2.5.1 Current Monitoring

Current monitoring includes monitoring that is currently occurring in the project area and will continue to occur. It includes:

2.5.1.1 Range

Annually, the Forest Service and the permittees develop an Annual Operating Instructions (AOI) for the allotments. This plan outlines rotation schedules, maintenance requirements and a list of improvements to be installed for the season. Once cattle are put on the allotments, periodic inspections by the District's Range Conservationist occur throughout the season checking for utilization, cattle distribution, and any other resources concerns. This monitoring is planned to continue on an annual basis.

2.5.2 Implementation Monitoring

Implementation monitoring is short-term monitoring and evaluates whether the prescribed treatments are being applied as prescribed.

2.5.2.1 Overall Project

To ensure the desired future conditions are met and the design criteria have been implemented, an Interdisciplinary Implementation Team would annually review treatment areas and review the implementation of this project. Steps would be taken to correct or adjust treatments where these measures are not being met or if the desired future condition is not being achieved.

2.5.2.2 Noxious Weeds

For noxious weeds, treatment areas would be monitored pre and post treatment for noxious weeds. Weed locations would be sent to the Noxious Weeds Coordinator and scheduled for treatment.

2.5.2.3 Wildlife

Raptor Sites: Known raptor nest sites and territories would be monitored (surveyed) during project implementation to ensure adequate protective measures are enacted and effective to avoid and/or minimize impacts. Protocol wildlife surveys (e.g., goshawk and other raptors) would be conducted, within suitable habitat for these species, prior to implementation to ensure these wildlife species have not moved from known locations or new sites are not present within treatment areas.

Snags/CWD: Post treatment sampling would occur within treatment units to determine if the desired number and type of snags and CWD are left (see Design Criteria #25). If sufficient snags and/or CWD are not present, steps would be taken to create snags and/or CWD where necessary.

MIS (Abert's squirrel): Long-term monitoring control plots have been established within the project area to determine Abert's squirrel use (by measuring Abert's sign) within ponderosa pine stands. This plot is part of a Forest wide monitoring program to determine how management on the Forest impacts these species. The 60-acre plot is a control plot that would be used as a baseline to compare other plots where mechanical

treatments have or would take place. Mechanical treatments such as harvest of trees would be excluded within control plots.

2.5.3 Effectiveness Monitoring

Effectiveness monitoring is long-term monitoring and focuses on determining whether the project area is meeting or moving toward desired future conditions, and if the rate of change is acceptable. This level of monitoring is intended to ensure that all resource areas are meeting or moving toward desired future conditions (within the scope of this analysis). The rate of acceptable change is determined by the responsible official unless expressly directed otherwise in the Forest Plan.

2.5.3.1 Overall Project

To ensure the desired future conditions are met and the design criteria have been implemented, an Interdisciplinary Implementation Team would annually review treatment areas and review the implementation of this project. Steps would be taken to correct or adjust treatments where these measures are not being met or if the desired future condition is not being achieved.

2.5.3.2 Wildlife

Raptor Sites: Known raptor nest sites and territories would be monitored (surveyed) during project implementation to ensure the protective measures enacted are effective to avoid and/or minimize impacts and protect known sites from adverse impacts.

Snags/CWD: Post treatment sampling would occur within treatment units to determine if the desired future condition (number and type of snags and CWD are left as defined in Design Criteria #25). If sufficient snags and/or CWD are not present, steps would be taken to create snags and/or CWD where necessary.

3.0 AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

3.1 VEGETATION AND FIRE

3.1.1 Affected Environment

Vegetation

The lower elevations in the west and south are a piñon-juniper woodland type. Ponderosa pine and Douglas-fir become dominant in the valleys to the north and east. Douglas-fir is more common on north aspects. Limber pine occurs sporadically throughout the western part of the project area, intermixed with ponderosa pine and Douglas-fir. In the higher elevation area of the central part of the project area, lodgepole pine is dominant for a couple hundred acres. Douglas-fir is common on the east aspects west of Chubb Park. North of Chubb Park is an area of Douglas-fir and blue spruce. Northeast of Chubb Park is an area dominated by ponderosa pine with Douglas-fir on north aspects, a few blue spruce, and piñon-juniper stands on steep south aspects. Aspen is present in some of the draws but is not common over the project area.

Ponderosa pine has been increasingly infested with MPB for approximately four years. Mortality is most pronounced in the area northeast of Chubb Park where approximately 90% of the ponderosa pine is either dead or infected with MPB. In the western areas, including Goddard Ranch and the southwestern areas there is moderate amount of MPB mortality; this area is not as severely impacted as the area northeast of Chubb Park. Ponderosa pine regeneration of seedlings and saplings is common throughout the project area including those areas severely impacted with MPB.

Douglas-fir in the area west and north of Chubb Park was severely impacted by spruce budworm in the 1980's and early 1990's. Dwarf mistletoe is present in both ponderosa pine and Douglas-fir at various levels of infestations.

Aspen is in decline over some but not all areas within the project area. In some areas, it is being encroached upon by conifers, has been weakened by extended drought, and is under attack by pathogens and insects. The large scale drought related aspen mortality currently being experienced in other parts of Colorado has not been seen in the project area; overstory aspen mortality has been seen a few miles to the east of the project area. Other stands of aspen consisting of large diameter trees are meeting the desired condition and are providing important habitats for wildlife species.

Grasses, forbs, and shrubs including mountain mahogany, common juniper, kinnikinnick, woods rose, gooseberry, currant, snowberry, cinquefoil, pussytoes, Richardson's geranium, and native grasses occur throughout the area. Grasses are especially abundant in areas experiencing MPB mortality. (See Section 3.4 Range for additional information.)

Fire

Fire regimes for grass, brush, ponderosa pine, and Douglas-fir have been altered somewhat due to past and current fire suppression, grazing, and logging activities; high mortality rates in conifers stands from insect and disease have increased the likelihood of high intensity wildfire occurring in these stands. The overall effect has been denser stands that may be more susceptible to mixed and high severity fires. Fire suppression, grazing and logging activities have not impacted lodgepole pine as much as the other vegetation types due to the longer fire return interval for lodgepole pine (typically over 100 years).

Table 3.1 show the typical fire regimes for the vegetation types in the project area.

TABLE 3.1 TYPICAL FIRE REGIMES FOR VEGETATION TYPES IN THE PROJECT AREA

Vegetation	Fire Regime	Frequency & Severity
Meadows & brush	I	High frequency (0-35 year) & low to mixed severity
Ponderosa pine	I	High frequency (0-35 year) & low to mixed severity
Douglas-fir	III	Low frequency (35 – 200 year) & mixed severity
Lodgepole pine	III	Low frequency (35 – 200 year) & mixed severity

3.1.2 Environmental Consequences of the Alternatives

3.1.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

Vegetation

MPB mortality would 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 and Douglas-fir would expand. In some areas aspen would be encroached by conifers and may experience decline and mortality due to pathogens and insects; in other area aspen would likely start to regenerate due to new openings that have been created by MPB mortality. Mortality from spruce budworm would deteriorate and would fall down, increasing the amount of dead fuel buildup. A Douglas-fir understory would develop.

See the Section 3.4 Range for additional information on grasses, forbs, and shrubs.

Fire

Under the No Action alternative fire behavior would vary across the fuel types. Fire behavior in grass and brush would occur as low to moderate intensity surface fire; ponderosa pine and 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.

3.1.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

Vegetation

Dead ponderosa pine and to a lesser extent for Douglas-fir would be salvaged and removed from the site. Salvaging dead and dying trees would decrease the likelihood of high intensity wildfire. Development of a ponderosa pine seedling and sapling understory would continue. Snag and down wood levels, needed for wildlife habitat, would remain.

Stands of ponderosa pine and Douglas-fir not impacted by insects or dwarf mistletoe would be thinned to below stocking thresholds where insect infestation is likely. MPB in ponderosa pine and Douglas-fir beetle in Douglas-fir are the principal insects being planned for. These efforts should maintain live conifer stands for wildlife habitat as well maintain dead, dying trees, and trees infected with dwarf mistletoe, which are important for many wildlife species. Dwarf mistletoe in ponderosa pine and Douglas-fir would be decreased where some but not all infected trees are removed or girdled. Infected seedlings would be removed in timber stand improvement activities.

In stands with conifer encroachment, aspen clones would expand where encroaching and surrounding conifers have been removed; this would result in establishment of new aspen regeneration. Other aspen stands would likely start to regenerate due to new openings that have been created by MPB mortality. Snag and CWD needed for wildlife habitat would remain.

Small patch cuts in lodgepole pine would encourage lodgepole pine regeneration.

Fire

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

During prescribed fire operations, pockets of higher intensity fire (torching) may occur where residual slash from thinning operations or untreated pockets exist. Prescribed fire in open ponderosa pine and Douglas-fir stands would help to maintain more open stands and maintain lower intensity surface fire within the stands.

3.2 AIR QUALITY

3.2.1 Affected Environment

The air quality in and around the project area is good; factors that impact the local airshed include pollutants from Highways 24/285 and wood smoke from fireplaces. There are no non-attainment areas in the upper Arkansas River Valley. The closest non-attainment area is the Denver Metro area approximately 100 miles to the east. During the winter, inversions often trap particulates close to the surface, especially in the late evening and early morning hours. Regional haze from Colorado Springs and Denver tends to affect the area. Visibility of the Collegiate Peaks and the 14,000 feet plus peaks in the area is an important air quality consideration.

Smoke Sensitive Areas

Several smoke sensitive areas lie within a 30 mile radius of the project area and are displayed below. While these areas do not necessarily meet the official definition of smoke sensitive, experience has shown that these areas need to be considered when planning and executing prescribed fires.

FIGURE 3.2 SMOKE SENSITIVE AREAS NEAR THE PROJECT AREA

Area	Distance from Boundary	Direction
Buena Vista	6 miles	west
Leadville	30 miles	northwest
Salida	25 miles	south
Fairplay	30 miles	northeast
Highway 24/285	0 – 8 miles	south & east

Wilderness areas

There are no Class 1 Federal Airsheds near the project area; the closest Class 1 Federal Area is over 60 miles northwest of the project area (Maroon Bells-Snowmass Wilderness). Though the wilderness areas surrounding the project area are not Class 1 Federal Areas, the appeal of the area for tourists is the good view of the peaks in the area. The wilderness areas and their distance from the project area are displayed below.

FIGURE 3.3 WILDERNESS AREAS NEAR THE PROJECT AREA.

Wilderness Areas	Distance from Boundary	Direction
Buffalo Peaks Wilderness	9 miles	north
Collegiate Peaks Wilderness	15 miles	west
Mount Massive Wilderness	35 miles	northwest
Lost Creek Wilderness	45 miles	northeast

3.2.2 Environmental Consequences of the Alternatives

3.2.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

If no fuels reduction work is done and no prescribed burning takes place in this area, it is likely that prescribed fire would be used elsewhere on the Mountain Zone (Salida and Leadville Ranger Districts) and adjacent districts.

3.2.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

The areas most likely to be affected by smoke produced from broadcast and pile burning lie within Highway 24/285 corridor and the Arkansas River Valley; the areas include the towns of Buena Vista and Nathrop. Smoke impacts would be of short duration (2 to 5 days) and have only temporary effects. Smoke is expected to remain at nuisance levels rather than at levels that could impair human health. Impaired visibility in the immediate area of burning is possible. The further from the prescribed fire a given area is, the less likely that area would experience high levels of smoke.

There is essentially no difference between the No Action and Proposed Action alternatives in terms of expected annual emissions. The zone currently uses a range of smoke management and emission reduction techniques to reduce potential impacts during prescribed burning. Techniques include: low fuel moistures, burning during daylight hours only, stopping ignition a minimum of two hours prior to sunset, and concentrated fuel loadings (piles) for rapid consumption. Smoke production from the burning of slash piles would be minimal and of short duration. Prescribed fire would be used primarily from fall to spring, thus reducing impacts to summer recreational activities. Prescribed fire activities may have some short term impacts on fall hunting seasons, including limited access to areas where prescribed fire activity is occurring and short term smoke impact to visitors. The heaviest smoke impact would be to firefighters during implementation and mop-up of prescribed burns.

Smoke production is a direct function of the amount of biomass burned; the more fuel, the more smoke. Piles would be burned to maximize fuel consumption, decrease periods of smoke impacts, and increase smoke dispersion. Nighttime smoke concentrations would often be heavier than daytime smoke concentration. At night, smoke tends to

settle closer to the ground in the cooler air and flow down the nearest drainage. People living along the drainage bottom would experience more smoke than people living further uphill.

All ignitions for the prescribed burn would follow direction set in the prescribed fire plan for that specific area. Prescribed fire plans follow direction set forth in the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (2006) and Forest Service specific manual direction. Smoke management follows all Colorado Air Pollution Control Division regulations and permitting process. Specifics for state regulated smoke emission requirements can be found at http://www.cdphe.state.co.us/ap/smoke/.

Cumulative Effects

Under the No Action and the action alternatives, smoke impacts are expected to be more concentrated in the summer months, when large fires could be expected. Pile burning would take place fall through spring and would not occur concurrently with wildland fire. The Mountain Zone Fire organization manages all prescribed fire on the zone, limiting the likelihood of several ongoing prescribed fires. Prescribed fire used by other districts or agencies would have little direct impact on the area other than potential visibility reduction with increased regional haze.

3.3 NOXIOUS WEEDS

3.3.1 Affected Environment

Surveys have been conducted on the project area for noxious weeds. Several sites have been identified in Chubb Park, McGee Gulch, Shield Gulch, and near Goddard Ranch (see the Noxious Weed section of the analysis file for the map of known weed locations). These sites include Canada thistle, downy brome, and hoary cress (whitetop). Each year, once weed sites have been located, efforts are made to treat these weeds. This effort is outlined in the “Invasive Species Action Plan” for the Pike and San Isabel National Forests approved in December 2006.

3.3.2 Environmental Consequences of the Alternatives

3.3.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

If no treatments are conducted in the project area, noxious weeds would continue to become established; weed seeds are transported along Highway 24/285 on trucks hauling hay and livestock. Recreational vehicles, ATVs and horses using and camping in the area, increasely importing new weed species to the project area. Monitoring and treatment would continue by the District. Educating the Forest users on the problems of noxious weeds on public lands and enforcement of weed-free hay regulations would continue.

Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

Both action alternatives would require yarding, skidding, and temporary road construction that would disturb soils and create a potential for new noxious weed sites. The treatment areas would be monitored and any new infestations found would be treated through the District's noxious weed program.

3.4 RANGE

3.4.1 Affected Environment

There are two grazing allotments within the North Trout Creek project area: Chubb Park and Fourmile.

The Chubb Park Allotment currently has 33 cow/calf units permitted for a five month grazing season (June 1 – October 31 annually). An additional 113 cow/calf pairs are permitted on a private land permit for the Colorado State Land Board (State) and private lands in Chubb Park. The majority of the available and suitable forage is located in the bottom lands and riparian areas on the State and private lands. Forest lands border State and private lands on both the east and west sides of Chubb Park; this land provides the upland forage. For the past five years, this allotment has experienced drought conditions. As a result, the permittee has taken "non-use for resource protection" for 2002, 2004, 2005, and 2006 grazing seasons.

FIGURE 3.1 CHUBB PARK LOOKING NORTH TOWARDS BUFFALO PEAKS

FIGURE 3.2 CHUBB PARK LOOKING SOUTH TOWARDS HIGHWAY 24/285

The majority of the Forest lands within the Chubb Park Allotment are forested with upland grass communities. Tree species include blue spruce (*Picea pungens*, Engelm.), ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*) and aspen (*Populus tremuloides*). These forest stands are mature and have been infected with mountain pine beetle. High mortality has occurred throughout these stands, especially in the ponderosa pine and Douglas-fir.

The following describes the existing condition of the Chubb Park allotment:

Grassland: Good species diversity is present in grasses and forbs, established upland grasses lacking vigor, drought stress is evident; noxious weeds are localized (Canada and musk thistle).

Stream/riparian: Forest lands have good vegetation cover with native riparian species present and some non-native species present (Canada thistle, musk thistle, pennycress, smooth brome, and Kentucky bluegrass). Recent willow dieback is possibly due to drought.

Mesic meadow: On the Forest lands hummocking is present. Species composition is dominated by tufted hairgrass.

Bench/transition areas: There is localized incidence of bare ground; vegetation cover of native species present is fair with non-native species present (Canada and musk thistle). Shrubby cinquefoil die off is occurring.

Upland shrub: Mature shrub community is composed of mountain mahogany, rubber rabbitbrush, mountain sagebrush, and currant; there is good growth and regeneration of mid-late seral shrub species. Native grasses and forbs are interspersed.

Aspen: Understory consists of down logs, with native forbs and grasses present, but grasses are largely decadent.

Ponderosa pine/Lodgepole pine/Mixed Conifer Forest: Bunchgrass understory is increasing under dead stands of ponderosa pine. In the mixed conifer, where past spruce budworm activity has resulted in a loss of 40% of the Douglas-fir community, upland grasses are increasing in quality and quantity.

FIGURE 3.3 UPLAND GRASSES INCREASING DUE TO DECREASE OF OVERSTORY VEGETATION COVER

The Fourmile Allotment currently has 50 cow/calf units permitted for a four month grazing season (June 1 – September 30 annually). For the past five years, this allotment

has experienced drought conditions. As a result, the permittee has taken non-use for resource protection for 2002, 2003, 2004, 2005 (50%), and 2006 grazing seasons.

The majority of the Forest lands within the Fourmile Allotment are forested with upland grass communities. Tree species include blue spruce, ponderosa pine, Douglas-fir, and aspen. These forest stands are mature. The ponderosa pine has been infected with MPB. High mortality has occurred throughout these stands, especially in the ponderosa pine and Douglas-fir.

Grazing within the allotment has been primarily in the bottomland and riparian areas of the Sevenmile and Fourmile drainages. The forested and uplands area have had less use and utilization of the grass resources.

FIGURE 3.4 FOURMILE ALLOTMENT: GODDARD RANCH AND SEVENMILE CREEK AREA

The following describes the existing condition of the Fourmile Allotment:

Grassland: Good species diversity is present in grasses and forbs; the upland grasses are decadent in areas. Drought stress is evident throughout allotment and there is a high incidence of bare ground.

Stream/riparian: There is good vegetation cover in most of the stream channels; willow and riparian graminoids are present and diverse in age structure and species. Cottonwood regeneration is lacking.

Mesic meadow: There is a diverse mixture of forbs, graminoids, and shrubs; systems have experienced significant drying.

Bench/transition areas: There is a high incidence of bare ground in areas; drought stress is evident. There is a high incidence of weedy species and forbs; fringed sage is increasing. Noxious weeds are in limited areas (downy brome, Canada thistle, leafy spurge).

Upland shrub: Good growth and regeneration of mid-late seral shrub species and native grasses; forbs are interspersed.

Piñon-juniper woodland: Stands are decadent in places; there is a diverse mix of native grass, forb, and shrub communities in the understory. Encroachment of piñon-juniper is occurring in the meadows and grasslands.

Aspen: There is evidence of impact to structure and native plant communities in some areas. Aspen is being encroached by conifer. The understory is composed of down logs, forbs and grasses, but grasses are largely decadent.

Ponderosa pine/Lodgepole pine/Mixed Conifer Forest: The bunchgrass understory is increasing under dead stands.

3.4.2 Environmental Consequences of the Alternatives

3.4.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

Under the No Action alternative the following direct effects to the rangeland and grazing are anticipated:

- As trees continue to die, an increase in forage production would occur in the uplands improving range conditions.
- Cattle movement and distribution may be restricted from the increase in dead, windthrown trees. Utilization of the upland grasses may also be restricted.
- Damage to existing range fences would continue to occur, increasing annual maintenance costs to the permittee.

FIGURE 3.5 PONDEROSA PINE APPROXIMATELY FOUR YEARS AFTER MPB INFESTATION

FIGURE 3.6 DEAD TREES AND WINDFALL CAUSE DAMAGE TO ALLOTMENT FENCE IN CHUBB PARK

Distribution of the cattle may be limited and more cattle impacts on the riparian areas would be anticipated.

3.4.2.1 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

The treatments proposed in both action alternatives would have the following effects to the range resources on both allotments:

- Reduction of the tree stocking levels and prescribed fire activities would allow for the increase in forage production; it would also allow for increased grass species composition of desirable grasses and increase the vigor of the plants.
- The salvage and removal of the dead timber would reduce restrictions on cattle movement, thus offering better distribution of cattle on the uplands.
- The maintenance costs of existing structures may be reduced; it is likely less trees would be falling on these structures.

By treating the vegetation, better distribution of the cattle may occur; less cattle impacts on the riparian areas would also be anticipated.

Cumulative Effects

The salvage, thinning and prescribed fire actions proposed in this project would improve the overall grazing management on these allotments in the next several years.

3.5 BOTANY

3.5.1 Affected Environment

Federally Listed, Candidate Species and Forest Service Sensitive Species

A species list from the Fish and Wildlife Service (2006) with all federally listed and candidate species within Chaffee County in Colorado was reviewed for this analysis. In addition, the Region 2 Sensitive Species list (Forest Service 2006) was also reviewed for Forest Service sensitive species. Using these two lists, the District determined which of those plant species had a potential to occur within its' administrative boundaries (Table 3.4). Species not known or with no potential of occurring on the District were documented with rationale (Wrigley et al. 2006.). Using this District list, species known or with a potential to occur or be affected by the proposed action are shown in the table below, and those marked with no potential to occur will not be discussed further. These species have been dropped from further analysis by meeting one or more of the following conditions:

- occurs in habitats that would not be impacted by the proposed activities;
- is outside of the geographical or elevational range of the species;

- species do not occur nor is expected in the project area during the time period activities would occur.

Critical Habitat

There is no proposed or designated critical habitat for any federally listed or proposed species within the project area; therefore, there would be no direct, indirect, or cumulative effects to any critical habitat. Critical habitat is not addressed further in this assessment.

Only those federally threatened, endangered, proposed, and Forest Service sensitive species with the potential to occur on the District and that could potentially be affected by this project (i.e., evaluated species), are addressed hereafter in this assessment.

TABLE 3.4 PLANTS: THREATENED, ENDANGERED, CANDIDATE/PROPOSED, AND FOREST SERVICE SENSITIVE SPECIES WITH THE POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
PLANTS				
Aquilegia chrysantha var. *rydbergii* Golden columbine	S		**ODR**	Along streams and in rocky ravines in mountains; 5,200-8,500 ft; El Paso and Fremont counties
Armeria maritima ssp. *sibirica* Siberian sea thrift	S		**HAB**	Grassy tundra slopes, on wet, sandy, or spongy organic soils; 11,900-13,000 ft; Park & Summit counties.
Asclepias uncialis Dwarf milkweed	S		**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.
Astragalus leptaleus Park milkvetch	S	✓		Moist swales and meadows; South Park to the Wet Mountain Valley; 7,500-10,000 ft; Park, Fremont, and Custer counties.
Botrychium lineare Narrow-leaved moonwort	S	✓		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
Botrychium multifidum Leathery grapefern	S		**ODR**	Mountain meadows; 6,700-9,900 ft; Larimer to Routt counties.
Braya glabella Arctic braya	S		**HAB**	Sparsely vegetated slopes above timberline, especially on calcareous substrates; 12,000-13,000 ft; Chaffee, Gunnison, Park, and Pitkin counties.
Carex diandra Lesser panicled sedge	S		**ODR**	Wet meadows and subalpine willow carrs; 7,400-9,000 ft; Boulder, Grand, Jackson, and Larimer counties.
Carex livida Livid sedge	S		**HAB**	Fens and wetlands; 9,000-10,000 ft; Jackson, Larimer, and Park counties.
Cypripedium parviflorum Lesser yellow lady's slipper	S	✓		Moist forests and aspen groves; 7,400-8,500 ft; Clear Creek, Custer, El Paso, Huerfano, Jefferson, Las Animas, Park, Pueblo, and Teller counties.
Draba exunguiculata Clawless draba	S		**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.
Draba grayana Gray's peak whitlow-grass	S		**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.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
Draba smithii Smith whitlow-grass	S	✓		Upper montane, subalpine and alpine, 8,000-11,000 ft; Custer, Las Animas, Mineral, and Saguache counties.
Drosera rotundifolia Roundleaf sundew	S		**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".
Epipactis gigantea Giant helleborine, stream orchid	S	✓		Seeps, springs, riparian areas and wetlands; 4,800-8,000 ft; western Colorado, also Chaffee, El Paso, Fremont, and Park counties.
Eriogonum brandegeei Brandegee's buckwheat	S		**ELE**	Piñon-juniper or sagebrush, often on grayish limestone soils; 5,700-7,600 ft; Chaffee, El Paso, Fremont, and Park counties.
Eriogonum exilifolium Dropleaf buckwheat	S		**ODR**	Sagebrush flats; North and Middle Parks in Jackson and Grand counties.
Eriophorum altaicum var. neogaeum white-bristle cottongrass	S		**HAB**	Alpine wetlands; 9500-14,000 ft; Eagle, Gunnison, Hinsdale, La Plata, Park, Saguache, and San Juan counties.
Eriophorum chamissonis Chamisso's cottongrass	S		**HAB**	Alpine wetlands; 10,400 ft; the Colorado distribution of this species is not known, partially due to taxonomic issues (the species is often confused with *Eriophorum altaicum* var. neogaeum).
Eriophorum gracile Slender cottongrass	S	✓		Montane and subalpine wetlands, wet meadows and pond edges; 8,100-12,000 ft; Jackson, Las Animas, and Park counties.
Eutrema penlandii Penland alpine fen mustard	T		**HAB ELE**	Alpine areas, downslope from persistent snowfields providing year round moisture, bogs that are wet with a constant source of flowing water; 12,000-12,800 ft; known to occur on the leeward side of the crest of the Mosquito Range, from Hoosier Pass to Mount Sherman, Park and Summit counties
Festuca campestris Rough fescue	S	✓		Subalpine meadows; 11,000 ft; Huerfano County
Festuca hallii Plains rough fescue, Hall fescue	S		**ODR**	Alpine and subalpine grasslands and meadows; 11,000-12,000 ft; Larimer County.
Ipomopsis globularis Globe gilia	S		**HAB**	Alpine ridgetops, and gravelly, calcareous soils; 12,000-14,000 ft; Lake, Park, and Summit counties.
Kobresia simpliciuscula Simple bog sedge	S		**HAB**	Alpine areas including tundra, fens, moist gravel, and glacial outwash; Park and Clear Creek counties.
Machaeranthera coloradoensis Colorado tansy-aster	S	✓		Mountain parks, slopes & rock outcrops & dry tundra; 8,500-12,500 ft; Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Saguache, & San Juan counties.
Malaxis brachypoda White adder's-mouth orchid	S	✓		Riparian areas, amongst mosses; 7,200-8,000 ft; El Paso & Jefferson counties.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
Mimulus gemmiparus Weber's monkeyflower	S	✓		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.
Neoparrya lithophila Rock-loving aletes	S	✓		Piñon-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.
Oenothera harringtonii Arkansas Valley evening primrose	S		**HAB ELE**	Grasslands; 4,700-6,100 ft; El Paso, Fremont, Huerfano, Las Animas, and Pueblo counties.
Parnassia kotzebuei Kotzebue's grass of parnassus	S	✓		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.
Penstemon degeneri Degener's beardtongue	S	✓		Piñon-juniper, ponderosa pine woodlands, & montane grasslands with coarse gravelly or rocky reddish soil with igneous bedrock, rock slab cracks; 6,000-9,500 ft; Fremont & Custer counties
Potentilla rupincola Rocky Mountain cinquefoil	S	✓		Subalpine or montane granitic outcrops amongst ponderosa or limber pine; 6,900-10,500 ft; Boulder, Clear Creek, Larimer, and Park counties.
Primula egaliksensis Greenland primrose	S	✓		Wet meadows, streambanks, willow carrs, fens, and on hummocks; 9000-10,000 ft; Park County.
Ptilagrostis porteri Colorado false needlegrass/Porter feathergrass	S	✓		Hummocks in fens and willow carrs; 9,200-12,000 ft; El Paso, Lake, Park, and Summit counties.
Ranunculus karelinii tundra buttercup	S		**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
Rubus arcticus ssp. *acaulis* Northern blackberry	S	✓		Wetlands in willow carrs and mossy streamsides; 8,600-9,700 ft; Clear Creek and Park counties.
Salix arizonica Arizona willow	S		**ODR**	Meadows, springs, seeps, riparian areas and wetlands; 8,300-10,800 ft; Conejos county
Salix candida Sageleaf willow	S	✓		Fens and pond and stream edges in foothill/montane wetlands; 8,800-10,600 ft; Gunnison, Hinsdale, Lake, La Plata, Larimer, and Park counties.
Salix myrtillifolia Blueberry willow	S		**HAB**	In fens from foothills to alpine; 9,300 ft; Park County.
Salix serissima Autumn willow	S		**HAB**	Wetland areas including marshes, fens, and bogs; 7,800-10,200 ft; Custer, Park, Larimer, and Routt counties.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
Selaginella selaginoides Club spikemoss	S	✓		Marshy areas and wet spruce forests; east side of the Park Range (possibly in Park, Teller, Jefferson, and Douglas counties?); little is known about the distribution of this species in Colorado.
Utricularia minor Lesser bladderwort	S	✓		Shallow water of subalpine ponds; 5,500-9,000 ft; north-central and west-central Colorado; little is known about the Colorado distribution of this easily overlooked plant.
Viola selkirkii Selkirk's violet	S	✓		Forests from montane to subalpine; 6,000-9,100 ft; Douglas, El Paso, and Larimer 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; **HAB**= no habitat present in analysis area; **ELE**= outside of elevational range of species; **INV**= presence of non-native salmonids.

For additional information on plant species, see the Biological Evaluation/Biological Assessment (BE/BA) in the analysis file.

3.5.2 Environmental Consequences of the Alternatives

3.5.2.1 Alternatives 1 (No Action)

Determinations of Effect

A determination of ***no effect*** to *Botrychium lineare* resulting from implementation of the No Action alternative is based on the following rationale:

- a review of the existing information shows no known occurrences of *Botrychium lineare* in the project area,
- no fuel reduction activities, prescribed burning, or road construction would take place.

A determination of ***no-impact*** for all other Region 2 sensitive plant analyzed in this document is based on the following rationale:

- a review of the existing information and field surveys revealed no known occurrences of any Region 2 sensitive plant species in the project area,
- no fuel reduction activities, prescribed burning, or road construction would take place.

Therefore, there would be ***no impact*** to *Astragalus leptaleus, Botrychium lineare, Cypripedium parviflora, Draba smithii, Epipactis gigantea, Eriophorum gracile, Festuca campestris, Machaeranthera coloradoensis, Malaxis brachypoda, Mimulus gemmiparus, Neoparrya lithophila, Parnassia kotzebuei, Penstemon degeneri, Potentilla*

rupincola, Primula egaliksensis, Ptilagrostis porteri, Rubus arcticus var. acaulis, Salix candida, Selaginella selaginoides, Utricularia minor, and *Viola selkirkii*.

3.5.2.2 Alternatives 2 (Proposed Action) and 3

Cumulative Effects

Current management direction is designed to eliminate or reduce possible negative cumulative impacts by protecting TEPS plant species from direct and indirect impacts. MacDonald (2000) reports that a critical step in cumulative effects analysis is to compare the current condition of the resource (in this case TEPS plants) and the projected changes due to management activities (in this case fuels management, mechanical or hand treatment) with the natural variability over time in the resources and processes of concern. This approach is difficult for TEPS plants since long-term data are usually lacking, and many TEPS plant habitats have a long history of disturbance, i.e., an undisturbed reference is often lacking. For some species, particularly those which do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site changes to sensitive plants is an effective way of reducing cumulative impacts. MacDonald (2000) states, "If the largest effect of a given action is local and immediate, then these are the spatial and temporal scales at which the effect would be easiest to detect. If one can minimize the adverse effects at this local scale, it follows that there would be a greatly reduced potential for larger-scale effects". Even though the cumulative effects analysis for TEPS plants is hampered by the absence of historic data and the lack of an undisturbed reference, we can minimize the potential cumulative effects by minimizing the local (direct and indirect) effects. For other species, particularly those that are disturbance tolerators or fire-followers, minimizing on-site changes can be detrimental. These species tolerate or benefit from on-site changes, which result in opening the stand, reducing the potential for catastrophic fire, and increasing light reception in the understory. Thus, the response of sensitive plant species to the management activities is species-dependent.

If adverse effects are not minimized at the local level, cumulative effects may occur. Past and present forest management activities have caused changes in plant community structure and composition across the forests. These management activities have altered the present landscape to various degrees and have had direct, indirect, and possibly cumulative effects on TEPS plant species. These effects can be minimized by following Forest Service standards and guidelines and by implementing integrated design features or mitigation measures to monitor or offset impacts to TEPS plant species. With these protective measures in place, cumulative effects are less likely to be adverse.

At this time there are no known TEPS plant populations within the project area, although abundant habitat exists. General botanical surveys have been performed in support of this project and the Ranch of the Rockies project. These site-specific surveys have resulted in the discovery of several Colorado Natural Heritage Program tracked plant species and several noxious weed populations but no TEPS plant species. Although no populations of TEPS plant species have been found in the project area, it is possible that a small population exists within the project area but escaped discovery during surveys. It is unlikely that substantial populations escaped detection during these surveys.

Therefore, any effects (including cumulative effects) to TEPS plant species are expected to be insignificant and discountable.

Determinations of Effect – Alternative 2 (Proposed Action) and 3

A determination of ***may effect, but not likely to adversely affect*** for *Botrychium lineare* is based on the following rationale:

- although site-specific surveys have been performed, the presence of *Botrychium lineare* cannot be discounted since it is a small and easily overlooked species that may escape detection during standard botanical surveys.
- should the species be present, mechanical treatments and prescribed fire would cause direct and indirect effects.

A determination of ***no-impact*** for *Utricularia minor* is based on the following rationale:

- although limited potential habitat for this aquatic species exists in the project area implementation of the project would not cause changes to its aquatic habitat.

A determination of ***may adversely impact individuals, but not likely to result in a loss of viability in the project area, nor cause a trend toward federal listing*** for *Astragalus leptaleus*, *Botrychium lineare*, *Cypripedium parviflora*, *Draba smithii*, *Epipactis gigantea*, *Eriophorum gracile*, *Festuca campestris*, *Machaeranthera coloradoensis*, *Malaxis brachypoda*, *Mimulus gemmiparus*, *Neoparrya lithophila*, *Parnassia kotzebuei*, *Penstemon degeneri*, *Potentilla rupincola*, *Primula egaliksensis*, *Ptilagrostis porteri*, *Rubus arcticus* var. acaulis, *Salix candida*, *Selaginella selaginoides*, *Utricularia minor*, and *Viola selkirkii* is based on the following rationale:

- there are no known occurrences of any TEPS plant species in the project.
- site-specific surveys revealed no new occurrences of TEPS plant species.
- an occurrence of TEPS plant species 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 3.5 EFFECT DETERMINATIONS FOR EACH SPECIES ADDRESSED IN THIS ASSESSMENT

[1] **STATUS CODES: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=FS sensitive
[2] **NE**=no effect; **NLAA**=may effect, not likely to adversely affect; **NLAA –B**=may effect, not likely to adversely affect – wholly beneficial; **LAA**=may effect, likely to adversely affect; **BI**=beneficial impact; **NI**=no impact; [1] **STATUS CODES: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=FS sensitive
[2] **NE**=no effect; **NLAA**=may effect, not likely to adversely affect; **NLAA –B**=may effect, not likely to adversely affect – wholly beneficial; **LAA**=may effect, likely to adversely affect; **BI**=beneficial impact; **NI**=no impact; **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; and **LRLV**=likely to result in a loss of viability on the Planning Area, or in a trend toward federal listing.=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; and **LRLV**=likely to result in a loss of viability on the Planning Area, or in a trend toward federal listing.

Species Common Name	Scientific Name	Status Code[1]	Determinations of Effect [2]	
			No Action	Action Alternatives
Narrow-leaved moonwort	*Botrychium lineare*	C,S	NE, NI	NLAA, MAII
Park milkvetch	*Astragalus leptaleus*	S	NI	MAII
Prairie moonwort	*Botrychium campestre*	S	NI	MAII
Yellow lady's slipper	*Cypripedium parviflorum*	S	NI	MAII
Smith's whitlow-grass	*Draba smithii*	S	NI	MAII
Giant helleborine	*Epipactis gigantea*	S	NI	MAII
Hall fescue	*Festuca hallii*	S	NI	MAII
Colorado tansy-aster	*Machaeranthera coloradoensis*	S	NI	MAII
White adder's mouth orchid	*Malaxis brachypoda*	S	NI	MAII
Weber's monkeyflower	*Mimulus gemmiparus*	S	NI	MAII
Rock-loving neoparrya	*Neoparrya lithophila*	S	NI	MAII
Kotzebue's grass-of-parnassus	*Parnassia kotzebuei*	S	NI	MAII
Degener's beardtongue	*Penstemon degeneri*	S	NI	MAII
Front Range cinquefoil	*Potentilla rupincola*	S	NI	MAII
Greenland primrose	*Primula egaliksensis*	S	NI	MAII
Northern raspberry	*Rubus arcticus* ssp. *acaulis*	S	NI	MAII
Sageleaf willow	*Salix candida*	S	NI	MAII
Lesser bladderwort	*Utricularia minor*	S	NI	MAII
Great spurred violet	*Viola selkirkii*	S	NI	MAII

3.6 WILDLIFE & FISHERIES

3.6.1 Affected Environment

Federally Listed and Candidate Species and Forest Service Sensitive Species

A species list from the Fish and Wildlife Service (2006) with all federally listed and candidate species within Chaffee County in Colorado was reviewed for this analysis. In addition, the Region 2 Sensitive Species list (Forest Service 2006) was also reviewed for Forest Service sensitive species. Using these two lists, the District determined which of those species had a potential to occur within its' administrative boundaries (Table 3.6). Species not known or with no potential of occurring on the District were documented with rationale (Wrigley et al. 2006.). Using this District list, species known or with a potential to occur or be affected by the Proposed Action are shown in the table below, and those marked with no potential to occur will not be discussed further in this document. These species have been dropped from further analysis by meeting one or more of the following conditions:

1. occurs in habitats that would not be impacted by the proposed activities;
2. is outside of the geographical or elevational range of the species;
3. species do not occur nor is expected in the project area during the time period activities would occur.

Critical Habitat

There is no proposed or designated critical habitat for any federally listed or proposed species within the project area; therefore, there would be no direct, indirect, or cumulative effects to any critical habitat. Critical habitat is not addressed further in this assessment.

Only those federally threatened, endangered, proposed, and Forest Service sensitive species with the potential to occur on the District and that could potentially be affected by this project (i.e., evaluated species) are addressed hereafter in this assessment.

TABLE 3.6 WILDLIFE AND FISHERIES: THREATENED, ENDANGERED, CANDIDATE/PROPOSED, AND FOREST SERVICE SENSITIVE SPECIES WITH THE POTENTIAL TO OCCUR WITHIN THE PROJECT

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
INVERTEBRATES				
Hudsonian emerald *Somatochlora hudsonica*	S		**ODR**	Known at 7 sites in Colorado within a 40-mile radius of Boulder. Boggy wetlands, streams, ponds, and reservoirs are potential breeding sites.
Rocky mountain capshell snail *Acroloxus coloradensis*	S		**HAB**	Resides in clean boreal lakes with rocky substrate. littoral zone of oligotrophic & mesotrophic mountain lakes with neutral to slightly alkaline water & high dissolved oxygen content; 8,800-9,800 ft.
Uncompahgre fritillary butterfly *Boloria acrocnema*	E		**ODR** **HAB** **ELE**	Known to only occur above timberline on Mt. Uncompahgre, laying eggs on snow willow (*Salix nivalis*); potentially occurring in Custer and Saguache counties.
FISH				
Greenback trout *Oncorhynchus clarki stomias*	T		**HAB** **INV**	Well-oxygenated headwaters of mountain streams restricted to 8 drainages on Pike-San Isabel NF; found in Chaffee, Custer, Douglas, El Paso, Huerfano, Lake, Park, and Pueblo counties.
AMPHIBIANS AND REPTILES				
Boreal toad *Bufo boreas boreas*	S	✓		Breeds in ponds & over winter in refugia within lodgepole pine, spruce-fir forests, & alpine meadows; 7,500-12,000 ft.
Northern leopard frog *Rana pipiens*	S	✓		Banks & shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds & streams, especially those with rooted aquatic vegetation up to 11,000 ft.
BIRDS				
Bald eagle *Haliaeetus leucocephalus*	T		**HAB**	Near open water including rivers, streams & lakes, nesting & roosting in large ponderosa pine, Douglas-fir, or cottonwood trees in proximity to open water and rivers.
Black swift *Cypseloides niger*	S		**HAB**	Nests on cliffs near or behind high waterfalls.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
Boreal owl *Aegolius funereus*	S	✓		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 in dbh.
Brewer's sparrow *Spizella breweri*	S		**HAB**	Sagebrush, mountain meadows, and mountain shrub habitat in CO.
Flammulated owl *Otus flammeolus*	S	✓		Old-growth or mature ponderosa pine, ponderosa pine, & Douglas-fir forests, often mixed with mature aspen, nesting in cavities, feeding on insects.
Gunnison sage grouse *Centrocercus minimus*	S		**ODR** **HAB**	Tall dense stands of sagebrush near wet meadows with tall grasses for hiding; occurring primarily in SW & W CO, but also including Saguache & S Chaffee County.
Lewis' woodpecker *Melanerpes lewis*	S		**HAB**	Lowland & foothill riparian forests, agricultural areas, urban areas with tall deciduous trees, & foothills including Wet Mountains & grasslands
Loggerhead shrike *Lanius ludovicianus*	S	✓		Open riparian areas, montane meadows, agricultural areas, grasslands, shrublands, & piñon-juniper woodlands in western valleys in E CO
Northern goshawk *Accipiter gentilis*	S	✓		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*	S		**HAB**	Spring & fall migrant in western valleys mountain parks, and eastern plains in CO inhabiting grasslands, agricultural areas, marshes & tundra in fall; 3,500-13,000 ft.
Olive-sided flycatcher *Contopus cooperi*	S	✓		Mature spruce-fir & Douglas-fir forests, especially on steep slopes or near cliffs, near bogs & meadows during the summer, 10,000-11,000 ft.
Peregrine falcon *Falco peregrinus anatum*	S	✓		Wide variety of habitats, selects cliff ledges or rock outcroppings for nesting, preferring high, open cliff faces that dominate the surrounding area.
Purple martin *Progne subis*	S		**HAB**	Old-growth & aspen forests near parks, generally near water; 6,500-10,000 ft in the summer, nesting in colonies in tree cavities or man made structures.
Short-eared owl *Asio flammeus*	S		**HAB**	Diurnal, prefers to inhabit open places like plains, marshes, but can also be found in forests, nests on the ground
Three-toed woodpecker *Picoides dorsalis*	S	✓		Mature or old-growth spruce-fir forest, but also occurs in ponderosa pine, Douglas-fir, & lodgepole pine forests with abundant snags and insect populations are present due to outbreaks from disease or fire.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
White-tailed ptarmigan *Lagopus leucurus*	S		**HAB**	Inhabit alpine tundra with moist, low-growing alpine vegetation, particularly willows (Salix ssp.), with boulders, in proximity of water.
MAMMALS				
American marten *Martes americana*	S	✓		Spruce-fir & lodgepole pine mature to old-growth forests with moderate to high density canopy closures & abundant snags & logs; 8,000- 13,000 ft.
Canada lynx *Lynx canadensis*	T	✓		Dense spruce-fir, Douglas-fir, early seral lodgepole pine, mature lodgepole pine with developing understory of spruce-fir & aspen in subalpine zone & timberline, using caves, rock crevices, banks, logs for denning, closely associated with snowshoe hare.
Common hog-nosed skunk *Conepatus leuconotus*	S		**ODR**	Grasslands & foothills, prefers partly wooded, brushy, rocky area; SE & south-central CO.
Fringed myotis *Myotis thysanodes*	S		**ODR**	Rocky outcroppings in mid-elevation ponderosa pine, piñon/juniper, oak, & mixed conifer woodlands, grasslands, deserts, & shrublands; Baca, El Paso, Huerfano, Las Animas, Otero, & Pueblo counties.
Gunnison's prairie dog *Cynomys gunnisoni*	S		**HAB**	Shrub-grassland habitats in SW CO in mesic plateaus and intermountain valleys, benches, and arid lowlands.
North American wolverine *Gulo gulo*	S	✓		Alpine & subalpine mature/intermediate timbered areas around natural openings, including cliffs, slides, basins, & meadows, dependant on ungulates, historically in CO, extending the length of the Rocky Mts.
Pygmy shrew *Sorex hoyi*	S		**HAB**	Occupies mesic habitats western CO at elevations above 9,600 ft., such as subalpine forests, edges of meadows, bogs, willow thickets, aspen-fir forests, and parklands.
River otter *Lontra canadensis*	S		**HAB**	Closely associated with aquatic and riparian habitats with abundant fish and crustaceans with a minimum flow of 10cfs, ice free reaches are required, may inhabit lakes and reservoirs, dens and resting sites may be located in beaver bank dens/lodges, log jams, dense riparian veg., undercut banks.
Spotted bat *Euderma maculatum*	S		**ODR**	Rocky outcroppings, crevices, & cliffs in ponderosa pine & piñon/juniper woodlands on the western slope; Moffat & Montezuma counties near Mesa Verde.
Townsend's big-eared bat *Plecotus townsendii*	S	✓		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.

[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; **HAB**= no habitat present in analysis area; **ELE**= outside of elevational range of species; **INV**= presence of non-native salmonids.

For additional information see the BE/BA in the analysis file.

MIS

Amendment 30 to the Land and Resource Management Plan for the PSICC (Forest Service 2005) identified four MIS for the Pike and San Isabel National Forests. All species analyzed are identified in Table 3.7. See the MIS Report in the analysis file for additional information.

TABLE 3.7 MANAGEMENT INDICATOR SPECIES FOR THE PIKE AND SAN ISABEL NATIONAL FORESTS ANALYZED FOR THE PROJECT

Species	Species expected in project area?	Habitat affected by project?	Further evaluation as MIS?	Primary Habitat type
Abert's Squirrel	Yes	Yes	Yes	Mature Ponderosa Pine
Brook Trout	No	No	No	Beaver Ponds, Streams
Elk	Yes	Yes	Yes	Widespread
Greenback Cutthroat Trout	No	No	No	High elevation lakes/streams

Species not expected in the project area and not affected by project activities will not be analyzed further. The following sections cover MIS documented in the project area and/or whose habitat may be affected by the proposed alternatives.

3.6.2 Environmental Consequences of the Alternatives

3.6.2.1 Alternatives 1 (No Action)

Determinations of Effect

All Wildlife Species

Under this alternative, suitable habitats would not be negatively affected. Natural ecological processes would continue unaffected and suitable habitat would improve for some cavity dependant species, or those that require large amounts or concentrations of snags and CWD. Under this alternative, areas with high tree mortality, grasses, forbs, and aspen would increase providing higher quality habitats for some species or their prey than currently exist.

Federally Listed Species

A determination of ***no effect*** to Canada lynx resulting from implementation of the No Action alternative is based on the following rationale:

- No fuel reduction activities, prescribed burning, or road construction would take place.
- No suitable habitat for lynx or its prey would be affected; therefore, there would be no direct, indirect, interdependent or interrelated, or cumulative effects as a result of this alternative.

A determination of ***no impact*** for all other Region 2 wildlife species analyzed in this document is based on the following rationale:

- No fuel reduction activities, prescribed burning, or road construction would take place.
- There are no direct, indirect, or cumulative effects as a result of this alternative.

Therefore, there would be ***no impact*** to boreal toad, northern leopard frog, boreal owl, flammulated owl, loggerhead shrike, northern goshawk, olive-sided flycatcher, peregrine falcon, three-toed woodpecker, American marten, North American wolverine, and Townsend's big-eared bat.

Direct and Indirect Effects - MIS

The local elk population would be expected to remain stable or increase slightly. This would occur because herbaceous vegetation would increase as more ponderosa pine succumbs to MPB activity. Greenback cutthroat trout are expected to remain absent from the area and be unaffected by this project. MPB in conjunction with extended drought in the area have resulted in extensive mortality of ponderosa pine in the vicinity. As a result, Abert's squirrels, which are closely associated with mature ponderosa pine, are expected to decline in the area because of these natural factors until suitable habitat reestablishes. Current habitat in the project area (approximately 3,400 acres before recent beetle activity) has been reduced in both quantity and quality from continued MPB activity.

Mule Deer (*Odocoileus hemionus*) and Bighorn Sheep (*Ovis canadensis*)

The local mule deer population would be expected to remain stable since there would be no browse treatments and MPB are opening the canopy. Bighorn sheep populations within the project area would continue to be suppressed as the canopy remains closed along Limestone Ridge in piñon-juniper habitats and elsewhere.

3.6.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

The effects analyzed below apply to both action alternatives, the only difference being areas treated. Both action alternatives are expected to have similar effects on the wildlife species analyzed. Both alternatives show a large amount of acres for prescribed burning. No more than 25% of this area is expected to actually be burned during the lifetime of this document due to logistics, funding and personnel limitations.

General Direct and Indirect Affects Applicable to all TEPS Wildlife Species

Habitat Modification

Effects from habitat modification include reducing the density of live and dead trees by removing the understory and smaller diameter trees until targets for the area are achieved. Reducing the number of trees in the area can have both positive and negative effects depending on species needs. The reduced number of snags would limit opportunities for perches, nests, and foraging for snag dependant associates and cavity nesters in the treatment areas. Design criteria call for retention of an average of 40 snags or recruitment snags per five acres. Retaining this number of snags in the treatment areas should provide adequate habitat for snag associate wildlife species, both currently and in the future. Most of the larger snags currently present are from the recent MPB outbreak, and the majority is ponderosa pine. These MPB snags often lack some desirable characteristics; species variety, long lifespan as a standing snag (they typically do not remain standing longer than 5 to 7 years), and defects that allow easy excavation for primary cavity nesters, which may be selected for in current green tree recruitment snags. As a result of the recent MPB infestation, there are a greater number of snags than would be expected, although they will not remain standing for long. The extent of tree mortality from beetle infestations extends much further than the project area. Removing some snags from treatment areas would impact individuals, but should not adversely affect snag associate populations if the numbers stated in the design criteria are met and maintained. Reducing the amount of canopy closure would allow more sunlight to reach the forest floor. The amount of grasses, forbs, and overall understory vegetation would be expected to increase. An increase in herbaceous vegetation would likely lead to increased small mammal populations. Small mammals are prey items for numerous mammal and bird species. Reducing tree density would make it easier for some species, like flammulated owls, to maneuver within stands and may become more attractive foraging habitat. Likewise, if openings are created then mountain bluebirds and other species utilizing more edge habitats would benefit. This comes at the expense of reduced visual obstruction for species that are more sensitive to human disturbance, which is discussed below.

Treatments would reduce current levels of down wood, which has implications for many species. Small mammals use down logs extensively as travel ways, especially when the logs are situated perpendicular to the slope. Down wood also creates subnivean travel ways during the winter. Reducing the amount of down wood would make it more difficult and require greater energy expenditures for small mammals to travel, especially during the periods with snow. As stated in Design Criteria #25, 30 snags/down logs per five

acres would be maintained in treatment units, which would minimize adverse impacts from the removal of some under the action alternatives. Finally, individuals could experience direct mortality from mechanical equipment (run over, hit) or prescribed fire treatments. These instances are expected to be rare and isolated and would not have any affect on vertebrate populations.

Human Disturbance

Thinning and fuels reduction related activities (e.g., marking, firewood cutting, prescribed fire related activities, driving, walking, mechanical treatment, etc.) affect terrestrial animal species through the potential for noise disturbance and the mere presence of humans which may be perceived as a threat. Displacement is an animal's immediate response to disturbance. This can have negative effects, especially to species with low tolerances to humans, species with limited distribution or mobility. However, little study has been done for the species addressed in this assessment. For example, the flight distances and return intervals for a given species following disturbance is unknown for most species. It is known that repeated or intensive disturbance can lead to long-term affects on distribution, abundance, demographics, species composition, and interactions by altering behavior, vigor, and productivity (Knight and Gutzwiller 1995). Although the direct effect may be displacement, there may be additional indirect effects. Energy is expended in fleeing, or energy intake is lost when an animal is displaced from foraging areas. Additional stress may occur during periods when animals are already stressed, for example, during periods of low food supplies such as winter periods with increased competition or limited foraging habitat or during spring reproductive seasons. Disturbance during the breeding season can cause reproductive failure from interruption of breeding behavior, nest abandonment, or inability of adults to feed juveniles when kept away from the nest or den (Knight and Gutzwiller 1995). Denning carnivores may move young to a new den location following disturbance, resulting in increased exposure to predators and increased stress to females and their young. When an animal is displaced, it moves into adjacent suitable habitat. However, little study has been done on how animals redistribute themselves if adjacent habitat is occupied. Territorial species may need to move long distances to find suitable unoccupied habitat if their existing territory becomes unusable. Displaced animals, especially juveniles, may be more susceptible to predation while fleeing or in unfamiliar areas.

Tolerance to humans varies both intra and inter specifically. Some species or individuals of a species may be very tolerant of human activity while others are highly sensitive to these disturbances. For example, marking, mechanical thinning, firewood gathering, and burning can displace animals from an area for a short period of time, or longer if the activity is sustained. The flight or flushing distance varies for different species. Human behaviors, the predictability of the disturbance, the frequency, magnitude, timing and location of the activity all have an influence on how animals react (Knight and Gutzwiller 1995). Noise can affect animals by disturbing them to the point that detectable change in behavior may occur. Such behavioral changes can affect their activity and energy consumption (Bowles 1995). Dangerous or unfamiliar noises are more likely to arouse wildlife than harmless and familiar noises. Habituation is the crucial determinant of success in the presence of noisy disturbances. Exposures of some experienced birds to frequent or expected activities may produce no or minimal losses of some species (Black et al. 1984). The habituation process can occur slowly, so it may not be detected

in the short-term. In the long-term, some nesting birds become more tenacious and less responsive in the presence of human disturbance if they are not deliberately harassed (Burger and Gochfeld 1981). Burger and Gochfeld (1981) and Knight et al. (1987) found responses to noise disturbances and habituation in nesting birds become more tenacious and less responsive in the presence of human disturbance if they were not deliberately harassed.

Raptors in frequent contact with human activities tend to be less sensitive to additional noise disturbances than raptors nesting in remote areas. However, exposure to direct human harassment may make raptors more sensitive to noise disturbances (Newton 1979). Where prey is abundant, raptors may even occupy areas of high human activity, such as cities and airports (Newton 1979, Ratcliffe 1980, White et al. 1988). The timing, frequency, and predictability of the noise disturbance may also be factors. Raptors become less sensitive to human disturbance as their nesting cycle progresses (Newton 1979). Studies have suggested that human activities within breeding and nesting territories could affect raptors by changing home range movements (Anderson et al. 1990) and causing nest abandonment (Postovit and Postovit 1987). Design criteria have been developed to avoid and minimize adverse impacts to known raptor territories and natal areas.

During implementation, all of the effects listed above from increased human activity levels could occur. Generally, the treatments in each unit would not be continuous throughout implementation of the entire project and they would be short-term (less than three years in duration). A subset of the units would likely be treated at any given time and would see bursts of activity over several different periods. An example would be a few weeks of marking, a few months of timber harvest, and a few days of prescribed fire, all of which are separated by periods of reduced activity or inactivity. Following treatments, the activity level of the project area would be expected to return to current levels.

Cumulative Effects

The cumulative effects discussed in this section are applicable to all wildlife species addressed; listed below is species specific discussion.

Under the Endangered Species Act (ESA), future federal actions are not considered in the cumulative effects analysis, rather only future state, tribal, or private activities that are reasonably certain to occur within the action area.

The Forest is an important resource providing for a wide variety of public recreational activities, which is expected to continue to increase in the future as the population of the region continues to grow. Future public recreation is expected to continue and increase in most areas within the analysis area. In areas of concentrated public recreation use, effects from future public recreation would contribute to cumulative effects to each of the species addressed. In areas where general recreation use is low (e.g., backcountry), effects from public recreational activities may be of greater influence on these species due to habitat modification (e.g., snow compaction and ground disturbance) and noise disturbance in remote areas. Fall and winter time activities conducted by the public are

both motorized and non-motorized and occur on and off system trails. Motorized use occurs on designated routes most often located on system trails (i.e., snowmobiles and ff-road vehicles). Future non-motorized activities by the general public occur frequently in roadless, remote backcountry locations (e.g., horseback, hiking, snowshoeing, skiing, etc.). Some types of recreation use can lead to habituation or harassment of animals. Effects of recreation activities on these species vary and depend on the type of activity as well as the species affected.

Backcountry areas of the Forest are primarily used by recreationists in the summer and fall seasons. Backpacking, hiking, horseback riding, hunting, fishing, and camping are the primary uses of the backcountry. Future winter activities may include skiing, snow boarding and snowshoeing. Outside of wilderness areas, motorized winter and summer use would also occur. The attractions of climbing “14er peaks” and high elevation lakes draw people to these scenic mountains. As populations in Colorado and the Front Range continue to grow, there would be increasing use of the backcountry for recreational activities, which would increasingly harass wildlife species and destroy their habitats. As discussed above, recreation activities have influenced the travel system in the project area and this is expected to increase into the future. Increased use of off road vehicles (ORV) for recreational use has resulted in an extensive “user-created” network of travel routes. As these new routes become more established over time, they would eventually be viewed by the public as system routes. The continued creation of new roads/trails would decrease the habitat effectiveness and capability within the project area. Human access facilitated by roads/routes may also increase the likelihood of human caused wildfires and the spread of invasive and noxious weeds. Roaded areas would also receive heavier recreational use because of easier access. Other future non-federal activities that are likely to occur include mining and vegetation treatments (e.g., mechanical harvest and/or prescribed fire).

As discussed above, human population growth has increased an average of 2.5% over the past decade, and this population growth is predicted to continue at the same rate within Chaffee County and surrounding counties. As more and more private lands adjacent to the Forest are developed, this would adversely affect many plant and wildlife species by increasing fragmentation, increased frequency and intensity of human noise disturbance, increased recreational use from nearby residents, and other associated activities. In addition, housing units and human developments within wildland urban interface areas immediately adjacent to the Forest substantially increase the risk of high intensity wildfires on the Forest that also would impact habitat for these species.

Under NEPA, the cumulative effects are defined somewhat differently than under ESA. The cumulative effects for the NEPA analysis includes the total effect, including both direct and indirect effects of the proposed action combined with the effects of past, present, and reasonably foreseeable future actions that are not specifically related to the proposed action. All past and current activities and their effects to the species addressed in this assessment are discussed in the BE/BA located in the analysis file. Below is a summary of historic and on-going activities within the project area that directly and indirectly affect wildlife species addressed in this assessment.

Historic mining activities have had great impacts on many species addressed in this assessment; those activities are responsible for shaping the landscape and vegetation

today. Historic uses of the Forest included intensive use by miners, market hunters, and trappers. Mining has caused destruction of habitat, leaching of heavy metals in to streams changing stream pH, erosion, and sedimentation into streams. Activities associated with mining that affect species include road and railroad development, timber harvest, weed invasion, and re-vegetation efforts. Much of the mixed conifer was harvested for mining timbers, fuelwood, and charcoal. Snags and CWD that provide important habitats were also harvested for fuel, which are lacking today. Many of the large diameter trees were removed. Within some areas, only lodgepole and aspen were regenerated, reducing species diversity.

Fire suppression has led to increased fuel loading and canopy closure. Fire suppression has prevented natural thinning of the predominately ponderosa pine and mixed conifer stands and limited tree growth. These small, dense stands are now relatively homogenous and are more susceptible to abnormal levels of insect and disease populations and tree mortality. Few snags were created as a result of fire suppression and existing snags continued to be harvested for fuel. These historic activities combined to produce a forest that has smaller trees, less structure (snags and CWD), less species diversity, and a low stand age diversity (more older stands).

Numerous activities require continued use of, or construction of new roads and trails. Roads in particular increase soil erosion, increase sedimentation, fragment, and directly remove habitat, facilitate the spread of invasive and noxious weeds. The spread of noxious weeds has led to changes in species composition of the Forest, increased competition with native plant species, and altered fire regimes that have adversely affected many wildlife species addressed here. Motorized and non-motorized recreational use (including OHV use, camping, horseback riding, mountain biking, hiking, hunting, and fishing) has led to the development of non-system roads and trails, development of dispersed campsites, erosion, disturbance to wildlife species, and the vectoring of invasive and noxious weeds in previously pristine areas.

Recreation is a frequent non-winter use of the Forest within the project area. Motorized touring (i.e., automobiles, four-wheeled drive vehicles, ORVs, and snowmobiles to a lesser degree), is prevalent as are hunting, camping, hiking, and horseback riding during certain times of the year. There is very little use of the area when snow is present. Each of the above activities have incrementally impacted wildlife species addressed in this assessment directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance.

Grazing leads to biomass removal and trampling. It has led to changes in species composition, compaction of soils, changes in fuel loading and the fire regime, downcutting of riparian areas with subsequent drying of adjacent meadows, and noxious weed invasion. Within riparian areas and wet meadows livestock grazing has led to churning of the soil and pedalisting (severe hummocking).

Timber harvest and thinning has led to a more open canopy with additional light reaching the forest floor (which may be beneficial or detrimental depending on the species), soil disturbance and compaction, development of skid roads, and noxious weed invasion. Changes in forest composition, structure and fire frequency have also taken place.

Urban development is expected to continue in the project area on private lands. This would continue to destroy and fragment species habitat, fragment/isolating populations, increase the risk of weed invasion, and the incidence of high intensity wildfire.

In addition to the activities outlined above, the Ranch of the Rockies and the Black Trout wildland urban interface/forest health projects are currently being implemented by the Salida Ranger District and South Park Ranger District of the Pike National Forest respectively. These projects are adjacent to the proposed North Trout Creek project. Additionally, range allotments on the Salida and Leadville Ranger Districts are being analyzed under NEPA and section 7 consultation under the Salida, Leadville, and McQuaid Range Allotment Management Plan.

If adverse effects are not minimized at the local level, cumulative effects may occur. Past and present forest management activities have caused changes in plant community structure and composition across the forests. These management activities have altered the present landscape to various degrees and have had direct, indirect, and possibly cumulative effects on TEPS species. These effects can be minimized by following Forest Service standards and guidelines and by implementing integrated design features (design criteria) or mitigation measures to monitor or offset impacts. With these protective measures in place, cumulative effects are less likely to be adverse.

The action alternatives would add to the overall cumulative effects to the species addressed in this assessment from the thinning, fuels reduction treatments, and associated increased level of human activity during treatments. These treatments within the project area may reduce short-term habitat effectiveness during implementation, but should return to pre-treatment human activity levels upon completion. Habitat changes could be positive or negative depending on species requirements as discussed in the direct and indirect effects. Changes from the North Trout Creek project would be in addition to the vegetation changes from the Black Trout and Ranch of the Rockies vegetation management projects and recent MPB in the vicinity.

Interrelated and Interdependent Actions

Interrelated activities are part of the proposed action that depends on the action for their justification, and interdependent activities have no independent utility apart from the action. There are no interrelated or interdependent actions associated with this project; therefore, no anticipated adverse effects to any of the species addressed in this assessment.

Species Specific Direct, Indirect, and Cumulative Effects

Federally Listed Species

Canada lynx

Much of the treatment areas are dry habitat types (ponderosa pine, Douglas-fir, piñon-juniper and shrubs) that are used relatively little by lynx. Most of the spruce-fir habitats

preferred by lynx are untreated in Alternatives 2 and 3. Table 3.8 gives a breakdown of affected habitat by alternative in the project area. Mapped potential denning habitat comprises approximately 90 acres and 210 acres for Alternatives 2 and 3 respectively; however, field verification by Mike Wrigley (FS Wildlife Biologist) in 2004 – 2006 discounted these areas as suitable denning habitat (i.e., they are not meeting current suitable denning habitat definitions, nor are they similar in vegetation and structure to other known den sites in Colorado). There is approximately 23,800 acres of mapped lynx denning habitat in the Buffalo Peaks LAU currently (Table 3.8). The salvage/thinning treatments contain approximately 870 acres and 720 acres of mapped winter foraging habitat for Alternatives 2 and 3 respectively (Maps 2.6 and 2.7). Most of these areas would likely remain as suitable habitat, but it would be degraded to a limited degree in the short-term (1 – 3 years) and possibly long-term (3 – 10 + years) depending on current stand structure which varies. These areas would still provide some foraging habitat, although its quality would be diminished substantially until lower vegetation components (shrubs, lower limb, saplings) redeveloped (expected to occur in roughly 10 – 15 years). Thinning of these stands may; however, stimulate regeneration and create a multi-storied stand where it is currently limited in some areas that could improve some habitat conditions as foraging habitat. Much of the proposed treatment areas are in lower quality habitat, in dry montane forests and grasslands that are on the fringes of the LAU. Altering such a minute amount of lower quality habitat in the Buffalo Peaks LAU is likely to have a negligible effect on lynx due the limited size, scope, and location of this project. Any affects to winter foraging habitat would be insignificant and fully discountable.

TABLE 3.8 BUFFALO PEAKS LAU HABITAT TYPES, ACREAGES, AND OWNERSHIP

Habitat Description	All Ownership (Acres)	FS Ownership—No Action (Acres)	Post Treatment FS Changes (Acres)		Post Treatment FS Changes (%)	
			Alt. 2	Alt. 3	Alt. 2	Alt. 3
LAU size	168,135	117,947	0	0	0	0
Potential	81,703	70,797	-261	-180	-0.4	-0.3
Denning	27,169	23,769	-90	-209	-0.4	-0.9
Winter Foraging	28,431	25,345	-868	-717	-3.4	-2.8
Other	26,103	21,683	+958	+926	+4.4	+4.3
Unsuitable	418	418	+261	+180	+62	+43

LCAS Standards and Guides Applicable to Alternative 2 and 3

The LCAS describes several conservation measures intended to conserve lynx and to reduce or eliminate adverse effects from a spectrum of management activities on federal lands. These measures are provided to assist federal agencies in seeking opportunities to benefit lynx and to help avoid negative impacts. The PSICC, as well as other National Forests in Region 2 that have no specific Canada lynx conservation measures identified in their Forest Plans, have agreed to use these measures as a consistent and effective approach for its conservation as specified in the Lynx Conservation Agreement between the Forest Service and FWS (February 7, 2000). The following tables address LCAS compliance with Alternatives 2 and 3.

TABLE 3.9 CANADA LYNX CONSERVATION ASSESSMENT AND STRATEGY STANDARDS; CONSERVATION MEASURES APPLICABLE TO ALL PROGRAMS AND ACTIVITIES (LCAS, 7-2 TO 4)

Standards	Pre-Treatment	Post-Treatment	Compliance
Programmatic Planning (7-3)			
Conservation measures will generally apply only to lynx habitat on Federal lands within Lynx Analysis Units (LAUs)	NA	NA	Yes
Lynx habitat will be mapped using criteria specific to each geographic area to identify appropriate vegetation and environmental conditions; refer to glossary and description for each geographic area in LCAS	NA	NA	Yes, mapped for PSICC
To facilitate project planning, delineate LAUs; LAUs should be at least the size of area used by a resident lynx and contain sufficient year-round habitat	NA	NA	Yes
LAU boundaries will not be adjusted for individual projects, but must remain constant	NA	NA	Yes
Prepare a broad-scale assessment of landscape patterns comparing historical and current ecological processes and vegetation patterns, such as age-class distributions and patch size characteristics; in the absence of guidance developed from such an assessment, limit disturbance within each LAU: if more than 30% of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management by Federal agencies	NA	NA	Yes, less than 1% of Buffalo Peaks LAU in unsuitable condition and proposed project adds 180-261 acres. Less than 1% of LAU in unsuitable condition post implementation.
Project Planning (7-4)			
Within each LAU, map lynx habitat; identify potential denning and foraging habitat (hares, squirrels, etc.), and topographic features important for lynx movement (major ridge systems, prominent saddles, and riparian corridors); identify non-forest vegetation (meadows, shrublands, grasslands, etc.) adjacent to and intermixed with forested lynx habitat providing habitat for alternate lynx prey species	NA	NA	Yes, different habitats and features important for lynx have been identified.
Within each LAU, maintain denning habitat in patches generally larger than five acres comprising at least 10% of suitable lynx habitat	23,560 acres	23,560 acres	Yes, mapped denning habitat occurs on over 20% of LAU and is maintained in larger patches.
Maintain habitat connectivity within and between LAUs	NA	NA	Yes, connectivity maintained, no Linkage Areas affected

TABLE 3.10 CANADA LYNX CONSERVATION ASSESSMENT AND STRATEGY STANDARDS; CONSERVATION MEASURES TO ADDRESS RISK FACTORS AFFECTING LYNX PRODUCTIVITY (LCAS, 7-4 TO 12)

Standards	Pre-Treatment	Post-Treatment	Compliance
Timber Management (7-4)			
Management actions shall not change more than 15% of lynx habitat within a LAU to an unsuitable condition within a 10-year period	418 acres unsuitable	679 acres unsuitable (maximum)	Yes, less than 1% of LAU is currently in unsuitable condition.
Following a disturbance (wind, fire, insect/disease), which could contribute to lynx denning habitat, do not salvage when the effected area is smaller than 5 acres (for exceptions, see pages 7-5 and 6)	NA	NA	Yes, insect disturbance is much greater than 5 acres.
In lynx habitat, pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat	NA	NA	Yes, no pre-commercial thinning would take place.
In aspen stands within lynx habitat, apply harvest prescriptions favoring aspen regeneration	NA	NA	Yes, aspen is favored in prescriptions for retention and regeneration.
Wildland Fire Management (7-6 to 8)			
In the event of a large wildfire, conduct a post-disturbance assessment prior to salvage harvest, particularly in stands formally in late succession stages, to evaluate potential for lynx denning and foraging habitat	NA	NA	Yes
Design burn prescriptions to regenerate or create snowshoe hare habitat	NA	NA	Yes, prescriptions are designed for fuels management; some snowshoe hare habitat will also regenerate as a result.
Recreation Management (7-8 to 9)	Not part of project		
Forest/Backcountry Roads and Trails (7-9 to 10)			
On Federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU (winter logging activities are not restricted)	NA	NA	Yes, winter logging not restricted—no net increase in designated snow routes.
Livestock Grazing (7-10 to 11)	Livestock management not part of project		
Other Human Developments: Oil & Gas Leasing, mines, Reservoirs, Agriculture (7-11 to 12)	Not part of project		

TABLE 3.11 CANADA LYNX CONSERVATION ASSESSMENT AND STRATEGY STANDARDS; CONSERVATION MEASURES TO ADDRESS MORTALITY RISK FACTORS (LCAS, 7-12 TO 13)

Standards	Pre-Treatment	Post-Treatment	Compliance
Predator Control (7-12)	Not part of project		
Competition and Predation as Influenced by Human Activities (7-13)			
On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU (intended for dispersed recreation rather than existing ski areas)	NA	NA	Yes, seasonal use restrictions in place to limit access to the public.
Highways (7-13)			
Within lynx habitat, identify key Linkage Areas and potential highway crossing areas	NA	NA	Yes, Linkage Areas outside Project Area—no potential highway crossing sites.

TABLE 3.12 CANADA LYNX CONSERVATION ASSESSMENT AND STRATEGY STANDARDS; CONSERVATION MEASURES TO ADDRESS MOVEMENT AND DISPERSAL (LCAS, 7-13 TO 16)

Standards	**Pre-Treatment**	**Post-Treatment**	**Compliance**
Programmatic Planning (7-14)			
Identify Linkage Areas important in providing landscape connectivity within and between geographic areas, across all ownerships	NA	NA	Yes, Linkage Areas identified
Develop and implement a plan to protect Linkage Areas on Federal lands from activities creating barriers to movement	NA	NA	Yes, barriers to movement don't result from project.
Evaluate the potential importance of shrub-steppe habitats in providing landscape connectivity between blocks of lynx habitat	NA	NA	Yes, habitats not in Project Area.
Highways (7-14)	Not part of project		
Land Ownership (7-15 and 16)	Not part of project		
Ski Areas/Large Resorts and Associated Activities (7-16)	Not in Project Area		

See above cumulative effect discussion for specific activities and further detail on potential adverse cumulative effects to wildlife species. Specifically, of the activities/effect listed above, grazing and timber harvest has had, and likely continues to have the greatest cumulative direct and indirect effect on these species. Grazing practices and stocking rates have improved, but historic grazing practices continue to have a dramatic effect on the function of the land, especially riparian ecosystems. The current MPB outbreak and subsequent logging across the analysis area would alter habitat composition, likely reducing the amount of down wood associated with quality denning habitat, but also increasing the amount of conifer regeneration important for high densities of snowshoe hare. Each of these activities and actions would increase habitat fragmentation, alter suitable habitat, and cause avoidance of areas to some degree as discussed above.

Forest Service Sensitive Species

Boreal toad and Northern leopard frog

Direct and Indirect Effects

Boreal toads and northern leopard frogs primarily use old beaver ponds and other shallow ponds with emergent vegetation as well as upland areas found within the analysis area. Although suitable habitat exists near (less than 2.5 miles) the project area, no known breeding toads or leopard frogs have been documented within the analysis area, although they are present in the vicinity (within five miles). Suitable breeding habitat would not be disturbed or otherwise affected by project activities. The project area contains potential over-wintering habitat for toads and frogs that would be altered by treatments. Should toads or frogs repopulate the area suitable overwintering habitat would continue to be present. Treatment activities and vegetation alteration may adversely impact individuals or habitat.

Cumulative Effects

Of the activities listed above, ongoing and anticipated future recreational use, grazing, and timber harvest within areas of potential breeding sites all have the greatest cumulative effect to this species and would directly and indirectly affect these species. Direct mortality of individuals at breeding sites from humans and cattle by stepping on individuals may occur, particularly when toadlets emerge from breeding ponds. Habitat modification has and is continued to be likely with removal of biomass and overstory from grazing and timber harvest. Water quality degradation and sedimentation, particularly from grazing, road construction, and mine effluent from abandoned, currently active, and future activities add to the cumulative effects to these species as well.

Boreal owl, Flammulated owl, Olive-sided flycatcher, American marten, and Three-toed woodpecker

Direct and Indirect Effects

These species are grouped together because of their similar habitats and potential effects from the proposed project. These species inhabit forested areas including; ponderosa pine, lodgepole pine, aspen, spruce-fir, riparian cottonwood, Douglas-fir, and mountain shrub communities, some of which occur within or adjacent to the project area. The biggest impact to these species would be the removal of snags and CWD, reduced tree understory density, and canopy cover. These species use snags for foraging, nesting, and/or perching. While maintaining an average minimum of 40 snags per 5 acres would still provide some habitat for these species, current and future habitat quality would be lowered in the short- (1 – 3 years) and long-term (3 – 10+ years) by reducing the amount of snags and down wood. These reductions are not expected to be substantial, rather the design criteria would maintain at least minimal habitat requirements for these species. Additionally, these stands would never be expected to attain old-growth characteristics, often favored by these species, with the continued

"maintenance" of the treatment area that is likely to occur. A more open stand structure could be partially beneficial for flammulated owl foraging as long as remaining habitat requirements are still met.

Cumulative Effects

Of the activities listed above, ongoing and anticipated future timber harvest and fire suppression within areas of suitable habitat have the greatest cumulative effect that would directly and indirectly affect these species. In particular, habitat modification from the removal of snags, CWD, and large trees would adversely affect these species and add to the cumulative effects. Each of these actions would increase habitat fragmentation and remove suitable habitat as discussed above.

Loggerhead shrike

Direct and Indirect Effects

There is no evidence of breeding shrikes in the project area and observations are rare, although they likely occur within more open areas in suitable habitats. Conducting prescribed burns in meadow habitats could displace individuals if they are using the area during burning. Prescribed burns in meadow habitats would be relatively small and similar unburned meadow habitats would remain in the vicinity. Given the rare occurrence of loggerhead shrikes (Andrews and Righter 1992) in the area, miniscule temporal and spatial impacts to potential habitats and availability of untreated habitats in the vicinity, no impacts to individuals are expected.

Cumulative Effects

Additional cumulative effects to the loggerhead shrike are not expected.

Northern goshawk

Direct and Indirect Effects

Treatments occurring near known nests or nests discovered in the future would be coordinated and approved by the Wildlife Biologist and would minimize disturbances and maintain habitat suitable for goshawks. Any vegetation treatments that occur within this protective area would be during the non-breeding season, and would likely be limited to removal of down wood accumulations. Most goshawk nests in the area are located within aspen dominated stands. Treatments may reduce conifer encroachment in aspen stands, which could reduce the diversity of bird and other prey species in the area. Birds are a key prey item for goshawks and removal of conifers in aspen stands could reduce foraging opportunities to some degree depending on the treatment level. Treatments should not cause goshawks to vacate the territory and there would likely be mixed conifer and aspen stands producing adequate prey opportunities short and long term. If some snags and/or CWD are removed, the loss of these habitat components could also affect goshawk prey species as well. However, goshawks need a relatively open stand

structure to capture prey. Reducing stand density on a limited basis as is proposed could increase foraging success and retain the area as suitable goshawk habitat. Stands that are more open could also improve habitat conditions for prey species (primarily passerines) which would ultimately benefit goshawks. Disturbance and habitat protective measures listed in the design criteria above would maintain or improve species diversity and habitat conditions for goshawks. Treatments may reduce the quality of habitat in some areas over the short-term; however, they would be minimized with these design criteria and goshawks are expected to continue inhabiting the area.

Cumulative Effects

Of the activities listed above, timber harvest and fire suppression has had, and likely continues to have the greatest cumulative direct and indirect effect on this species. The current MPB outbreak and subsequent logging across the area would alter habitat composition, ultimately creating a more open forest structure. Each of these activities and actions would increase habitat fragmentation and alter suitable habitat to some degree as discussed above.

Peregrine falcon

Direct and Indirect Effects

The project area contains quality falcon habitat, with many vertical cliffs in the vicinity. Smoke from prescribed burning is likely the only effect for peregrine falcons and that would have a very limited duration. Other treatments are not proposed in the vicinity of nesting habitat. Falcon use in the area is expected to continue as it does currently with all alternatives. Prey species habitat or nesting habitat is not expected to be affected.

Cumulative Effects

No additional cumulative effects are expected.

Townsend’s big-eared bat

Direct and Indirect Effects

The project area contains over 2,000 acres of piñon-juniper habitat, which is associated with Townsend’s big-eared bats. Mechanical and prescribed burn treatments would reduce the canopy closure in piñon-juniper habitat, but less than 25% of this habitat in the project area would be treated because of desired habitat diversity, limited funding, and personnel limitations. Suitable habitat is not expected to be affected substantially, although some short- and long-term adverse impacts may occur. These would be minimized by the design criteria and prescriptions described above and the amount of untreated habitat left in the area.

Cumulative Effects

Of the activities listed above, timber harvest and fire suppression has had, and likely continues to have the greatest cumulative direct and indirect effect on this species. The current MPB outbreak and subsequent logging across the area would alter habitat composition, ultimately creating a more open forest structure. Each of these activities and actions would increase habitat fragmentation and alter suitable habitat to some degree as discussed above.

North American wolverine

Direct and Indirect Effects

The project area is currently highly fragmented both by natural habitat types and human influences. It is unlikely the area is very attractive to wolverines because of the high amount of human development, fragmented habitat, and lack of potential denning habitat (remote cirque basins [Copeland 1996]). Wolverines may be attracted to ungulate (e.g., mule deer and elk winter ranges, which can serve as a source of carrion. Treatment activities could alter mule deer and elk use patterns or influence local populations in the short-term, but are not likely to be substantial and have any lingering effects to wolverines. Other areas of more remote habitat are more likely to be used by wolverines, but such a wide ranging animal could pass through the project area, but would not be expected to spend any extended period of time. This alternative would not limit their movement through the analysis area.

Cumulative Effects

Of the activities listed above, ongoing and anticipated future timber harvest and fire suppression within areas of suitable habitat have the greatest cumulative effect to these species. In particular, habitat modification from the removal of snags, CWD, and large trees would adversely affect these species and add to the cumulative effects to these species. In addition, changes in ungulate use or reduction of ungulate populations would have additional adverse cumulative effects. Each of these activities and actions would increase habitat fragmentation, remove suitable habitat, and cause avoidance of areas to some degree.

Determinations of Effect

A determination of ***may effect, but not likely to adversely affect*** for Canada lynx is based on the following rationale:

- Treatments could alter up to 870 acres and 720 acres of winter foraging habitat for Alternatives 2 and 3 respectively. Most of these areas would likely be “other” habitat following treatments.
- Ground truthing documented that no denning habitat is present within the treatment units. The 90 acres currently mapped as denning habitat for Alternative 2 were discounted after site visits as not meeting suitable denning habitat definitions; therefore denning habitat would not be affected.

- Quality lynx habitat was excluded from treatment during project design.
- Much of the proposed treatment areas are in lower quality habitat, in dry montane forests and grasslands and that are on the fringes of the LAU. Altering such a minute amount of the available lower quality habitat in the Buffalo Peaks LAU is not likely to have a measurable negligible effect on lynx due the limited size, scope, and location of this project. Any affects to winter foraging habitat would be insignificant and fully discountable.
- Lynx screens 5a and 5b were completed resulting in concurrence of the NLAA determination in this assessment.

A determination of ***no impact*** *for loggerhead shrike, peregrine falcon, and North American wolverine* is based on the following rationale:

- Loggerhead shrike are uncommon in the area, with no documented breeding. Limited spatial and temporal impacts to potential habitat, with abundant non-disturbed habitat available in adjacent areas.
- Cliff habitat of the peregrine falcon is not being treated. Very limited (spatially and temporally) potential smoke would not alter habitat use.
- The project area is currently highly fragmented and has intense human activity—factors typically avoided by wolverines. Treatments would increase potential prey populations (deer and elk) should a wolverine pass through the area.

A determination of ***may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing*** *for boreal toad, northern leopard frog, boreal owl, flammulated owl, northern goshawk, olive-sided flycatcher, three-toed woodpecker, American marten, and Townsend's big-eared bat* is based on the following rationale:

- A minimum of 40 snags/down logs and recruitment snags per 5 acres would be maintained in treatment areas. Additional snags and down wood could be removed.
- Treatments could occur in nesting, roosting, foraging or over-wintering habitat, but adequate suitable habitats would remain post-treatment.
- Design criteria require a treatment buffer around water (potential toad and frog habitat).

TABLE 3.13 EFFECT DETERMINATIONS FOR EACH SPECIES ADDRESSED IN THIS ASSESSMENT

[1] **STATUS CODES: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=FS sensitive
[2] **NE**=no effect; **NLAA**=may effect, not likely to adversely affect; **NLAA –B**=may effect, not likely to adversely affect – wholly beneficial; **LAA**=may effect, likely to adversely affect; **BI**=beneficial impact; **NI**=no impact; [1] **STATUS CODES: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=FS sensitive
[2] **NE**=no effect; **NLAA**=may effect, not likely to adversely affect; **NLAA –B**=may effect, not likely to adversely affect – wholly beneficial; **LAA**=may effect, likely to adversely affect; **BI**=beneficial impact; **NI**=no impact; **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; and **LRLV**=likely to result in a loss of viability on the Planning Area, or in a trend toward federal listing.=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; and **LRLV**=likely to result in a loss of viability on the Planning Area, or in a trend toward federal listing.

Species Common Name	Scientific Name	Status Code[1]	Determinations of Effect [2]	
			No Action	Action Alternatives
Boreal toad	*Bufo boreas*	S	NI	MAII
Northern leopard frog	*Rana pipiens*	S	NI	MAII
Boreal owl	*Aegolius funereus*	S	NI	MAII
Flammulated owl	*Otus flammeolus*	S	NI	MAII
Loggerhead shrike	*Lanius ludovicianus*	S	NI	NI
Northern goshawk	*Accipiter gentilis*	S	NI	MAII
Olive-sided flycatcher	*Contopus cooperi*	S	NI	MAII
Peregrine falcon	*Falco peregrinus*	S	NI	NI
Three-toed woodpecker	*Picoides dorsalis*	S	NI	MAII
American marten	*Martes americana*	S	NI	MAII
Canada lynx	*Lynx canadensis*	T	NE	NLAA
North American Wolverine	*Gulo gulo*	S	NI	NI
Townsend's big-eared bat	*Plecotus townsendii*	S	NI	MAII

Direct and Indirect Effects - MIS

The effects analyzed below apply to both alternatives—the only difference being acres treated. Both action alternatives are expected to have similar effects on the MIS analyzed; only Alternative 3 is incrementally higher than Alternative 2.

Under these alternatives, fuels reduction would proceed as described in Alternatives 2 and 3. Up to approximately 8,000 acres of elk habitat and 1,500 acres (Alternative 2) and 1,700 acres (Alternative 3) of Abert's squirrel habitat may be affected. Thinning smaller diameter ponderosa pine would reduce stand densities further, but would also promote growth and speed the production of suitable Abert's habitat for the area. Abert's squirrels populations may be reduced, but quality habitat may be recruited quicker. Alternative 2 treats approximately 200 fewer acres of ponderosa pine than Alternative 3. Ponderosa pine would remain under both action alternatives, but densities would be

reduced. Design criteria also require clumps of dense, large diameter ponderosa remain post-treatment.

Short-term direct and indirect effects:

Live ponderosa pine would be favored in the thinning process to help establish larger diameter trees over a shorter time period and enhance potential Abert's habitat (see Design Criteria #23 and 24). The number of live ponderosa pine trees remaining in the treatment area varies greatly across the project area because of recent MPB attacks and may not support Abert's squirrels in some previously occupied areas. Potential Abert's habitat in the treatment areas comprises a sizeable amount available on the Salida Ranger District, which is also experiencing the same fate with MPB. However, the action alternatives would retain Abert's habitat (Table 3.14) and would not result in a loss of viability for the species over the planning area as a result of these alternatives.

TABLE 3.14 ACTION ALTERNATIVES ACRES OF POTENTIAL ABERT'S SQUIRREL HABITAT ON DIVERSITY UNITS

Habitat Quality*	Proposed Action[1]		Alternative 3[1]	
	DU 223	DU 224	DU 223	DU 224
High	550	150	400	200
Moderate	1,500	450	1,600	400
Forage	600	100	600	100
Total	**2,650**	**700**	**2,600**	**700**

*All habitat structural stages (HSS) are for ponderosa pine habitats only.
High quality = HSS 4B, 4C or 5; Moderate quality = HSS 4A; Forage = HSS 3A, 3B, or 3C
[1]Rounded to nearest 50 acres
Vegetation information obtained from CVU data.

The project area contains three diversity units (DU), 222, 223 and 224. DU 222 is not carried through the analysis because 1) very little (less than 400 acres) is being impacted by the action alternatives; 2) the impacted area constitutes less than 3% of the DU; and 3) most of the DU is in forested habitat owned by the Forest Service where additional management activities are not occurring (adjacent to the Buffalo Peaks Wilderness). Given the preceding reasons habitat effects would be washed out given the size of the DU and potential affected areas. The entire project area is considered when not analyzing diversity units.

The proposed treatments are expected to improve elk forage quantity and quality by opening the canopy and allowing more light to reach the forest floor. Typically, an increase in herbaceous vegetation is the result of opening the forest canopy in the short-term resulting in increased forage. The treatment areas are within elk winter range and seasonal restrictions in the design criteria would minimize potential conflicts during winter. Only a small portion of the project area (less than 200 acres) is in elk calving areas and proximate calving areas would be unaffected. No new permanent roads would be constructed with this project and any temporary roads constructed would have limited access for administrative uses only (closed to the general public) during operations. Treatments are not expected to result in a measurable change in elk populations or

trends. Given the wide distribution, abundance, increasing population trend, and game status of elk, there are no viability concerns.

Long-term direct and indirect effects:

Over the longer term, as mature ponderosa pine re-establishes, quality Abert's habitat is expected to increase. Elk forage quality and quantity would decrease as canopy closure increases, but should have no measurable impact on the population because these changes would occur incrementally over many years and elk would adjust use patterns to accommodate the changes. Additionally, many other environmental effects would be acting on the elk population simultaneously and incremental vegetation changes would not be discernable from many other environmental variables.

Mule Deer and Bighorn Sheep

Alternative 2: Proposed Action

Fuels reduction would proceed as described in Alternative 2. The biggest changes for mule deer would be realized in the southwestern portion of the project area where shrublands would be burned. Burning would enhance browse species by stimulating new growth for bitterbrush and mountain mahogany. These areas would likely be burned in a mosaic, with patches of burned and unburned vegetation expected within prescribed burn treatment areas. Less than 25% of the treatment areas designated for prescribed fire are expected to be implemented due to personnel and funding constraints.

Bighorn sheep would benefit from mechanical treatments in the piñon-juniper (southeastern portion of the project area) prior to burning because the canopy would be opened and larger areas are more likely to be burned. Opening the canopy would create additional sheep habitat in the Limestone Ridge vicinity.

Alternative 3

Effects to mule deer would be similar to Alternative 2, since many of the same areas would have prescribed burns in mule deer habitats, only areas treated would be incrementally higher. There would be no mechanical thinning in the piñon-juniper prior to prescribed burning along Limestone Ridge. Prescribed burns in these areas without thinning would be spottier and the fuels would not be as continuous or make as large an opening. Without creating openings, bighorn sheep would continue to avoid the areas with higher canopy closure.

3.7 SOILS

3.7.1 Affected Environment

The soils of the project area are derived from a variety of sedimentary, igneous, and metamorphic bedrock. Most of the area contains soils that were developed from shallow granitic rocks within a dry climatic zone. The parent soil material derived from the rock is low in nutrient contents and supports limited amounts of vegetation. Organic matter contents are low in these soils due to the dry semi-arid climate and the lack of available nutrients for plant growth. The potential for soil erosion following soil disturbance is moderate to high in many areas. The higher erosion potential is due to the lack of organic matter and vegetative cover inherent in these soils and this area.

The valley bottoms and small drainages total less than five percent of the area. Maintenance of the soil productivity of the valley and drainage bottoms is essential to the health and diversity of the entire area. These soils have been accumulated from hill slope erosional processes over thousands of years and contain alluvial material that is very susceptible to surface disturbance. The soils are generally a material weathered in place from micaceous granite and gneiss bedrock. Disturbance of the surface course sandy loam layer can cause a loss of water and nutrient holding capacity, and thereby reduce vegetative cover.

Wet Soils

Based on soil information available from the Northern San Isabel and Western Pike National Forest Soil Survey (1995), it was determined that portions of the project area have been identified as having some wet or organic soils. These soils include: *Cryoborolls-Cryaquolls association* and *Cumulic Haploborolls*. These soils are located in riparian corridors within the project area.

Erosional Processes

Several erosional processes actively occur within the project area. They are sheet/rill erosion, compaction, and to a minor extent mass wasting. Each plays a part in assisting sediment delivery to streams and occasional loss of productive soil.

Sheet erosion appears to be prevalent in the shallow sandy soils with little vegetation. There are small drainages and valley bottoms that contain alluvial material that is very susceptible to surface disturbance.

Soil Erosion Potential[1]

Soil erosion potential tables were developed based upon: soil type, texture, slope, K-factor and vegetative cover. The results of this stratification are displayed in Tables 3.15 and 3.16. The low, moderate, or severe ratings are not intended to mean how intensively the resource can be managed; rather they are intended as a relative rating used to indicate the potential of bare ground eroding, mostly from raindrop impact and runoff.

TABLE 3.15 EROSION HAZARD FOR PROPOSED ACTION

WATERSHED	PROPOSED ACTION TREATMENT	EROSION HAZARD	% of Total Treatment Acres
Four Mile Ck	Prescription A, Prescribed Fire	1	11.42%
Trout Ck	Prescription A, Prescribed Fire	1	15.15%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	7.98%
Salt Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	0.10%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	15.34%
Four Mile Ck	Prescription C, Salvage and Thinning	1	1.04%
Trout Ck	Prescription C, Salvage and Thinning	1	0.85%
			51.88%
Four Mile Ck	Prescription A, Prescribed Fire	2	2.52%
Trout Ck	Prescription A, Prescribed Fire	2	13.87%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	2	5.45%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	2	3.08%
Four Mile Ck	Prescription C, Salvage and Thinning	2	0.26%
Trout Ck	Prescription C, Salvage and Thinning	2	2.15%
			27.32%
Four Mile Ck	Prescription A, Prescribed Fire	3	3.58%
Salt Ck	Prescription A, Prescribed Fire	3	0.01%
Trout Ck	Prescription A, Prescribed Fire	3	11.91%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	0.48%
Salt Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	0.04%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	2.01%
Trout Ck	Prescription C, Salvage and Thinning	3	2.77%
			20.80%

[1] This 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. 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.

TABLE 3.16 EROSION HAZARD FOR ALTERNATIVE 3

WATERSHED	ALTERNATIVE 3 TREATMENT	EROSION HAZARD	% of Total Treatment Acres
Four Mile Ck	Prescription A, Prescribed Fire	1	9.98%
Trout Ck	Prescription A, Prescribed Fire	1	13.88%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	6.69%
Salt Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	0.09%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	1	11.06%
Four Mile Ck	Prescription C, Salvage and Thinning	1	0.69%
Trout Ck	Prescription C, Salvage and Thinning	1	5.38%
			47.78%
Four Mile Ck	Prescription A, Prescribed Fire	2	4.21%
Trout Ck	Prescription A, Prescribed Fire	2	19.65%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	2	4.80%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	2	2.70%
Trout Ck	Prescription C, Salvage and Thinning	2	0.13%
			31.49%
Four Mile Ck	Prescription A, Prescribed Fire	3	4.71%
Salt Ck	Prescription A, Prescribed Fire	3	0.01%
Trout Ck	Prescription A, Prescribed Fire	3	13.95%
Four Mile Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	0.58%
Salt Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	0.01%
Trout Ck	Prescription B, Salvage, Thinning, Prescribed Fire	3	1.01%
Four Mile Ck	Prescription C, Salvage and Thinning	3	0.00%
Trout Ck	Prescription C, Salvage and Thinning	3	0.45%
			20.72%

3.7.2 Environmental Consequences of the Alternatives

3.7.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

Over the past 100 years fires have been actively suppressed in the project area. Fuel loads have been increasing and trees are becoming decadent and susceptible to insect infestation and disease. The result of fire suppression may be an increase in high intensity wildfires which would clear surface vegetative material and sterilize soils. This would directly contribute to severe soil erosion.

Under the No Action alternative, hazardous fuels and the risk of wildfire would continue to increase. If a wildfire were to occur, an increase in soil erosion would result, with a possibility of soil sterilization and delayed re-vegetation, in those areas where extremely hot, prolonged fires occur. A lack of surface vegetation after these events would contribute to much more rapid surface runoff, soil loss, and sediment yield.

Cumulative Effects

This alternative would reinforce the past ecological track this area is following and would set conditions for continued erosion levels exceeding Forest Plan Standard.

3.7.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

Wet Soils

Design of mechanical treatment activities using off road vehicles that avoid operations within the wet areas would minimize mixing and displacement of these soils. Further verification prior to temporary road layout and construction is recommended prior to finalizing size and shape so as to avoid these wetland soils. In wet areas, soil compaction would occur, and plants may be unable to germinate in the impacted area. Loss of vegetation could result in these sites drying up. Non-native or undesirable plant seeds could also be introduced. When cross-country, off-route motorized traffic is spread out over a large area, so are the associated environmental effects, with most impacts occurring during wet soil conditions. If the disturbance is not repeated, natural regeneration could occur in areas with productive soils. However, areas containing less productive soils would show signs of disturbances caused by cross-country, off-route vehicular travel for years. Temporary roads crossing streams and wetlands would result in the loss of vegetation and increased soil compaction, bank instability, and increased sedimentation.

Erosional Processes

Erosion of soils due to vehicular use along riparian management areas would occur on easily compacted or erodible soils. In areas for proposed temporary roads, it is anticipated that the temporary roads would accumulate surface runoff and channel water, thereby accentuating rilling and increasing the potential for sediment delivery to streams.

Road Construction & Reconstruction

Research has shown that seventy percent of total sedimentation from slopes occurs the first year after road construction. Temporary roads would affect the annual sediment deposition, with cross drains by far the largest source of sediment from roads. Increased runoff causes greater erosion of road prisms and provides greater energy for sediment transport below slopes (Ketcheson and other 1996). Erosion rates, after initial spring runoff, vary by site conditions such as ground cover density, slope, gradient, aspect, rainfall erosion on cut and fill slopes (Megahan 1995), gradient, effects of grade, traffic induced rutting, and type of surfacing on road treads (Burroughs and King 1985).

Reconstruction of existing roads, including gravelling the full width of drainages structures in Riparian Habitat Conservation Areas and contributing areas, would reduce sediment delivery, especially from poorly drained roads or those roads in poor condition.

Implementation of Best Management Practices would effectively minimize most erosion on newly constructed and reconstructed roads.

Fire

Typically the range of fire effects on soils is dependant on soil moisture, fuel conditions, and weather as they contribute to fire intensity and severity. Soil nutrients are either lost by volatilization or are transformed into highly available ions by burning. Nutrients not volatilized are released as highly mobile ions which can be metabolized rapidly either by plants or microorganisms (McNabb and Swanson 1990). Fire increases the potential for accelerated erosion primarily through its effects on vegetation and soil. As fire increases in severity, more vegetation is killed, more forest floor organic matter is consumed, and the likelihood of changing the physical properties of the soil increases. Duff consumption would provide the maximum mineral seedbed, while partial consumption or charring would limit the exposure of the mineral seedbed. Negative impacts may occur from slash concentrations where fire intensity is greater and localized. Very hot fires, where rocks are fractured, can leave deep ash layers and prevent seeds from reaching the mineral soil bed. Surface moisture and nutrients may be depleted enough to prevent regeneration and establishment of vegetation.

Soil Erosion Potential

The following soil families located within the project area have an Erosion Hazard of 3 and may require more attention when rehabilitating after treatment.

Cheadle family - Rock outcrop complex

Revegetation considerations: Drought tolerant plants have the greatest chance for success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings. Management activities are limited by rock outcrop. Maintaining and enhancing the potential natural plant community can reduce the erosion hazard and maintain sustained multiple-use.

Cryorthents - Rock outcrop complex

Revegetation considerations: Trees are slow to return after a disturbance. Planting grasses and forbs have the best chance of success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings.

Timber management considerations: Activities are limited by steep slopes, rock outcrop, and erosion hazard. Trees to plant are Douglas-fir, ponderosa pine, and lodgepole pine.

Leadville-Rogert families - Rock outcrop complex

Revegetation considerations: Initial disturbances are best stabilized with grass, grass-likes, and forbs plant. Mulching or similar treatment can retain soil moisture, reduce erosion hazard, and protect emerging plant seedlings. Reforestation may require overstory canopy cover shade for tree seedling establishment.

Timber management considerations: Reforestation is limited by very low to moderate available water capacity and rubbly soil surfaces. Reforestation requires long periods of time and many conifer trees prefer overstory canopy cover shade for tree seedling establishment. Aspen is seral in some areas below 11,000 feet.

Legault family - Rock outcrop complex

Revegetation considerations: Trees are slow to return after a disturbance. Planting grasses and forbs have the best chance of success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings.

Timber management considerations: Plant trees that are drought tolerant or re-vegetate with grasses and forbs.

Ratake family - rock outcrop complex

Revegetation considerations: Drought tolerant plants have the greatest chance for success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings.

Timber management considerations: Piñon pine is slow to return after a severe disturbance. Seral stages will be dominated by grasses, forbs, and mountain-mahogany.

Rogert family - Rock outcrop complex

Revegetation considerations: Drought tolerant plants have the greatest chance for success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings.

Other management considerations: Management activities are limited by rock outcrop, steep slopes, and erosion hazard.

Sphinx family, dry - Rock outcrop complex

Revegetation considerations: Trees are slow to return after a disturbance. Planting drought tolerant grasses and forbs have the best chance of success. Mulch or similar treatment would protect the soil from erosion, help conserve soil moisture, and protect emerging plant seedlings. Management activities are limited by slopes, rock outcrop, and severe erosion hazard, windthrow hazard, low available water capacity, and south facing slopes; plant trees that are drought tolerant or re-vegetate with grasses and forbs.

Alternative 2 and 3 are similar in treatments and outcomes. The primary differences occur in lengths of temporary roads and treatment type in specific area. While the Alternative 2 utilizes slightly more miles of temporary roads (0.6 miles), more of the treatment area with moderate and severe erosion potentials is treated mechanically than Alternative 3. Alternative 2 also treats a smaller area than Alternative 3.

Salvage & Thinning

The two action alternatives would have a positive effect on soil resources. Removal of dead and dying trees would reduce the likelihood of future high intensity wildfires and their associated detrimental affects. Mechanical treatments, low intensity fires, removal and repair of temporary roaded areas, spreading slash, mulching, and seeding of burned areas and areas with high erosion potentials would help stabilize the soil resource. Alternative 2 would better protect the soil resources in areas of moderate and severe erosion potential than Alternative 3 because less surface area is exposed to the detrimental effects of burning (Tables 3.15 and 3.16). More areas with moderate and severe erosion potential would be hand treated, removing the possibility of fire destroying scarce, soil-stabilizing vegetation.

Cumulative Effects

Both Alternative 2 and 3 would have the lowest impact to the soil resource among the action alternatives, primarily due to the mechanical treatments and the relatively low temperatures involved in the fuels treatments of the surface vegetation and the mulching and re-vegetation activities.

The result of successful treatment would help prevent high intensity fire in the treated areas, maintain the soil nutrient base and soil productivity, minimize man-caused soil erosion, and maintain integrity of associated ecosystems. Soil loss and sediment yield would remain within acceptable limits commensurate with the natural ecological processes.

3.8 HYDROLOGY

3.8.1 Affected Environment

The project area is primarily located within the Fourmile Creek and Trout Creek sixth-level watersheds; both are tributaries to the Arkansas River. A small portion of the project area is located within the Salt Creek sixth-level watershed (Park County), tributary to the South Platte.

Streams, Riparian and Springs

The majority of the project area is dominated by intermittent streams. Tables 3.17 and 3.18 show the stream mileage for the project area. The perennial stream miles are not too meaningful because of the way the project boundary intersects the perennial streams. Portions of South Fork, North Fork and the main stem of Sevenmile Creek are

perennial within the Fourmile Creek sixth-level watershed. Some portions of Trout Creek and its main stem are also perennial. The project area has a highly dissected stream network that is capable of delivering sediment to nearby perennial streams during runoff and storm events. Figure 6 (see Hydrologic section of the analysis file) is a map of riparian and streams for the project area.

TABLE 3.17 STREAM MILEAGE BY WATERSHED FOR PROJECT AREA

Watershed	Intermittent Stream	Perennial Stream
Fourmile Creek	32.12	1.68
Trout Creek	68.81	0.13
Salt Creek	1.75	0

TABLE 3.18 RIPARIAN ACREAGE BY WATERSHED FOR PROJECT AREA

Watershed	Riparian Acreage
Fourmile Creek	135
Trout Creek	288
Salt Creek	6

The majority of the project area receives between 12 – 14 inches of rainfall per year. Table 3.19 displays the mean, maximum and minimum temperatures and the mean precipitation by month for the project area. The number of wet days for the project area is also shown.

TABLE 3.19 CLIMATOLOGICAL INFORMATION FOR PROJECT AREA.

Month	Mean Maximum Temperature (Degrees F)	Mean Minimum Temperature (Degrees F)	Mean Precipitation (Inches)	Number of Wet Days
January	30	11.9	0.37	3.4
February	33.8	10.7	0.41	3.4
March	39	12.2	0.72	5.2
April	47.7	17.8	0.84	4.9
May	58.2	25.9	1.1	6.5
June	68.8	32.8	1.31	7.3
July	74.4	38.9	2.3	11.5
August	71.5	37.7	2.25	12.5
September	65.3	29.8	1.21	5.8
October	55.1	18.8	1.02	4.1
November	39.7	12	0.7	3.9
December	30.7	10.6	0.5	4.1
Annual			12.72	72.5

Nearly 36% of the annual precipitation falls in July and August; 72% of the annual precipitation falls between the first of May and the end of October. The highest number of wet days occurs in July and August.

3.8.2 Environmental Consequences of the Alternatives

3.8.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

Fuels would continue to accumulate and the fire regime condition class would remain at a moderate to high departure from the natural (historical) regime. In short, the watershed would be at a greater risk of high intensity wildfires and the health of the trees less than desired. Thus significant effects to the watershed could be realized as the result of a high intensity wildfire.

In one way or another, fire affects nearly every component of the hydrologic cycle from altering vegetative cover, thus the interception of precipitation, to the amount of water that infiltrates into the soil, to the amount of water and sediment leaving the hillslope as overland flow. Extensive research covering the effects of fire on soil and water exists. General Technical Report, *Wildland Fire in Ecosystems, Effects of Fire on Soil and Water* (September, 2005) prepared by the Rocky Mountain Research Station provides a state-of-knowledge review on this subject matter. The effects of fire on water quality, riparian areas, wetlands and hydrologic processes are summarized in the Hydrologic section of the analysis file.

In most cases, sediment is the main pollutant that affects water quality on Forest lands. The literature reports that roads are the main input of sediment into the watershed and its stream network. The overall sediment yield for the roads in this project area was covered by the Fourmile Travel Management Plan. For this project, sediment yield from the existing, closed roads (that will be utilized to implement this project) was calculated (WEPP model) and used as a baseline to compare sediment yield between the No Action and action alternatives. Sediment yield from the existing, closed roads in the Fourmile Creek watershed was predicted to be 1.9 tons/year and from the existing, closed roads in the Trout Creek watershed was predicted to be 2.2 tons/year. Therefore, approximately 4.1 tons per year are predicted to be eroded from the existing, closed roads within the project area.

3.8.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

The proposed treatments for the action alternatives are the same, yet locations and amounts of treated acreage do vary between the action alternatives.

Since less than 15 acres would actually be treated in the Salt Creek Watershed under either alternative, the effects are not specified for this watershed. However, all design criteria and mitigation associated with Prescriptions A and B would apply to the treated acres within this watershed. No acres are to be treated using Prescription C in the Salt Creek Watershed.

Roads (Existing, Closed and Proposed Temporary Roads)

While minor variations in the mileage of existing, closed roads and proposed, temporary roads occur between the alternatives, the temporary stump road mileage is estimated at one mile for each alternative. While sediment would be lost from these stump roads, no comparative analysis was done for them since the mileage did not differ between the action alternatives. Sediment yield from the existing, closed roads (to be reopened) and the proposed temporary roads is addressed in the next section.

The direct effects associated with prescribed burning involve the preparation work to render the treatment units suitable for burning and the direct effects related from fire being applied to the landscape. Handlines and ATV draglines typically remove the ground cover and litter down to the mineral soil. Exposing the mineral soil increases the erosion potential from these trails due to raindrop impact; the erosion potential is a function of soil type and slope. Broadcast burning consumes ground cover and vegetation; where fire burns at intensities great enough to expose bare soil and even generate water repellent layers in the upper portion of the soil profile, infiltration, runoff and erosion are directly affected. These effects are magnified when high, intensity burns occur on steep slopes; Figures 3, 4a and 5a (see Hydrologic section of the analysis file) shows treatment areas that have a high erosion hazard if the mineral soil is exposed from the treatment type, in this case prescribed fire. Slash and other debris from line preparation work are generally stacked and burned in piles; soils can become sterilized from the resulting heat given off during burning of the piles.

The main indirect effects associated with prescribed burning are erosion and subsequent deposition of sediment into the drainage network, increase opportunity for weed invasion on areas that are burned at high intensity, and if slash disposal is not done properly an increased opportunity for flooding. Erosion would increase when treatments expose the mineral soil. This displaced sediment can affect water quality as it is transported offsite into the drainage network and into perennial streams. Weeds tend to be the first colonizer of sterile and/or disturbed sites; if unchecked this invasion can accelerate the spread of weeds throughout the watersheds of the project area. From years of onsite inspection, slash near drainages may end up in ephemeral drainages and intermittent channels; problems may occur when high water either from runoff or a high-intensity, short duration precipitation event transports this debris downstream to plug culverts and the like. This can have the unintended consequence of washing out roads and associated facilities.

The main direct effects associated with salvage and thinning involve the removal of timber and its byproducts from the landscape. In order to provide for the removal of forest products from the landscape, skid trails and roads, and log landing decks are required. The resulting ground disturbing activities from product removal and road building are significant direct effects. These activities directly expose the mineral soil and increase the erosion potential. Exposing the mineral soil increases the erosion potential from the disturbed and road surfaces due to raindrop impact; the erosion potential is a function of soil type and slope. These effects are magnified when salvage logging and thinning occur on steep slopes; Figures 3, 4b, 4c, 5b and 5c (see the Hydrologic section of the analysis file) show treatment areas that have a high erosion hazard if the mineral soil is exposed from salvage and/or thinning operations. Road construction can also alter

normal flow patterns within the watershed. In effect, they increase the stream network density.

Erosion and sediment delivery to the stream network, weed invasion and the potential for flooding are also indirect effects associated with salvage logging and thinning operations. These ground disturbing activities alter the landscape more so than moderate intensity prescribed burns, yet they allow for product removal to be consumed by the public.

Effects Unique to each Alternative, and the Differences between the Action Alternatives

Table 3.20 shows the treatment acreage for the Proposed Action and Alternative 3. Approximately one-third of the effects from project-related activities occur in the Fourmile Creek watershed and two-thirds of the effects from project-related activities occur in the Trout Creek watershed.

TABLE 3.20 COMPARISON OF ACTION ALTERNATIVES BY WATERSHED BY PRESCRIPTION

		Treatment Acres		
		Proposed	Alternative	Diff
Watershed	Prescription	Action	3	PA-Alt3
Fourmile Creek	Prescription A, Prescribed Fire	1,490	1,810	-320
Fourmile Creek	Prescription B, Salvage, Thinning, Prescribed Fire	1,183	1,156	26
Fourmile Creek	Prescription C, Salvage and Thinning	110	67	43
	Totals	2,783	3,033	-250
Salt Creek	Prescription A, Prescribed Fire	1	1	0
Salt Creek	Prescription B, Salvage, Thinning, Prescribed Fire	12	9	3
Salt Creek	Prescription C, Salvage and Thinning	0	0	0
	Totals	13	10	3
Trout Creek	Prescription A, Prescribed Fire	3,482	4,556	-1,074
Trout Creek	Prescription B, Salvage, Thinning, Prescribed Fire	1,737	1,415	322
Trout Creek	Prescription C, Salvage and Thinning	490	571	-80
	Totals	5,709	6,541	-832

Effects Summary

Table 3.24 provides a realistic estimate of the probable acres that would be treated for each action alternative. Prescription B and C totals in this table reflect the treatment area with slopes that are less than or equal to 30%. The entire treatable acres for Prescription A were included because fire can be applied to any hillside, however where fire burns at a high intensity on those slopes exceeding 30%, some mitigation may be required.

Table 3.22 identifies the number of acres by prescription and alternative that exceed 30% slope.

TABLE 3.21 TREATMENT TOTALS BY ACTION ALTERNATIVE

Prescription	Proposed Action	Alternative 3	Diff. PA-Alt3
Prescription A Totals	4,973	6,367	-1,394
Prescription B Totals	2,932	2,580	352
Prescription C Totals	601	637	-37
Totals	8,505	9,585	-1,079

TABLE 3.22 REDUCTION OF TREATMENT TOTALS (RESTRICTED BY SLOPES >30%)

Prescription	Proposed Action	Alternative 3
Prescription A Totals	894	1,401
Prescription B Totals	233	123
Prescription C Totals	283	41
Totals	1,410	1,565

TABLE 3.23 DIFFERENCE BETWEEN TABLE 3.21 AND TABLE 3.22

Prescription	Proposed Action	Alternative 3
Prescription A Totals	4,079	4,966
Prescription B Totals	2,699	2,457
Prescription C Totals	318	596
Totals	7,095	8,020

TABLE 3.24 PROBABLE TREATED ACRES BY ACTION ALTERNATIVE

Prescription	Proposed Action	Alternative 3
Prescription A Totals	4,973	6,367
Prescription B Totals	2,699	2,457
Prescription C Totals	318	596
Totals	7,989	9,421

From an effects perspective, more land would be treated by prescribed fire (Prescription A) under Alternative 3 than under the Proposed Action.

TABLE 3.25 SUMMARY OF PROBABLE MECHANICALLY TREATED ACRES

Prescription	Proposed Action	Alternative 3	Diff. PA-Alt3
Total treated, Prescription B and C only	3,532	3,218	315
Less acreage, Prescription B and C only	516	164	352
Probable treated acres, Prescription B and C only	3,016	3,054	-37

Table 3.25 displays the probable acreage that could be mechanically treated. The difference between the Proposed Action and Alternative 3 for both Prescriptions B and C is only 37 acres. From an effects perspective, these two alternatives are quite similar.

The total miles of existing, closed roads used to estimate sediment loss between the action alternatives was 10.3 miles for the Proposed Action and 10.0 miles for Alternative 3. The total miles of proposed, temporary roads used to estimate sediment loss between the action alternatives was 6.2 miles for the Proposed Action and 5.9 miles for Alternative 3.

For the overall project, the estimated sediment yield from the reopened, existing closed roads and proposed, temporary roads was calculated to be 41.2 tons/year for the proposed action and 40.3 tons/year for the Alternative 3. The difference in sediment yield between the action alternatives and No Action alternative ranges between 8.4 to 8.8 times greater in the Fourmile Creek watershed and 9.3 times greater in the Trout Creek watershed (see Table 3.28). The difference in sediment yield between the action alternatives for these same roads was estimated to be 0.9 tons/year within the Fourmile Creek watershed and no, net tons/year within the Trout Creek watershed.

The combined total sediment loss from the reopened, existing closed and proposed, temporary roads was determined to be the same for each action alternative at 22.5 tons/year. The combined total sediment loss from these roads in the Fourmile Creek watershed was predicted to be 18.7 tons/year under the Proposed Action and 17.8 tons/year under Alternative 3. Thus, in terms of sediment yield from these roads, the action alternatives are quite similar and the yield differs only by approximately one ton between them.

Cumulative Effects

Fourmile Creek Watershed

Within this watershed, the major difference between the Proposed Action and Alternative 3 is the amount of land being treated with prescribed fire. An additional 320 acres would be treated under Alternative 3. Small differences in acreages exist between the action alternatives for Prescriptions B and C.

The project proposes to reopen 5.4 miles of existing, closed roads under the Proposed Action, and reopen 5.2 miles of existing, closed roads under Alternative 3. In addition, the project proposes to construct 2.7 miles of temporary roads under the Proposed Action compared to 2.5 miles of temporary roads under Alternative 3. The differences

between the alternatives are quite small. When compared to the No Action alternative, these road miles then become significant. Table 3.26 shows a comparison of the existing, closed and proposed, temporary roads by watershed between action alternatives.

For the existing, closed roads that would be reopened, between 9.2 and 9.6 tons/year more of sediment is predicted to be eroded than compared to the No Action alternative. The Proposed Action would potentially generate 0.4 tons/year more than Alternative 3. For the proposed, temporary roads, between 6.7 and 7.2 tons/year more of sediment is predicted to be eroded than compared to the No Action alternative. These roads do not exist under the No Action alternative. The Proposed Action would potentially generate 0.5 tons/year more than Alternative 3. See Table 3.27 for sediment yield by watershed and alternatives.

Trout Creek Watershed

Within this watershed, the major difference between the Proposed Action and Alternative 3 is the amount of land being treated with prescribed fire. An additional 1070 acres would be treated under Alternative 3. Under the Proposed Action, approximately 320 additional acres would be treated by Prescription B; it is also expected that 80 less acres would by treated by Prescription C under the Proposed Action than Alternative 3.

The project proposes to reopen 4.8 miles of existing, closed roads under the Proposed Action and Alternative 3. In addition, the project proposes to construct 3.5 miles of temporary roads under the Proposed Action and Alternative 3. There is virtually no difference in these mileages between the action alternatives. Yet when compared to the No Action alternative, these road miles then become significant (Table 3.26).

For the existing, closed roads that would be reopened, 10.5 tons/year more of sediment is predicted to be eroded when comparing the action alternatives to the No Action alternative. The Proposed Action and Alternative 3 would generate the same amount of sediment from the existing, closed roads. For the proposed, temporary roads, 9.8 tons/year more of sediment is predicted to be eroded when comparing the action alternatives to the No Action alternative. These roads do not exist under the No Action alternative. The Proposed Action and Alternative 3 would generate the same amount of sediment from the proposed, temporary roads. See Table 3.27 for sediment yield by watershed and alternatives.

TABLE 3.26 COMPARISON OF ROADS FOR EACH ACTION ALTERNATIVE.

Type of Roads	Proposed Action (Approximate Miles)	Alternative 3 (Approximate Miles)
Existing Closed Road, Fourmile Creek	5.43	5.20
Existing Closed Road, Trout Creek	4.83	4.80
New Temporary Road, Fourmile Creek	2.65	2.46
New Temporary Road, Trout Creek	3.50	3.45
Total Miles	16.41	15.91

TABLE 3.27 SEDIMENT YIELD BY WATERSHED AND ALTERNATIVES (TONS/YEAR)

Watershed	Road Type	No Action Alternative	Proposed Action	Alternative 3	Diff. PA-NA	Diff. Alt3-NA	Diff. PA-Alt3
Fourmile	Existing Closed	1.90	11.5	11.1	9.6	9.2	0.4
Trout Creek	Existing Closed	2.19	12.7	12.7	10.5	10.5	0.0
Fourmile	Temporary	0	7.2	6.7	7.2	6.7	0.5
Trout Creek	Temporary	0	9.8	9.8	9.8	9.8	0.0
Fourmile	Combined	1.90	18.7	17.8	16.8	15.9	0.9
Trout Creek	Combined	2.19	22.5	22.5	20.3	20.3	0.0

3.9 CULTURAL AND HERITAGE RESOURCES

3.9.1 Affected Environment

The cultural resources located within the project area constitute an important record of prehistoric and historic human habitation and use of the central Colorado region and the Arkansas Hills. The significance of individual cultural sites is a function of their relationships to important events, peoples or styles and their ability to provide additional scientific information about the prehistory or history of the area. As of August 16, 2006, the Forest Service has conducted one continuing and six previous cultural resource inventories within the project area. As a result of these investigations 82 historic properties (termed “prehistoric sites” or “historic sites”) have been identified and recorded. Seventeen of these sites are affiliated with historic use, 61 are prehistoric in their affiliation and four exhibit both historic and prehistoric phenomena.

The 19 recorded historic sites (including the four with both historic and prehistoric use) are related to transportation (historic railroads), mining, and public works (specifically, Civilian Conservation Corps (CCC) restoration and range improvement work). The railroad related sites document use of the project area by the Denver, South Park, & Pacific (DSP&P) Railroad and also by the Midland Railroad. These sites include the grade, Summit Station, and town site used by the DSP&P, and the grade, trestle over the DSP&P grade, Bath Station, and town site used by the Midland. The mining related sites are associated with the Colorado High Country Mining Boom of the late 19th and early 20th century. Local flurries of mining activity in the Colorado Mountains were based on the discoveries of promising ore deposits and their exploitation. These local boomlets were quite limited in a geographic sense; as one area “hit it rich”, there would be a short period of expansion and frenzied activity followed by a contraction as the lode played out and another strike was made somewhere else. Mining sites in the project area are expressed as prospecting complexes, miner’s cabins, and mining camps. The individual resources include one mining camp, one prospect complex consisting of 11 shallow explorations and a mine shaft, and two miners’ camps formal mining habitations containing a log cabin and domestic refuse. Eight other mining related resources are mine complexes containing shafts and adits, domestic refuse, and construction debris. The Civilian Conservation Corps sites consist of series of check dams in individual

drainages, terracing on fragile slopes, and a quarry area where material for the dams was obtained.

The 63 recorded prehistoric sites are generally characterized as surface areas of stone tools, and stone tool manufacturing debris. One culturally modified ponderosa pine also was identified. Concentrations of finished tools and manufacturing debris were noted at many sites; these may represent the remnants of temporary dwellings, or outside activity areas. Total quantities of material items on the surfaces of these sites generally range from five to several hundred artifacts. Prehistoric sites with relatively few surface items and with no recognizable materials concentrations are usually interpreted as resource procurement and processing areas. Prehistoric sites with relatively large totals of surface items (30 or more) and containing concentrations are thought to be seasonal camps. Thus, the prehistoric properties recorded in the project area probably represent locations where small prehistoric social groups processed or consumed harvested resources. Based on the characteristics of surface materials and their expression, the majority of sites identified in the project area date from the Middle Ceramic Period to the Historic Contact Period (A.D. 1000-1870); the area probably was inhabited during earlier periods, but the evidence for such use has been obscured or destroyed by later human use and geological forces.

Forty-four of the 82 recorded historic properties are eligible or potentially eligible for listing in the National Register of Historic Places (NRHP). Some of the eligible or potentially eligible properties are associated with prominent themes in Colorado history or prehistory. These particular properties and some additional historic properties contain intact archeological deposits and information of value to researchers. These sites are a potential source for addressing research problems in Colorado Mountain archeology; for example, in calculating the time span of prehistoric occupation in the southern Rocky Mountains, or in reconstructing the subsistence patterns and other lifeways of indigent social groups. Some of the sites may be important to the modern descendants of the American Indians peoples who previously inhabited the area. The eligible historic sites are records of the movement of people and materials into the mountains to exploit the Colorado Gold Rush, the expansion of Colorado Railroads, and public works projects with the goal of conservation of public lands and resources.

3.9.2 Environmental Consequences of the Alternatives

3.9.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

Under the No Action alternative, there would be no direct affect to cultural resources.

Implementation of the No Action alternative would increase the amount of dead wood, which may increase the frequency of uncontrolled wildfires. Such wildfires could damage standing historic structures; also, wildfires would destroy standing trees and surface vegetation increasing erosion and loss of archaeological material.

Cumulative Effects

There should be no direct cumulative effects resulting from implementation of the No Action alternative and other potential public land management actions in the near future. Presumably, potential future actions would trigger NHPA mandated studies that contain assessments of effects cultural resources and recommendations for mitigation of harmful effects.

Alternatives 2 (Proposed Action)

Direct and Indirect Effects

If this alternative is implemented with the identified prescriptions there would be no direct effect to cultural resources. Avoiding significant cultural properties would prevent undesirable effects.

The indirect effect of project implementation would be the reduction in fire danger, and resultant erosion and soil loss on and around archaeological sites. The curtailment of the fire danger and current water and wind erosion would be a positive indirect effect.

Cumulative Effects

The cumulative effect would also be positive, in that the positive effects realized through implementation of the treatments contained in this alternative would not be negated by additional actions of projects in the near future. Vegetation would periodically have to be thinned to insure adequate site protection standards are maintained.

Alternatives 3

Direct and Indirect Effects

If this alternative is implemented there would be no direct affect to cultural resources; the avoidance strategy would be implemented to prevent direct effects.

The indirect effects are similar to those described for Alternative B.

Cumulative Effects

The cumulative effects for Alternative 3 are similar to those of Alternative 2. The cumulative effects would be positive; the positive effects realized through implementation of the treatments contained in this alternative would not be negated by additional actions of projects in the near future. Vegetation would periodically have to be thinned to insure adequate site protection standards are maintained.

3.9 RECREATION RESOURCES

3.10.1 Affected Environment

Motorized recreation is the dominant human use of the project area. Most recreation is day-use, occurring in the spring and fall, when temperatures are cool, and the high mountain areas to the west are snow covered and inaccessible. Deer and elk hunting are common activities in the fall. Winter recreation use, occurs mostly below snowline at approximately 8,500 feet. Most of the summer use and overnight camping occurs on the long weekend holidays of Memorial Day, Fourth of July, and Labor Day. Residents living close by also use the area for morning and evening walks and drives during the heat of the summer. Current recreation activities include: driving for pleasure, off-highway vehicle driving with ATVs, motorcycles, and 4-wheel drive vehicles, mountain biking, horseback riding, wildlife viewing, nature study, hunting, rock hounding, camping, picnicking, firewood gathering, and hiking. Five outfitter/guides use the area for either mountain biking on the Midland Trail and/or horseback riding. The annual Collegiate Peaks Marathon run happens in early May and bisects the Lenhardy Road (FSR 376) west of FSR 376 A.

The recreation opportunity spectrum (ROS) for the area consist of about 50 percent Roaded Natural and 50 percent Semi-Primitive Motorized. The public has a good understanding of the existing rules and regulations for motorized travel in the area as a result of the Fourmile Travel Management Plan. The decision document for the plan was signed in October 2002 and shortly thereafter the plan was implemented starting with nine bulletin boards with a large map of the area showing where motorized and mechanized travel is permitted. Most of the area is closed to wheeled motorized use from December 1 through April 15 to provide for less disturbance of wildlife and to help reduce the rutting of roads during wet soil conditions. Many travel routes go through or near private land, affecting about eight private in-holdings. The Forest Service limits travel to designated routes which consist of National Forest System roads and trails. There are many spur roads off the system routes leading to dispersed campsites. Some of these routes are close to 300 yards long traveling across open grassland in order to reach a shaded timbered site or a site with a nice view of the Collegiate Peaks.

Since the Fourmile Travel Management Plan has been implemented there has been increased use of ATVs and high performance trail motorcycles. Often this use is associated with overnight camping. Most of the people camping camp with large groups of family members, friends or clubs. Increases in population, area popularity among

motorized users, availability of improved OHVs, and economic factors have all contributed to more motorized use over the last decade.

The only developed facilities are the Midland trail and associated signing (bulletin boards and route markers and trailhead structures at Shields Gulch where the Midland Trail intersect the gulch from the west, and Trout Creek Pass and FSR 311). There are plans to develop a trailhead on the east end of the Davis Meadow Trail 1434 north of the Goddard Ranch.

The Homestake water pipeline traverses through the northern section of the project area running parallel to FSR 311 and is under a special-use permit with the Forest Service. The City of Aurora owns this pipeline and has a private road easement on FSR 311 through the Goddard Ranch in the NW ¼ of Section 24.

3.10.2 Environmental Consequences of the Alternatives

3.10.2.1 Alternatives 1 (No Action)

Direct and Indirect Effects

The current management would continue to provide for recreation use and access on designated roads and trails. Insect and diseased trees adjacent to dispersed campsites and along existing roads would continue to be a hazard to recreation users.

Lack of management may lead to forest with increase number of trees killed by MPB and the build up of hazardous fuels which could eventually lead to high intensity fires and the lost of preferred camping sites.

Cumulative Effects

High tree mortality in forests may continue making it less desirable for sightseeing, camping, and recreation in general.

3.10.2.2 Alternatives 2 (Proposed Action) and 3

Direct and Indirect Effects

The short term effects would include unsightly slash, seasonal smoke form prescribed burns, and mixed traffic use during high public use periods. Hazard trees would be removed from high use areas of dispersed camping and system roads. Land survey monuments and bearing trees would be located and identified on the ground. More temporary roads would be opened making it attractive for OHV users to violate.

The proposed action would help maintain a healthy forest ensuring desirable camp sites for the future, reducing the chances of high intensity fires and unsightly scars and making it more desirable for the recreating public. Closing roads effectively to OHV users and monitoring them would be a challenge.

3.11 ECONOMIC ANALYSIS

The Forest Service standard software program Quicksilver was used to perform this economic analysis. Detailed values can be found in the Economic section of the analysis file.

Values considered in performing this economic analysis include costs from burn implementation, burn preparation, road closures, road maintenance, temporary road construction, harvest administration, and timber sales preparation. Benefits include private home protection, rangeland improvement, stumpage value, and wildlife habitat improvement.

Alternative 1 is the No Action alternative; therefore no cost or benefits were analyzed as part of the process.

TABLE 3.28 COMPARISON OF ECONOMIC ANALYSIS RESULTS FOR ALTERNATIVE 2 AND ALTERNATIVE 3

Analysis Results	Alternative 2	Alternative 3
Present Value Costs	-$2,121,605.40	-$2,195,606.32
Present Value Benefits	$10,697,767.56	$10,687,945.08
Present Net Value	$8,576,162.16	$8,492,338.76
Benefit Cost Ratio	5.04	4.87
Composite Rate of Return	15.84%	15.57%

Given the high project benefits relative to cost for both Alternatives 2 and 3, either alternative would be a good choice and preferable over Alternative 1. With the demonstrated difference shown in the benefit cost ratio between the two action alternatives, Alternative 2 would be the better choice economically.

4.0 CONSULTATION AND COORDINATION

During the development of this environmental assessment, the Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons:

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REFERENCES

Adams, A. W. 1982. Migration. In: Thomas, Jack Ward; Toweill, Dale E., eds. Elk of North America: ecology and management. Harrisburg, PA: Stackpole Books: 301-322.

Allen, A.W. 1987. The relationship between habitat and furbearers. *In*: M. Novak, J.A. Baker, M.E. Obbard comps., (eds.). Wild furbearer management and conservation in North America. North Bay, Ontario: Ontario Trappers Assoc.: 164-179.

Allred, W.S., and W.S. Gaud. 1994. Characteristics of ponderosa pines and Abert squirrel herbivory. Southwestern Naturalist 39:89-90.

Anderson, D.E., O.J. Rongstad, and W.R. Mytton. 1990. Home-range changes raptors exposed to increase human activity levels in southeastern Colorado. Wildlife Society Bulletin 18:134-142.

Andrews, R. and R. Righter. 1992. Colorado birds, a reference to their distribution and habitat. Denver Museum of Natural History. Denver, CO. 442 pp.

Armstrong, D.M. 1987. Rocky mountain mammals. Colorado Associated Univ. Press. Boulder, CO. 223 pp.

Aubry, K.B, G.M Koehler, and J.R. Squires. 1999. Ecology of Canada lynx in Southern Boreal Forests. USDA Forest Service General Technical Report RMRS-GTR-30.

Banci, V. A. 1994. Wolverine. Pp. 99-127 in The scientific basis for conserving forest carnivores in the western United States. (L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon and W. J. Zielinski, eds.). USDA Forest Service General Technical Report RM-254, Fort Collins, CO.

Banks, R.C. 1979. Human-related mortality of birds in the United States. USDI, Fish and Wildlife Service, Spec. Sci. Rep. Wildlife No. 215.

Berrie, P.M. 1973. Ecology and status of the lynx in interior Alaska. World's Cats, 1:4-41.

Black, B.B., M.W. Collopy, H.F. Percival, A.A. Tiller, and P.G. Bohall. 1984. Effects of low-level military training flights on wading bird colonies in Florida. Report by Florida Coop. Fish. and Wildlife Res. Unit. Gainesville, FL. University of Florida, for the U.S. Air Force Technical Report No. 7. 190 pp.

Bock, C.E. and J.H. Bock. 1974. On the geographical ecology and evolution of the three-toed woodpeckers (*Picoides tridactylus* and *Picoides arcticus*). Am Mid Nat 92(2): 397-405.

Boreal Toad Recovery Team. 1998. Report on the status and conservation of the boreal toad (*Bufo boreas boreas*) in the Southern Rocky Mountains 1997. Ed. Chuck Loeffler. Denver, CO: Colorado Division of Wildlife. 40 pp.

Bowles, A.E. 1995. Responses of wildlife to noise. *in* Knight and Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Island press, Washington, D.C. 372 pp.

Brand, C.J., L.B. Keith, and C.A. Fischer. 1976. Lynx responses to changing snowshoe hare densities in central Alberta. J. Wildlife Manage., 40:416-428.

Brittell, J.D, R.J. Poelker, S.J. Sweeney, and G.M. Koehler. 1989. Native cats of Washington, Section IIII: lynx. Unpubl., Washington Department of Wildlife, Olympia, WA.

Brown, P.M., M.R. Kaufmann, and W.D. Shepperd. 1999. Long-term, landscape patterns of past fire events in a montane pine forest of central Colorado. Landscape Ecology, 14: 513-532.

Burger, J. and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. J. of Comparative and Physiological Psychology (Series A) 95:676-684.

Burroughs, E.R. Jr.; King, John. 1989. *Reduction of Soil Erosion on Forest Roads.* USDA Forest Service. Intermountain Research Station. General Technical Report INT-264: 16p.

Buskirk, S.W. S.C. Forrest, M.G. Raphael. 1989. Winter resting site ecology of marten in the central Rocky Mountains. J. of Wildlife Manage. 53: 191-196.

Buskirk, S.W. and R.A. Powell. 1994. Habitat ecology of fishers and American martens. *In*: Buskirk, S.W., A. Harestand, and M. Raphael, compilers, eds. Biology and conservation of martens, sables and fishers. Ithaca, NY. Cornell University Press, 283-296.

Buskirk, S.W., L.F. Ruggiero, and C.J. Krebs. 1999. Habitat fragmentation and interspecific competition: implications for lynx conservation. USDA Forest Service General Technical Report. RMRS-GTR-30.

Cartron, J.E., W.S. Richardson, and G.A. Proudfoot. 2000. The cactus ferruginous pygmy-owl taxonomy, distribution, and Natural History. Pgs. 5-15. *In* J.E. Cartron and D.M. Finch (eds.), Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. General Technical Report. RMRS-GTR-43. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Churcher, P.B. and J.H. Lawton. 1987. Predation by domestic cats in an English village. J. of Zoology, London 212: 439-455.

Clark, B.S., D.M. Leslie Jr. and T.S. Carter. 1993. Foraging activity of adult female Ozark big-eared bats (*Plecotus townsendii ingens*) in summer. J. Mamm. 74(2): 422-427.

Code of Federal Regulations. 1982. National Forest System Land and Resource Management Planning. USDA, Forest Service. 36 CFR Part 219. September 30.

Colorado Air Pollution Control Division. http://www.cdphe.state.co.us/ap/smoke/

Colorado Department of Local Affairs. 2003. Internet website. Colorado Economic and Demographic Information System. http://www.dola.colorado.gov/demog/Population/widepro1.cfm

Colorado Division of Wildlife. 1998. Draft Conservation strategy for the re-establishment of Canada lynx and wolverine in the Southern Rocky Mountains. Seidel et al., eds. Colorado Division of Wildlife. Denver, CO. Unpubl. Draft. January 12, 1998. 116 pp.

Colorado Division of Wildlife. 2004. Internet website. http://wildlife.state.co.us/species_cons/lynx.asp

Colorado Division of Wildlife. 2005. Natural Diversity Information Source GIS Elk Activity Map. http://ndis.nrel.colostate.edu/ftp/ftp_response.asp

Colorado Natural Diversity Information Source. 2001. Internet website. Rare Plant Guide. http://ndis.nrel.colostate.edu

Colorado Natural Heritage Program. 2004a. Rare and imperiled animals, plants and plant communities database. Fort Collins, CO.

Colorado Natural Heritage Program. 2004b. Boreal toad survey and monitoring project 2004. A report prepared for the CDOW and U.S Forest Service. Fort Collins, CO.

Cook, John G., Larry L. Irwin, Larry D. Bryant, Robert A. Riggs, and Jack Ward Thomas. 1998. Relations of forest cover and condition of elk: a test of the thermal cover hypothesis in summer and winter. Wildlife Monographs. 141:1-61.

Copeland, J.P. and C.L. Harris. 1994. Wolverine ecology and habitat use in central Idaho. Progress report, Idaho Department, Fish and Game. 29pp.

Copeland, J.P. 1996. Biology of the wolverine in central Idaho. M.S. thesis. University of Idaho, Moscow. 138 pp.

Corn, J.G. and J.C. Fogleman. 1984. Extinction of montane populations of the northern leopard frog (*Rana pipiens*) in Colorado. J. of Herp. 18:147-152.

COVERS. 2001. Colorado Vertebrate Ranking System. Designed and produced by John E. Gross at the Natural Resource Ecology Laboratory for the Colorado Division of Wildlife.

de Vos, A. and S.E. Matel. 1952. The status of the lynx in Canada, 1929-1952. J. Forestry, 50:742-745.

Diana, S.G. and V.R. Beasley. 1998. Amphibian toxicology. Pgs. 266-277. *In*: Lannoo, M.J., (ed). Status and Conservation of Midwestern amphibians. Univ. of Iowa Press. Iowa City, IA. 507 pp.

Edge, W. D, C. L. Marcum, S.L. Olson-Edge. 1987. Summer habitat selection by elk in western Montana: a multivariate approach. Journal of Wildlife Management. 51(4): 844-851.

Ehrlich, P.R., D.S. Dobkin, D. Wheye. 1988. The birder's handbook. Simon and Schuster Fireside Books, N.Y., N.Y. 785 pp.

Ehrhart, R.C. and P. Hansen. 1997. Effective cattle management in riparian zones: A field survey and literature review. Montana BLM Riparian Tech. Bull. No. 3. BLM, Montana State Office. Missoula, MT. 92 pp.

Elliott, B.E. 2000. Vascular flora of south-central Colorado. M.S. Thesis. Department of Botany. Univ. of WY, Laramie, WY

Elliott, B.E., and R.L. Hartman. 2000. A general floristic survey of the San Isabel and Rio Grande National Forests south of the Arkansas and South Arkansas Rivers. Unpubl. rpt.

Finch, D.M. 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain region. General Technical Report RM-215. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range and Experiment Station. 38 pp.

Fitzgerald, J.P, Meaney, C.A, Armstrong, D.M. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. 467 pp.

Foster Wheeler Environmental Corporation. 1999. Landscape Assessment, Upper South Platte Watershed. Volumes 1, 2, and 3. Prepared for the USDA Forest Service, Colorado State Forest Service, Denver Water Board, and U.S. Environmental Protection Agency.

Goggans, R. 1986. Habitat use by flammulated owls in northeastern Oregon. Thesis, Oregon State University, Corvallis, Oregon, USA.

Guggisberg, C.A.W. 1975. Wild cats of the World. Taplinger Publ. Co., New York, NY. 328 pp.

Hall, J.G. 1981. A field study of the Kaibab squirrel in Grand Canyon National Park. Wildlife Monographs 75. 54 pages.

Hammerson, G.A. 1982. Bullfrog eliminating leopard frogs in Colorado? Herpetological Review. 13:115-116.

Hammerson, G.A. 1999. Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, M-I-3-86. Niwot, CO. 131 pp.

Hargis, C.D. and D.R. McCullough. 1984. Winter diet and habitat selection of marten in Yosemite National Park. Journal of Wildlife Management 48: 140-146.

Harris, M.P. 1984. The puffin. T & A D Poyser, Calton, Staffordshire, England. (81).

Harrison, H. 1979. A field guide to western bird nests. Houghton Mifflin. Boston, MA.

Hayward, G.D. 1997. Forest Management and conservation of boreal owls in North America. The Raptor Research Foundation. J. Raptor Res. 31(2):114-124.

Hayward, P.T. and E.O. Garton. 1989. Wilderness sensitivity of Selway-Bitterroot Wilderness vertebrates. Nez. Perce National Forest, Idaho. University of Idaho, College of Forestry, Wildlife, and Range Science. Moscow, ID.

Hayward, G.D. and P. Hayward. 1993. Boreal Owl. *In*: A. Poole, P. Stettenheim, F. Gill (eds.). The birds of North America. Academy of Natural Science, Philadelphia; American Ornithologists' Union, Washington, DC.

Holt, E.A. 2002. Vascular Flora of the Sawatch, West Mosquito, and West Gore Ranges and Castle Peak Area, Colorado. Department of Botany. University of Wyoming, Laramie, WY.

Holt, E.A. and R.L Hartman. 2002 Vascular Flora of the Sawatch, West Mosquito, and West Gore Ranges and Castle Peak Area, Colorado. Unpubl. rpt.

Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide, 2006. http://www.nifc.gov/fire_policy/

Irvine, J.R., Hahn, J. P., Whiting, J. L., Manis, G., Chesler, B., Mitchell, N., Flack, T., Martin, T., and Joel Norgren. Soil and Ecological Land Unit Survey: Northern San Isabel and Western Pike National Forests, Colorado. Unpublished.

Joslin, G., and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 301pp.

Kaufmann, M.R., P.J. Fornwalt, L.S. Huckaby, and J. Stoker. In prep. Cheesman Lake – a historical ponderosa pine landscape guiding restoration in the South Platte Watershed of the Colorado Front Range. USDA Forest Service General Technical Report RMRS-GTR-XXX. Rocky Mountain Research Station, Fort Collins, CO.

Keith, J.O. (2003, August 25). Abert's Squirrel (*Sciurus aberti*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/abertsquirrel.pdf 4/25/2005

Keith, J.O. 1965. The Abert squirrel and its dependence on ponderosa pine. Ecology 46:150-163.

Ketcheson, Gary L; Megahan, Walter F. 1996. *Sediment Production and Downslope Sediment Transport from Forest Roads in Granitic Watersheds.* Research Paper INT-RP-486 US Department of Agriculture, Forest Service, Intermountain Research Stations: 10.

Kingery, H.E. (editor). 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Colorado Wildlife Heritage Foundation. Denver, CO. 636 pp.

Klem, D.A. 1979. Biology of collisions between birds and windows. Ph.D. thesis. Southern Illinois Univ.

Knight, R. L. and K. Gutzwiller, eds. 1995. Wildlife and Recreationists. Island Press, Washington D.C. 372 pp.

Knight, R.L., O.J. Grout, and S.A. Temple. 1987. Nest defense of the American Crow in urban and rural areas. Condor 89:175-177.

Koehler, D.M and M.G. Hornocker. 1977. Fire effects on marten habitat in the Selway-Bitterroot Wilderness. J. Wildlife Manage. 41:500-505.

Leege, T.A., compiler. 1984. Guidelines for evaluating and managing summer elk habitat in northern Idaho. Wildlife Bull. No. 11. Boise, ID: Idaho Fish and Game. 37 p. [A cooperative effort. Financial support provided by the Idaho Department of Fish and Game Federal Aid Project W-160-R, U.S. Forest Service, Bureau of Land Management, Plum Creek Timber Company and Idaho Forest Industry Council].

LeFranc, M.M. Jr. and B.A. Millsap. 1984. A summary of state and federal agency raptor management programs. Wildlife Society Bull. 12:274-282.

Leonard, S., G. Kinch, V. Elsbernd, M. Borman, and S. Swanson. 1997. Riparian management, Grazing management for riparian-wetland areas. General Technical Report. 1737-14. BLM. Denver, CO. 80 pp.

Linkhart, B. D. 1984. Range, activity, and habitat use by nesting flammulated owls in a Colorado ponderosa pine forest. Masters thesis, Colorado State University, Fort Collins, CO.

Loeffler, C. 2000. Report on the status and conservation of the boreal toad (*Bufo boreas boreas*) in the southern Rocky Mountains. Loeffler (ed). CDOW. Denver, CO. Unpubl. rpt

McCallum, D.A. 1994. Flammulated Owl (*Otus flammeolus*). *In* The Birds of North America, No. 93, (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union. 24 p.

McKelvey, K.S.; Buskirk, S.W.; Krebs, C.J. 1999. Theoretical Insights into the Population Viability of Lynx. USDA Forest Service General Technical Report RMRS-GTR-30.

McNabb, D.H., and F.J. Swanson. 1990. *Effects of fire on soil erosion*. Corvallis: Oregon State University Press.

Mech, L.D. 1980. Age, sex, reproduction, and special organization of lynx colonizing northeastern Minnesota. J. Mamm., 61:261-267.

Megahan, Walter F. 1995. *Surface Erosion Module.* Washington State Department of Natural Resources, Olympia Washington.

Moseley, R. K. 1991. A Field Investigation of Park Milkvetch in Idaho. Idaho Department of Fish and Game. Boise, ID.

NatureServe. 2003. An online encyclopedia of life [web application]. Version 1.6. Arlington, VA, USA: NatureServe. Available: http://www.natureserve.org/explorer.

Nava, J.A. 1970. The reproductive biology of the Alaska lynx. Unpubl. M.S. Thesis, Univ. Alaska, Fairbanks, AK. 141 pp

Nead, D.M., J.C. Halfpenney, and S. Bissel. 1985. The status of wolverines in Colorado. Northwest Science, 8:286-289.

Newton, I. 1979. Population ecology of raptors. Poyser Ltd., Hertfordshire, England. 399 pp.

Noss, R.F. and B. Csuti. 1994. Habitat fragmentation. Pp. 237-264. *In* G.K. Meffe and C.R. Caroll (eds.), Principles of conservation biology. Sinauer Assoc., Sunderland, MA.

Page, J., N. Dodd, T.O. Osborne, J.A. Carson. 1978. The influence of livestock grazing on non-game wildlife. *In*: A compilation of papers presented at the annual meeting for the Western Section of the Wildlife Society and California-Nevada Chapter of the American Fisheries Society. Koch, D.L. (ed). Pgs 159-173. February 2-4, 1978. Incline Village, NV.

Patton, D.R. 1974. Estimating food consumption from twigs clipped by the Abert squirrel. USDA, Forest Service, Research Note; RM-272. 3 pages.

Parker, G.R., J.W. Maxwell, L.D. Morton, and G.E.J. Smith. 1983. The ecology of the lynx (*Lynx canadensis*) on Cape Breton Island. Canadian J. Zool., 61:770-786.

Pederson, J.C., R.C. Farentinos, and V.M. Littlefield. 1987. Effects of logging on habitat quality and feeding patterns of Abert Squirrels. Great Basin Naturalist 47(2):252-258.

Peek, J.M. 1982. Elk. Pages 851-861 in: J.A. Chapman, and G.A. Feldhamer, eds. Wild Mammals of North America. The Johns Hopkins University Press, Baltimore, Maryland.

Peterson, David L.; Johnson, Morris C; Agee, James K.; Jain, Theresa B.; McKenzie, Donald; and Reinhardt, Elizabeth D. 2005. Forest Structure and Fire Hazard in Dry Forests of the Western United States. PNW-GTR-628.

Peterson, R. T. 1990. A field guide to western birds. Houghton Mifflin Company, Boston. 432 pp.

Postovit, H.R. and B.C. Postovit. 1987. Impacts and mitigation techniques. Pgs. 183-2,134 in B.A. Giron Pendleton, B.A. Millisap, K.W. Cline, and D.M. Bird, eds. Raptor management techniques manual. Natl. Wildlife Fed., Washington, D.C. 420 pp.

Ratcliffe, D.A. 1980. The peregrine falcon. Poyser Ltd., Hertfordshire, England. 41 pp.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, G. Goodwin, R. Smith, and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. General Technical Report. RM-217. Ft. Collins, CO: USDA Forest Service, Rocky Mountain For. and Range Exp. Station. 90 pp.

Reynolds, R. T., and B. D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. Pgs. 239-248 *in* R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, (eds.) Biology and conservation of northern forest owls. USDA Forest Service General Technical Report. RM-142.

Reynolds, R. T., and B. D. Linkhart. 1992. Flammulated owl in ponderosa pine: evidence of preference for old growth. Pages 166-169 *in* M.R. Kaufman, W.H. Moir, and R.L. Bassett, technical coordinators. Proceedings of the workshop on old-growth in the Southwest and Rocky Mountain Region. Portal, Arizona, USA.

Richardson, C.T. and C.K. Miller. 1997. Recommendations for protecting raptors from human disturbance: a review. Wildlife Society Bull. 25(3):634-638.

Robbins, C.S., D. Bystrak, and P.H. Geissler. 1986. The breeding bird survey: its first fifteen years, 1965-1979. U.S. Fish and Wildlife Service Resource Publ. 157.

Rodrick, E. and R. Milner, eds. 1991. Management Recommendations for Washington Priority Habitats and Species. Washington Department of Fish and Wildlife, Habitat Management Divisions.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. Forest Service, Fish and Wildlife Service, Bureau of Land Management, and National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.

Saunders, J.K. 1963a. Movements and activities of the lynx in Newfoundland. J. Wildl. Manage., 27:390-400

Saunders, J.K. 1963b. Food habits of the lynx in Newfoundland. J. Wildlife Manage., 27:384-390.

Saunders, D.A., R.J. Hobbs, and C.R. Margules. 1991. Biological consequences of ecosystem fragmentation: a review. Conservation Biology. 5: 18-32.

Shenk, T. 2006. Lynx Fact Sheet. Wildlife Commission Meeting: Nov. 8, 2006.

Soutiere, E.C. 1979. The effects of timber harvesting on the marten. J. Wildlife Manage. 43:850-860.

Spackman, S.B., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado rare plant field guide. Prepared for the Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

Spencer, W.D., R.H. Barrett, and W.J. Zielinski. 1983. Marten (*Martes americana*), habitat preferences in the northern Sierra-Nevada, U.S.A. J. Wildlife Manage. 47:1181-1186.

Squires, J.R. and T. Laurion. 2000. Lynx home range and movements in Montana and Wyoming: preliminary results. Pgs 337-349 *In* Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C. L. Krebs, K.S. McKelvey, and J.R. Squires (Tech. Eds.). Ecology and conservation of lynx in the United States. Univ. Press of Colorado and USDA Forest Service RM-GTR-30WWW 480 pp.

Steventon, J.D. 1979. Influence of timber harvesting upon winter harvesting upon winter habitat use by martens. Unpubl. M.S. Thesis, Univ. Maine, Orono, ME. 30 pp.

Steventon, J.D. and J.T. Major. 1982. Marten use of habitat in a commercially clear-cut forest. J. Wildl. Manage. 46:175-182.

Toelle, D. pers. comm. 2003. February 25, 2003, BLM

Towry, R.K. 1984. Wildlife habitat requirements. Pgs. 73-210. *In* Managing forested lands for wildlife. Hoover, R.L. and Wills, D.L. eds.

USDA Forest Service. 1984. Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands Land and Resource Management Plan.

USDA Forest Service. 2001. Canada lynx population and habitat data for the Pike and San Isabel National Forests. Unpublished report. Pueblo, CO.

USDA Forest Service. 2003. Threatened, Endangered and Sensitive Species of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands.

USDA Forest Service. 2005. MIS Amendment to the PSICC 1984 Land and Resource Management Plan.

USDA Forest Service. 2006. Region 2 Regional Forester's Sensitive Species List. Region 2 Supplement No. 2600-2006-1. May 3, 2006. Denver, CO.

USDA Forest Service. Water Erosion Prediction Project (WEPP) model; WEPP Interface for Predicting Forest Road Runoff, Erosion and Sediment Delivery, December, 1999.

USDA Forest Service. Wildland Fire in Ecosystems, Effects of Fire on Soil and Water. General Technical Report RMRS-GTR-42, Volume 4, 2005.

U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; final rule to list the contiguous U.S. distinct population segment of the Canada lynx as threatened. Federal Register. 58 16051-86. Department of the Interior, Washington, D.C.

U.S. Fish and Wildlife Service. 2002. Endangered and threatened wildlife and plants; annual notice of recycled petition finding for the slender moonwort. Federal Register. 67 FR 39035. Department of the Interior, Washington, D.C.

U.S. Fish and Wildlife Service. 2006. Federally listed and candidate species and their status in Colorado (by county). Ecological Services Colorado Field Office (April, 2006).

Udvardy, M.D.F., ed. 1977. The Audubon Society field guide to North American birds. Alfred A. Knopf, New York, NY. 855 pp

Verner, J. 1994. Current management situation of flammulated owls. *In* Flammulated, boreal, and great gray owls in the United States (G.D. Hayward, ed.): A technical conservation assessment. USDA Forest Service General Technical Report. 253.

Weber, W. A., and R.C. Wittman. 1996. Colorado Flora: Eastern Slope. University Press of Colorado, Niwot, Colorado.

White, C.M., W.B. Emisin, and W.M. Bren. 1988. Atypical nesting habitat of the peregrine falcon (*Falco peregrinus*) in Victoria, Australia. J. Raptor Res. 22:37-43.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pgs 237-256. *In* M.E. Soule (ed.), Conservation biology: the science of scarcity and diversity. Sinauer Assoc., Sutherland, MA.

Zeveloff, S.I. 1988. Mammals of the Intermountain West. University of Utah Press, Salt Lake City, Utah.

GLOSSARY

6th Level Watershed – Hydrologic units of capability (HUCS) are organized by watersheds, with lower numbers referring to larger areas. Third field HUCS are large basins, such as the Willamette Basin or John Day River Basin in Oregon. Fourth, 5th, and 6th field (level) HUCS are progressively smaller sub-basins

Basal Area – The sum of the outside-bark cross-sectional area at breast height of all live trees per unit plot area.

Broadcast Burning – Prescribed burning activity where fire is applied generally to most or all of an area within well defined boundaries for reduction of fuel hazard, as a resource management treatment, or both.

Canopy Closure – In a stand, the progressive reduction of space between crowns as they grow and spread laterally. A canopy in which the individual crowns are nearing general contact is termed a close canopy; and having achieved contact, a closed canopy. In general, closure indicates a process, while cover indicates a condition.

Class 1 Airshed – Geographic areas designed by the Clean Air Act subject to the most stringent restrictions on allowable increment of air quality deterioration. Class I areas include Forest Service wildernesses and nation memorial parks over 5,000 acres, National Parks exceeding 6,000 acres, international parks, as well as other designated lands.

Coarse Woody Debris (CWD) – A term for the dead trees left standing or fallen, as well as the remains of branches on the ground in forests.

Condition Class – Depiction of the degree of departure from historical fire regimes, possibly resulting in alternations of key ecosystem components. These classes categorize and describe vegetation composition and structure conditions that currently exist inside the Fire Regime Groups. Based on the coarse-scale national data, they serve as generalized wildfire rankings. The risk of loss of key ecosystem components from wildfires increases from Condition Class 1 (lowest risk) to Condition Class 3 (highest risk).

Cumulative Effect – (a) Direct effects, which are caused by the action and occur at the same time and place; (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. (40 CFR 1508.8)

Decks – A stack of trees or logs.

Effects (or impacts) – (a) Direct effects, which are caused by the action and occur at the same time and place; (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. (40 CFR 1508.8)

Endangered Species – A plant or animal that is in danger of extinction throughout all or a significant portion of its range.

Environmental Assessment – (a) a concise public document for which a Federal agency is responsible that serves to: (1) Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) Aid an agency's compliance with the Act when no environmental impact statement is necessary; and (3) Facilitate preparation of a statement when one is necessary. (b) Shall include brief discussions of the need for the proposal, of alternatives as required by section 102(2)(E), of the environmental impacts of the proposed action and alternatives, and of a listing of agencies and persons consulted. (40 CFR 1508.9)

Existing Closed Roads – Roads that have been previous closed.

Fire Intensity – Energy release per unit length of flame front.

Fire Regime Condition Class – A qualitative measure classified into three classes describing the relative degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings.

Fire Severity – The effect of fire within the fire perimeter in terms of replacement/removal of the upper layer vegetation and surface burning. Replacement/removal may or may not cause a lethal effect on the plants.

Fuel – Any combustible material, especially petroleum-based products and wildland fuels.

Fuel loading – The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually dry weight.

Fuelwood – Wood cut into short lengths for burning.

Hazardous Fuels – A fuel complex defined by kind, arrangement, volume, condition, and location that presents a threat of ignition and resistance to control.

Management Indicator Species (MIS) – A wildlife species whose population will indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities to that ecosystem. MIS species are selected by land management agencies.

Mountain Pine Beetle – The common name for the bark beetle (*Dendroctonus ponderosae* Hopkins).

No Action Alternative – The no action alternative describes the most likely future condition that could be expected if you don't take action. It serves as a baseline to compare other alternatives to determine the magnitude of benefits and adverse effects.

Non-system Road – A road or trail that is not identified as National Forest System road.

Noxious Weed – A plant species that is highly injurious or destructive and has a great potential for economic impact.

Piling and Burning – Piling slash resulting from logging or fuel management activities and subsequently burning the individual piles.

Prescribed Burning – Application of prescribed fire.

Prescribed Fire – Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

Prescribed Fire Burn Plan – A plan required for each fire application ignited by management. Plans are documents prepared by qualified personnel, approved by the agency administrator, and include criteria for the conditions under which the fire will be conducted (a prescription). Plan content varies among the agencies.

Project Area – The area within which the proposed activities are limited to. It may be confused with the analysis area, which is the area that bounds the analysis for a particular resource and/or issue.

Recreation Opportunity Spectrum (ROS) – A formal Forest Service process designed to delineate, define, and integrate outdoor recreation opportunities in land and resource management planning. ROS classes are used to describe all recreation opportunity areas from natural, undisturbed, and undeveloped to heavily used, modified, and developed. ROS designations attempt to describe the kind of recreation experience one may have in a given part of the National Forest.

Recruitment Trees/Recruitment Snags – Any standing **live** (green) tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife. These trees have characteristics such as large size (diameter and height) for site, condition, age, and decay stage; evidence of use; valuable species types; and relative scarcity. They serve as critical habitat (for denning, shelter, roosting, and foraging) for a wide variety of organisms such as vertebrates, insects, mosses, and lichens.

Salvage Timber Harvest – Removal of trees that are dead, damaged, or imminently threatened with death or damage in order to use the wood before it is rendered valueless by natural decay agents.

Skid Trails – A rough-formed, temporary forest trail suitable for use by horses or equipment such as bulldozers or skidders in bringing trees or logs from the actual place of felling to a landing.

Slash - Debris resulting from such natural events as wind, fire, or snow breakage; or such human activities as road construction, logging, pruning, thinning, or brush cutting. It includes logs, chunks, bark, branches, stumps, and broken understory trees or brush.

Snag - Any standing dead or dying trees with special characteristics that provide valuable habitat for conservation or enhancement of wildlife. These trees have characteristics such as large size (diameter and height) for site, condition, age, and decay stage; evidence of use; valuable species types; and relative scarcity. They serve as critical habitat (for denning, shelter, roosting, and foraging) for a wide variety of organisms such as vertebrates, insects, mosses, and lichens.

Stump Road – A road created by removing high stumps to allow forest users to access an area for a short period of time. The road is not cleared or improved with equipment.

Surface Fire – Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.

System Road – Road that is officially designated as a Forest Service road.

Temporary Road – A timber extraction road constructed specifically for use during the harvesting operations and closed at the completion of harvesting.

Thinning – Selectively cutting trees to improve remaining forest stand by removing trees of poor form, low vigor or by reducing tree density.

Timber Stand Improvement – Actions to improve growing conditions for trees in a stand, such as thinning, pruning, prescribed fire, or release cutting.

Torching – The burning of the foliage of a single tree or a small group of trees, from the bottom up.

Treatment Area – The area within the project area where treatments (i.e., thinning, prescribed fire, etc.) will occur.

Water Influence Zone (WIZ) – The area including the geomorphic floodplain, riparian ecosystem, and inner gorge. Its minimum horizontal width (from top of each bank) is the greater of 100 feet or the mean height of mature dominant late-seral vegetation. It includes adjacent unstable and highly erodible soils. The WIZ protects interacting aquatic, riparian, and upland functions by maintaining natural processes and resilience of soil, water, and vegetation systems.

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APPENDIX A
PROPOSED ROADS

Road Number	Mileage	Current Condition	Proposed Use	Closure Methods	Considerations*
NTC-1 Existing Closed Road	0.48	Existing, non-system, two-track road that was closed in 2004 by ripping and seeding (a road closure sign is located at the entrance above FSR 311).	Single purpose use for commercial timber sale (includes reopening road, providing drainage, and closing road upon completion of the timber sale. Road may be used as a control feature for prescribed burning operations.	Water bar for drainage, rip and seed, and install road closure signage.	Current condition lacks water bars. Existing water bars are eroded and tracks are rutted, little vegetation on road surface.
NTC-2 Existing Closed Road	0.68	Existing, non-system two track road. Follows contour, running east/west along base of south facing slope. Road is flat, grassed over, and has had minimal use in the past. Currently closed by NTC-1 closure.	Minimal access needed for commercial timber operations. Following harvest road may be used as a control feature for prescribed burning operations.	Provide drainage where needed (i.e. water bars). Slash in road to restrict any unauthorized ATV use. Coordinate closure with NTC-1.	
NTC-3 Proposed Temporary Road	0.28	Proposed new temporary road. Termini is through State land by an old temporary road from salvage logging in 2005.	Single-use road for commercial timber operations.	Water bar and provide drainage, if needed; scatter slash over road prism to obstruct unauthorized ATV traffic, protect and/or repair fence line at State land and Forest Service boundary.	Recommend moving to west and extending up ridge, eliminate NTC-4.
NTC-4 Proposed Temporary Road	0.22	Proposed new temporary road.	Single purpose temporary road; short spur to the east on the contour of a south facing slope. May follow old road template. May be used as a control feature for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide minor drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Eliminate.
NTC-5 Proposed Temporary Road	0.85	Proposed new temporary road.	Single purpose minimal impact temporary road. May follow old road template on the south side of draw. May be used as a control feature for prescribed burning operations.	Rip the first 3/8 mile and re-contour; reseed with native grass. Slash in to restrict unauthorized use. For the remaining portions of the road, close, provide drainage, reseed where disturbed, slash in, if available.	Reroute NTC-5 and NTC-6. Consider one temporary road on ridge between proposed locations of NTC-5 and NTC-6.
NTC-6 Proposed Temporary Road	0.59	Proposed new temporary road.	Single purpose road. The southern termini (approx. ¼ mile) would require some cut and fill on slope approx. 100 feet above draw on the contour. Remaining portion will be on contour above draw south exposure. Road may serve as a control feature for prescribed burning operations.	Rip the first ¼ mile and re-contour; reseed with native grass. Slash in to restrict unauthorized use. For the remaining portion of the road, close, provide drainage, reseed where disturbed, slash in, if available.	Reroute NTC-5 and NTC-6. Consider one temporary road on ridge between proposed locations of NTC-5 and NTC-6.

NTC-7 Proposed Temporary Road	0.60	Proposed new temporary road.	Single purpose road. The southern termini (approx. ¼ mile) would require some cut and fill on slope approx. 100 feet above draw on the contour. Remaining portion will be on contour above draw south exposure. Road may serve as control feature for prescribed burning operations.	Rip the first ¼ mile and re-contour; reseed with native grass. Slash in to restrict unauthorized use. For the remaining portion of the road, close, provide drainage, reseed where disturbed, slash in, if available.	Use fireline instead, avoid road construction of NTC-7.
NTC-8 Existing Closed Road	2.74	Existing two track road, closed on both ends. Access is through State land. It was used in 2004 & 2005 for a salvage sale on State land. Majority of road is grassed in, flat.	Single purpose road for commercial timber sale and prescribed burning operations. Restricted use.	Close termini with wire fence and berm. Sign closed. Provide rolling drainage. Maintain road for fire access, if needed. Restrict unauthorized ATV use at both ends of road.	Avoid/minimize use where road borders riparian in SW ¼ of Section 8 and in the NE ¼ of Section 17. Inspect this road prior to reopening.
NTC-9 Proposed Temporary Road	0.19	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning. Restricted use.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-10 Proposed Temporary Road	0.18	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning. Restricted use.	Rip following use; seed with native grass, if soil is disturbed. Provide minor drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Relocate out of drainage.
NTC-11 Existing Closed Road	0.63	Existing, non-system, two-track road that was closed in 2004 by ripping and seeding.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control features for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Reduce to 1,000 feet, seek Hydrologist approval before extending road across/through riparian.
NTC-12 Existing Closed Road	0.50	Existing, non-system, two-track road that was closed in 2005 by ripping and seeding.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control features for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-13 Proposed Temporary Road	0.39	Proposed new temporary road. Access is through State land.	Single purpose road for commercial timber sale and prescribed burning. Restricted use.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Eliminate, goes to no treatment area.

NTC-14 Proposed Temporary Road	0.32	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning. Restricted use.	Rip following use; seed with native grass, if soil is disturbed. Provide minor drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Move to east out of drainage and onto ridge.
NTC-15 Existing Closed Road	1.02	Existing, non-system, two-track road that has been closed for numerous years by boiler plate and short fence on east end. Grassed in well. Follows ridgeline.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control feature for prescribed burning operations.	Rip following use; seed with native grass if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-16 Existing Closed Road	0.70	Existing, non-system, two-track road that has been closed for numerous years by boiler plate and short fence on east end. Grassed in well. Follows ridgeline.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control feature for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide minor drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-17 Existing Closed Road	0.82	Existing, non-system, two-track road that has been closed for numerous years by boiler plate and short fence on west end. Some slope on road and existing drainage.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control feature for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-18 Existing Closed Road	0.56	Existing, non-system, two-track road that has been closed for numerous years by boiler plate and short fence on east end. Some slope on road and existing drainage.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control feature for prescribed burning operations.	Obliterate following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-19 Existing Closed Road	1.19	Existing, non-system, two-track road that has been closed for numerous years. Some slope on road and existing drainage. Closed with NTC-17.	Single purpose use for commercial timber sale. Reopen road, provide drainage, and close upon completion of the timber sale. Road may be used for control features for prescribed burning operations.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-20 Existing Closed Road	0.74	Existing, non-system, two-track road that has been closed for numerous years. Some slope on road and existing drainage. Closed on private land.	Single purpose use for commercial timber sale and prescribed burning. Reopen road, provide drainage, and close upon completion of the timber sale. Need private land access.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Consult with Hydrologist to identify drainage crossing in NW ¼ of Section 3. Restrict length to 2,200 feet. Prohibit use of road/trail that borders riparian in NE ¼ of Section 4 (approximately 1,500 feet).

NTC-21 Proposed Temporary Road	Estimate: 0.25 miles	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning. Restricted use.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Prohibit use at proposed location. Relocate out of drainage, move to east on ridge.
NTC-22 Proposed Temporary Road	estimated 0.25 miles	Proposed new temporary road. Follow location of old skid trail.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-23 Proposed Temporary Road	Estimate: 0.35 miles	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Reduce proposed length by 400 feet. Consult with Hydrologist to identify drainage crossing. Maintain 100 feet buffer of spring.
NTC-24 Proposed Temporary Road	Estimate: 0.35 miles	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Move road to east out of drainage.
NTC-25 Proposed Temporary Road	Estimate: 0.25 mile	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-26 Proposed Temporary Road	Estimate: 0.25 mile	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Reduce proposed length by 600 feet. Access across drainage can be obtained from NTC-14.
NTC-27 Proposed Temporary Road	Estimate: 0.40 miles	Proposed new temporary road. Follow ridge top for location.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	
NTC-28 Proposed Temporary Road	Estimate: at 0.50 miles	Proposed new temporary road.	Single purpose road for commercial timber sale prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in	Eliminate, road is in the drainage. Access can be obtained from FSR 376.

				to restrict unauthorized ATV use.	
NTC-29 Proposed Temporary Road	Estimate: 0.50 miles	Proposed new temporary road.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide minor drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Prefer access from top. If not, move last 1,500 feet of proposed segment south out of riparian.
NTC-30 Existing Closed Road	Estimate: 0.50 miles	Existing, non-system, two-track road that has been closed for numerous years. Some slope on road and existing drainage.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Prohibit use, current closure begins in riparian and crosses two small drainages. Access can be obtained from NTC-29.
NTC-31 Existing Closed Road	Estimate: 0.25 miles	Existing, non-system, two-track road that has been closed for numerous years. Some slope on road and existing drainage.	Single purpose road for commercial timber sale and prescribed burning.	Rip following use; seed with native grass, if soil is disturbed. Provide drainage structures on steeper portion of road. Slash in to restrict unauthorized ATV use.	Prohibit use, current closure in riparian. Field verify current closure prior to reopening. Consider moving north to ridge if suitable crossing at McGee Gulch can be identified, harden crossing if necessary.

* Additional Considerations:

Road closures may include the use of a weed free mulch to facilitate reclaiming these sites. Field inspection revealed limited vegetation, inadequate water bar spacing and significant erosion. In addition, prior to reopening, existing closed roads and constructing any of the proposed temporary roads, a Hydrologist, Soil Scientist and Roads Engineer or Engineer Technician should conduct a site inspection.

Prior to reopening, existing closed roads and constructing any of the proposed temporary roads, a Hydrologist, Soil Scientist, and Roads Engineer or Engineer Technician should conduct a site inspection to identify suitability of road for intended use, location placement (for new, temporary roads), problem areas, corrective actions, and the like.

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