VEGETATION MANAGEMENT
AND
TRAVEL MANAGEMENT
IN
BOX CREEK WATERSHED
FINAL ENVIRONMENTAL ASSESSMENT

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SAN ISABEL NATIONAL FOREST
LEADVILLE RANGER DISTRICT
LEADVILLE, COLORADO

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ROYAL GORGE FIELD OFFICE
CANON CITY, COLORADO
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LAKE COUNTY, COLORADO
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Some of the miles and/or acreages in this analysis vary by resource. This variation often depends on the criteria selected to run the analysis. For example, to determine cumulative impacts, or to better display the effects of roads on a resource, all roads, including private, state, and county, may have been included in a particular analysis. The total road miles in the alternatives only include Forest Service and Bureau of Land Management jurisdiction.

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Purpose and Need for Action

Introduction and Background

The Box Creek Project was initiated approximately 5 years ago by the United States Forest Service -Leadville Ranger District (Forest Service (FS)) and the Royal Gorge Field Office - Bureau of Land Management (BLM) to address concerns regarding vegetation conditions in the Lodgepole Flats area. After studying this area, the agencies decided to expand the project area and emphasis to include the entire Box Creek Watershed, and to consider vegetation health and wildlife habitat across this larger area. This Environmental Assessment (EA) documents the expanded project area and the emphasis toward travel and vegetation management. The Project involves an interagency partnership between the US Forest Service (FS) and Bureau of Land Management (BLM). On August 15, 2003, the Field Manager of the Royal Gorge Field Office signed a Decision Notice to implement the BLM travel management portion of the Box Creek Vegetation and Travel Management Plan and amended the Royal Gorge Resource Management Plan.

Description of Project Area

The Box Creek watershed is located on the eastern aspect of the Sawatch Range of the Rocky Mountains. The project area is approximately 8 miles southwest of Leadville and 115 miles west of Denver, Colorado (Map 1 – Project Location Map). The project area provides regional and local recreation opportunities for communities along the Front Range, Interstate 70-Corridor and the Upper Arkansas River Valley. The Project Area is approximately 18,644 acres in total area (public and private lands). Ownership includes 10,923 acres managed by the FS and BLM, 936 state-owned land acres, and 6,785 acres of private and other ownership.

Purpose and Need for Action

The purpose of the project is to move the project area toward the desired conditions as described in the Forest Plan for forest health, dwarf mistletoe, travel management; wildlife habitat; and the National Fire Plan for fire condition classes; and provide cohesiveness in the management of public lands with the BLM. The District Ranger has found the need to increase forest diversity, reduce dwarf mistletoe infestations; decommission (obliterate) unneeded roads and those causing erosion, water degradation and/or habitat degradation; and improve habitat effectiveness and capability for selected wildlife species; improve big-game forage and security habitat; move towards improving fire risk condition classes near urban interface; and to complement the BLM travel management in the Box Creek Watershed (BLM Decision, August 15, 2003).

Current Conditions

The area has been heavily managed in the past. Currently, lodgepole stands are homogeneous, dense, and predominately even-aged. Many trees are deformed and have suppressed growth. Currently, dwarf mistletoe infection is very severe and widespread. Seventy-two percent (72 %) of the forested area is heavily infected (more than ½ of the branches or stems infected). Twelve percent (12%) were viewed as having light infection (1/2 or less of the total number of branches infected). And sixteen percent (16 %) of the forested area was viewed as having no visible infections.

Because non-system roads are poorly located and causing accelerated soil loss; increased stream sedimentation; and wildlife habitat degradation; there is a need to permanently close and/or obliterate 30.5 miles of roads and seasonally close approximately 7.5 miles. Wildlife habitat is compromised by lack of diversity in stand structure;

effective habitat components such as patches of snags and coarse woody debris; high road densities; lack of openings and lack of forage production. Current fire condition classes of the majority of the area (9983 out of 10,915acres) are classes 2 and 3; there is a need to move towards reducing fire condition classes.

Desired Conditions

The desired condition as described in the Forest Plan for disease is to prevent or suppress disease that threaten forest tree stands (III-82).

The desired condition as described in the Forest Plan for transportation management is to keep existing roads open to public motorized use unless (a) use causes unacceptable damage to soil and water uses; (b) they are located in areas closed to motorized use and are not "designated routes" in the Forest travel management direction or (c) use conflicts with wildlife management objectives (III-74).

The desired condition as described in the Forest Plan for wildlife is to (1) provide habitat needs of one or more management indicator species and optimize habitat capability (III-134); (2) maintain wildlife effectiveness and capability and provide winter habitat (cover and forage) for deer and elk (III-128, III-152); (3) manage Rangeland vegetation to provide needed vegetation species composition and interspersed grass, forb, and shrub sites and variety in age of browse plants(III-134); (4) manage road use to provide for habitat needs of management indicator species, including road closures and area closures, and to maintain habitat effectiveness (III-143); (5) to manage Forest cover types to achieve and maintain desired thermal and hiding cover, cover-opening ratios and other habitat needs associated with tree cover (III-154).

The desired future condition from the Forest Plan for fire risk condition classes is to use prescribed fire to accomplish resource management objectives such as reducing fuel load buildup, wildlife habitat improvement (III-82) and to comply with State and Federal Air Quality standards (III-82).

The desired condition for fire risk condition classes as described in the National Fire Plan is to reduce areas in high departure from the central tendency of the natural (historical regime (FRCC 3) to low (FRCC 1) and moderate (FRCC 2) departure (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). Low departure is considered to be within the natural (historical) range of variability while moderate and high departures are outside.

This project would help achieve the following PSICC Forest Plan (Forest Plan) goals:

- Increase diversity for wildlife and habitat improvement (Forest Plan, pg. III-4)
- Improve habitat capability through direct treatments of vegetation (Forest Plan, pg. III-33)
- Increase winter range habitat capacities for deer and elk (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)
- Manage the transportation system for increased cost-effectiveness, efficiency and utility (Forest Plan, pg. III-4)
- Maintain wildlife habitat effectiveness (III-138)

Proposed Action

The proposed action was developed with consideration of U.S. Forest Service and Bureau of Land Management policies, legislative mandates, and approved forest and resource management plans.

This EA evaluates the proposal to achieve the stated needs of the Box Creek Vegetation and Travel Management Project. The actions that are proposed include vegetation treatments, prescribed fire, road closure and/or

obliteration, and revegetation to occur over the next 10 years. The specific actions proposed in this document would:

- **Treat approximately 5,447 acres with a combination of various tools such as thinning, prescribed fire, and mechanical removal**
- **Close and/or obliterate 11.6 miles of non-system and 2.6 miles of system roads**
- **Seasonally close 7.5 miles of roads**
- **Close year round 7.4 miles of roads permanently**

Decisions to be Made

This EA will analyze the environmental consequences of the proposed action and reasonable, implement able alternatives to that action, while meeting the purpose and need. An EA is not a decision document. It is a document that discloses the environmental consequences of implementing the proposed action or alternatives to that action. The decision will be documented in a decision notice signed by the responsible official. The Leadville District Ranger is the responsible official for deciding what actions will be taken on Forest Service System lands. The responsible official will make a number of decisions to address the identified issues and to improve the overall health of the forest and public lands. The decision maker may select any alternative, or a combination of the alternatives. The selected alternative will address:

1. **Should mechanical treatments and/or prescribed fire be completed to maintain and restore vegetation?**
2. **Should non-system roads be reclaimed to reduce existing and potential future erosion and sedimentation to streams?**
3. **Should seasonal road restrictions be implemented to protect wildlife habitat?**

Land and Resource Management Plan (Forest Plan)

The Land and Resource Management Plan: Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands (Forest Plan, USFS 1984) provides the overall guidance for management of the land within its borders through its goals, standards and guidelines and Management Area (MA) direction. These goals and MA direction provide guidance for proposed actions on the Forest. In this section, the general guidance of the MA directions is discussed.

Incorporation of the Forest Plan

This document is tiered to and repeatedly references the Land and Resource Management Plan: Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands (Forest Plan), which sets forth the direction for managing the resources of the Pike and San Isabel National Forests. For clarity, that document is referred to as the "Forest Plan."

Planning for activities on National Forest System lands involves two levels of decisions. The first level is development of a Forest Plan that provides direction for all resource management programs, practices, uses, and protection measures. The Forest Plan consists of both Forest-wide and area-specific standards and guidelines that provide for land uses with anticipated resource outputs under a given set of management constraints. The outputs are not fixed decisions by the Forest Plan, because all conditions required to produce the outputs are not controlled by the agency and because environmental conditions may change. These plans also contain general cumulative effects of the anticipated actions, i.e., effect of regional roadless values, regional wildlife populations, and the water quality of major drainage systems.

The second level of planning occurs during Forest Plan implementation. It usually involves the analysis and implementation of site-specific management practices designed to achieve the goals and objectives of the Forest Plan.

Forest Goals and Objectives

The Forest Plan's goals and objectives provide broad, overall direction regarding the type and amount of goods and services that the Forest will provide. The goals are concise statements describing a desired condition to be achieved sometime in the future. They are expressed in broad, general terms and are timeless in that they have no specific date by which they are to be completed. The goal statements are the principal basis for the objectives. Goals are also in response to appropriate laws, regulations, and policies. The objectives are concise, time-specific, measurable results that respond to the Forest Plan goals. These objectives are the basis for the management requirements listed in the Forest Plan and Management Area Directions.

Forest-wide Direction, Standards and Guidelines

The Forest-wide management requirements set the baseline conditions that must be maintained throughout the Forest in order to implement the Forest Plan as it was intended. They establish the environmental quality and natural resource requirements and mitigating measures that apply to all areas of the Forest. Individual MAs (see below) may have additional requirements that must be followed. The Forest Plan provides direction, and standards and guidelines that are specific to individual resources.

Management Areas

The Forest Plan divides the Forest into individual Management areas (MAs), each of which has an emphasis that directs management activities within the MAs borders. The Forest Plan designates specific direction, goals, and standards and guidelines to be used in the management of these areas to more completely meet the MA emphasis (called "management area prescriptions"). Each MA is described by its management emphasis, or general direction and goals, and specific standards and guidelines to help achieve those goals for the MA. There are 4 MAs in the Project Area; MA 3A (Semi-primitive Non-motorized Recreation), 4B (Management Indicator Species), 5B (Big Game Winter Range), and 9A Riparian Management (included within the other MAs). A brief description of these MAs, number of acres included with the MA and the percentage of the Project Area, is described below.

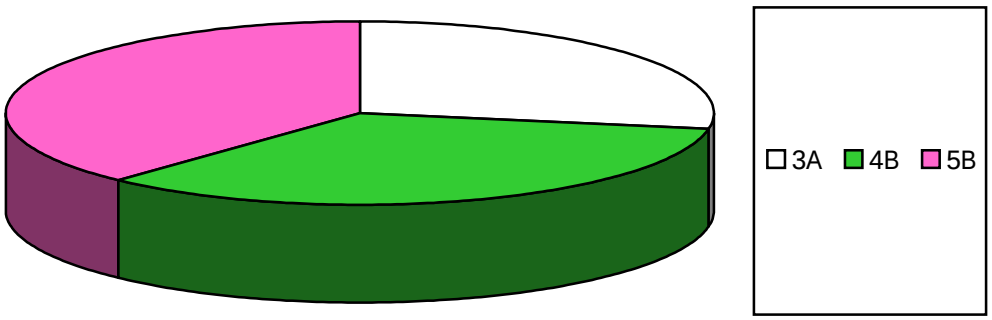

Figure 1-1. Project Area Management Areas

Management Area 3A – (2,324 acres or 28 percent of Project Area)

MANAGEMENT EMPHASIS—SEMIPRIMITIVE NONMOTORIZED RECREATION IN ROADED OR NONROADED AREAS

This MA provides opportunity for nonmotorized recreation in a nonwilderness, semiprimitive setting, both roaded and unroaded. Recreational opportunities, such as hiking, horseback riding, hunting, cross-country skiing, etc., are available.

Management Area 4B – (2,876 acres or 34 percent of Project Area)

MANAGEMENT EMPHASIS–HABITAT FOR MANAGEMENT INDICATOR SPECIES

The management emphasis is on the habitat needs of one or more management indicator species for wildlife. 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 those that are early succession dependent, in order to increase species richness and diversity.

Vegetative 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 vegetative characteristics are regulated. Rangeland vegetation is managed to provide needed vegetative species composition and interspersed grass, forb, and shrub sites or variety in age of browse plants. Recreation and other human activities are regulated to favor the needs of the designated species.

Management Area 5B – (3,208 acres or 38 percent of Project Area)

MANAGEMENT EMPHASIS—BIG GAME WINTER RANGE

The management emphasis provides for forage and cover on big game winter ranges. 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. Investments in compatible resources occur. Livestock grazing is compatible but managed to favor wildlife habitat.

New roads other than short-term temporary roads are located outside of the MA. Short-term roads are obliterated within one season after intended use. Existing local roads are closed and new motorized recreational use is managed to prevent unacceptable stress on big game animals during the primary big game use season.

Management Area 9A – (584 acres of the Project Area)

MANAGEMENT EMPHASIS – RIPARIAN AREA MANAGEMENT

The emphasis of this MA is on the management of all of the component ecosystems of riparian areas. These components include the aquatic ecosystem, the riparian ecosystem (characterized by distinct vegetation) and adjacent ecosystems that remain within approximately 100 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.

The goals of this MA are to provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water-body shorelines. The aquatic ecosystem may contain fisheries habitat improvement and channel stabilizing facilities that harmonize with the visual setting. Forest riparian ecosystems are treated to improve wildlife and fish

habitat diversity with specified silvicultural objectives. Fish habitat improvement treatments are applied to lakes and streams to enhance habitats and increase fish populations. This MA is not mapped in the Forest Plan; therefore the acres are estimated and not included in Figure 1-1.

BLM Royal Gorge Resource Management Plan

The BLM Royal Gorge Resource Management Plan (as amended May 13, 1996) identifies future management of land and resources administered by BLM in the Royal Gorge Planning Area. For clarity, this document is referred to as "RMP". On February 3, 1997, the BLM amended all RMPs to include the new Standards for Public Land Health.

BLM Travel Management Decision for Box Creek Watershed

On August 15, 2003, the Field Manager of the Royal Gorge Field Office signed a Decision Notice to implement the BLM travel management portion of the Box Creek Vegetation and Travel Management Plan administered public lands and the lands BLM is in the process of acquiring in the Box Creek planning area. The travel management system will consist of about 3.8 miles of roads open all year, about 2.7 miles that are seasonally closed, about 1.5 miles are closed, except for administrative use, and about 14.6 miles of roads will be closed and restored.

Documents Tiered to and Incorporated by Reference

This EA is tiered to the 1984 Forest Plan (40 CFR 1502.20). Tiering is done to eliminate duplication and reduce excessive paperwork. A Biological Evaluation (BE) for Threatened, Endangered, Proposed and Sensitive Species, Wildlife, Fisheries and Management Indicator Species Report, Colorado Forest Stewardship Guidelines to Protect Water Quality, Best Management Practices (BMPs) for Colorado, Soil Management Handbook, R2 Supplement 2509.18, Watershed Conservation Practices Handbook, and State of Colorado Forest Stewardship Guidelines – Best Management Practices, BLM Royal Gorge Resource Management Plan, and BLM Travel Management Decision for Box Creek Watershed (dated August 15, 2003) are incorporated by reference. Copies of the documents are on file in the Project Record located at the Leadville Ranger District Office.

Chapter 2
Scoping, Issues and Alternatives

INTRODUCTION

This chapter describes the public involvement process, scoping and issues identification, and development of alternatives. The issues that were developed from the scoping process are discussed in terms of their incorporation into the alternatives. This chapter describes the action alternatives that meet the Purpose and Need. A No-Action alternative is also discussed. The three action alternatives each respond to identified issues, resulting in a slightly different approach to achieving the purpose and need. The elements of the alternatives are described, followed by a detailed discussion of each alternative. Finally, alternatives are briefly compared by the major issues that were part of alternative development.

PUBLIC INVOLVEMENT, SCOPING, AND ISSUE IDENTIFICATION

Scoping for this project actually began during preparation of the Upper Arkansas Assessment (Forest Service, 1999) and the Lodgepole Flats Categorical Exclusion (Forest Service, 1999). This project has appeared quarterly in the Forest's Schedule of Proposed Actions (SOPA) under the names of Lodgepole Flats Restoration and Box Creek Restoration Project since the project began. An interdisplinary team (IDT) of resource specialists from the FS and BLM was formed in 2000 to begin analysis of the Box Creek Watershed.

PUBLIC INVOLVEMENT

The public scoping process was initiated with distribution of a scoping notice to local newspapers, and individuals, organizations, and government agencies on the project mailing list. Public scoping began February 14, 2000, with a letter mailed to 75 individuals. A second public mailing occurred on October 30, 2000. This list included adjacent landowners (complied from Court House records) and mailed to 748 parties. Public notices were placed in local newspapers including *The Herald Democrat* (November 16, 2000), *The Leadville Chronicle* (November 16 & 30, 2000), and the *Pueblo Chieftain* (November 9, 2000). This notice described the project, presented the purpose and need for the proposal, and provided information on how to participate in the scoping process. Interested parties were invited to comment on the proposal.

Presentations have been made internally to FS leadership and District employees, Lake County Commissioners, Lake County Soil Conservation District (LCSCD), Environmental Protection Agency (EPA) and Water board members. A field trip to Box Creek Watershed was made on June 23, 2000 with LCSCD members to examine forest health conditions in the Lodgepole Flat area. Prior field trips were made with a representative of the environmental organization, Colorado Wild, when the analysis area was smaller, and did not include BLM lands.

Thirteen letters were received from both mailings. The letters were reviewed and are incorporated into the alternatives.

ISSUE IDENTIFICATION

Scoping identified four issues for alternative development. These issues and the objectives of the actions proposed by this EA to address the issues are presented in Table 2-1.

Table 2-1. Issues and Management Objectives for the Action Alternatives

Issue	Objectives for proposed actions
Forest Health Dwarf Mistletoe Management	Increase diversity in size structure, age, age class structure and species composition. Improve the current forest health trend in mature lodgepole pine stands in the project area by minimizing the spatial extent of dwarf mistletoe.
Travel Management	Provide for decrease in soil erosion. Manage travel management. Reduce road densities in wildlife habitat. Decrease disturbance to wildlife.
Wildlife Habitat	Increase diversity in stand structure, spatial patterns, and effective habitat components for a variety of wildlife species such as patches of snags and coarse woody debris. Provide openings with young trees to provide habitat for Canada lynx prey and nearby denning habitat. Provide areas where human disturbance is minimized.
Fire Condition Classes	Move towards reducing number of acres in fire condition classes 2 and 3.

Issues Dismissed from Further Analysis

If an issue was considered to be outside the scope of this environmental assessment, or if the best available information indicated that effects would be negligible, it was eliminated from further analysis, as per NEPA requirements. The issues considered but not carried forward in the analysis are as follows:

Inventoried Roadless area management

All action alternatives are consistent with the interim direction on roadless areas. There are no new roads proposed for the IRAs in this project. Any decision selected on either roads or timber harvest will be consistent with the Roadless Policy. Therefore, this issue was dismissed.

ALTERNATIVES

This section describes the action alternatives that meet the purpose and need for action. The No Action alternative was also evaluated to provide a baseline and to comply with NEPA direction (40CFR1508.25 (b)). The action alternatives were developed in response to identified issues, resulting in different approaches to achieving the purpose of the project. Four alternatives were developed including: No action (Alternative A), Proposed Action (Alternative B), Harvest Tool Emphasis (Alternative C), and Fire Tool Emphasis (Alternative D). The alternatives present a full range of options from which the decision maker may choose to implement. The Action Alternatives are consistent with the Forest Plan, Forest Management Act and are consistent with federal, state and local laws and requirements. The main differences between the action alternatives are the tool combinations used to treat the stands. Based on information and analysis presented in Chapter 3, Affected Environment and Environmental Consequences, this chapter also provides a comparative environmental effects summary.

The following factors and issues listed above were used to develop the alternatives.

Boundary and Ownership: The Box Creek Watershed unit boundary and the PanArk urban interface were used as the project area boundary. Although the entire area was used in looking at potential vegetation types, historic range of variability, and other factors, only National Forest System lands and lands managed by the BLM were considered for treatment.

Potential Vegetation Type (PVT): Land type associations (PSICC 1997) combine climate, soil, and topography to represent the site potential to produce potential natural vegetation types (PVTs). The Box Creek Watershed PVT's include:

- **Alpine**: Generally between 12,000 to 14,400 feet elevation, high peaks, alpine basins, talus and rocks; stunted trees, mostly short alpine plants
- **Subalpine**: Generally between 10,200 to 12,000 feet, steep mountains; cold, moist site conifers and deciduous trees, mountain shrubs, grasses and forbs.
- **Montane:** Generally between 9,500 to 10,400 feet, nearly level to steep ground and lateral moraines; dry conifer and deciduous trees, short mountain shrubs, grasses and forbs.
- **Lower Montane:** Generally between 9,200 to 9,600 feet, moderately steep lateral moraines and alluvial fans; sagebrush grassland.
- **Riparian:** Elevations range from the valley bottom (9,200 feet) to alpine (13,600 feet), narrow to wide stream channels, ponds, lakes, seeps; conifers, deciduous trees, shrubs, grasses, forbs and mosses.

Existing Vegetation Cover (CT): LANDSTAT satellite 30-meter imagery was used to characterize current vegetation cover types and stand delineation for all ownerships. Stand exams were performed including stand delineation and species composition to verify accuracy of LANDSTAT. Cover types include:

- Tundra
- Spruce-fir
- Lodgepole pine
- Mixed conifer (lodgepole, Douglas-fir, ponderosa pine)
- Ponderosa pine
- Aspen
- Riparian
- Shrub/Grass

Structural Stages: Structural stage characterizations were developed using agency databases, aerial photo interpretations, and field validations. Structural stages include:

- **Grass/Seedling**: grass or grass with seedling trees
- **Sapling:** trees greater than 4 feet tall or 1 to 5 inches diameter at breast height (dbh)
- **Pole:** trees between 5 to 9 inches dbh
- **Mature:** trees 9 inches and larger dbh (pole timber or saw timber)
- **Old-growth:** trees 9inches and larger, exhibiting old-growth characteristics.

Suitable Lynx Habitat (SLH): Suitable lynx habitat (Forest Service 2001) was used to evaluate treatment options in lynx analysis units. Lynx habitat characteristics used are:

- **Potential lynx habitat**: contains both suitable and unsuitable vegetation conditions

- **Denning Habitat**: contains structural features used for denning
- **Forage Habitat**: contains vegetation characteristics used by lynx prey species.

Desired Future Condition (DFC): Desired Future Condition is defined as existing or potential vegetation cover type, seral stage, and disturbance. The IDT developed a 5-step process to identify DFC for proposed treatment units:

1. Describe **HRV historic** vegetation, structure and disturbance;
2. Describe **existing** vegetation, structure and disturbance;
3. Calculate the **departure** for vegetation, structure and disturbance (referred to as historic range of variability [HRV];
4. Determine what vegetation, structure and disturbance could be **changed to meet objectives**:
    - Shift trends to natural patterns
    - Restore fire adapted ecosystems
    - Manage for healthy forests
    - Provide quality wildlife habitat

   Determine what the **most effective tool combination** could be used to achieve the objectives

Fire Regime Condition Class: The National Fire Plan – Cohesive Strategy (GAO/RCED-99-65 2000). The National Fire Plan (Forest Service, 2001) provides direction to reduce wildland fire risks. Linked to the Fire Plan, the Cohesive Strategy provides guidance for prioritization and planning of projects to reduce wildland fire risks. Priorities for projects include risk reduction to: wildland – urban interface; soil, air and water; wildlife species habitat; wildland sustainability. The general restoration strategy involves reducing departure from natural fire regimes and HRV. Fire regime departure defines three fire risk classes for ecosystems based on departure of existing vegetation, structure, and changes in disturbance factors. The three condition classes as defined in the Cohesive Strategy are described below. The relative risk of fire-caused losses of key components that define the system increases for each respectively higher number condition class, with little or no risk at the Class 1 level. Most of the analysis area is in condition classes 2 and 3. (Map 2 – Box Creek Fire Regimes Condition Class)

- **Class 1, Low Risk:** Fire regimes are in an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning in an historical range. Fires burning in Condition Class 1 pose little risk to the ecosystem and have positive effects to biodiversity, soil productivity, and hydrologic process.
- **Class 2, Moderate Risk:** Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Wildfires burning in Condition Class 2 lands can have moderately negative impacts to species composition, soil conditions, and hydrologic processes.
- **Class 3, High Risk:** Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. These results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their historical range. Wildfires burning in Condition Class 3 may eliminate desired ecosystem components, exacerbate the spread of unwanted non-native species, and result in dramatically different ecological effects compared to reference conditions.

ALTERNATIVES CONSIDERED IN DETAIL

Alternative A: No Action

Alternative A is the No Action alternative (Map 3). Under Alternative A, present management activities would continue to occur, but no additional activities to improve forest health would occur. Current management activities include:

- **Noncommercial sale of fire wood, post and poles.** 30 to 40 acres per year for public fuel wood, and 20 to 30 acres per year for other wood products such as post and poles for personal use. Annual volume sold is approximately 150 cords (192 ccf) of firewood at $15/cord per year and 117 ccf (one hundred cubic feet) post and pole material.
- **Slash Treatment.** Management units are treated for accumulated slash as needed after the units are closed. Prescribed fire in the most common treatment although mechanical chipping is used in areas where fire is not an option. Acres treated each year vary based on burning conditions; approximately 40 to 100 acres are burned in a 1 to 3 year period.
- **Dwarf Mistletoe Treatment.** There is approximately 485 acres of young sapling size lodgepole regenerated in the late 1970s and early 1980s. Maintenance activities to protect the regenerated trees from dwarf mistletoe infection include removal of infected mature trees for 66 feet, removal of infected trees in the stand, or girdling the infected trees to create snags. Felled trees are either sold as public fuel wood or retained on site. This activity began in 1998 and is expected to continue in the future. Approximately 5 to 50 acres are treated annually.
- **Roads.** There are approximately 26.5 miles of motorized use open system roads (both FS and BLM) in the project area.
    - **Seasonal Road Closures.** There are three roads closed with locked gates with closures effective yearlong. These road closures have been in effect for more than 10 years and are expected to remain closed in the future except for approved activities. The road closures are on Forest Development Road (FDR) 130 near the crossing with Box Creek (approximately 2 miles closed); FDR 160A (1.8 miles); and FDR 160B (0.6 miles).
    - **Non-system Roads.** There are approximately 30 miles of non-system roads in the project area. Under this Alternative, these roads would not be closed and obliterated.

Tools Common to All Action Alternatives

Tools available to make changes in vegetation structure and disturbance for this project include:

Protection - Protection of existing vegetation and structure in the current condition

Fire - to include management ignited mixed surface, ground, or stand replacement fire

Harvest - using regeneration, thinning, group or individual tree selection silvicultural methods

Presciptions Common to All Action Alternatives

The Box Creek Project Area was mapped using species composition, vegetation structure, size classes, and ownership. Each polygon was assigned a unique identifying number. Individual polygons were assigned a treatment prescription based on existing vegetation and structure and the desired future outcome to meet objectives. Some polygons were assigned more than treatment prescription if objectives could potentially be met with either treatment. The number of acres in each prescription will change by alternative. The total number of acres to be treated is the same for all alternatives; however the methodology will change by alternative. The number of acres selected best meets the purpose and need and would move the area more quickly towards desired

conditions. Proposed treatment will be through small commercial as well as non-commercial means including service and stewardship contracting authorities.

Prescription Descriptions

Prescriptions 3: Regenerated lodgepole. Where second growth has been infested with dwarf mistletoe, infected trees near the treatment unit margins will be removed. Where sagebrush exists, low intensity prescribed fire would be implemented. Existing snags and CWD would be maintained where present.

Prescription 6: No Treatment Areas. No treatment (i.e., mechanical or prescribed fire) shall occur in these units. These polygons include mixed conifer and aspen stands, Engelmann spruce and subalpine fir old-growth stands, stands that have potential to develop late successional characteristics or old-growth lodgepole pine, water, rock, or non-forested areas on federal land. DFC for federal lands is sustaining current conditions. Some of these polygons are private or state land.

Prescriptions 8, 10: Restoration and regeneration of lodgepole pine and mixed conifer. Where lodgepole pine stands have high amounts of dwarf mistletoe infestation or lack species such as ponderosa pine or Douglas-fir, priority would be placed on re-establishment and clear cut regeneration treatments. This would involve the removal of trees in areas greater than 20 acres in size to prevent the spread of mistletoe. The largest diameter residual trees and existing snags would be left. Interplanting ponderosa pine, Douglas-fir or spruce-fir seedlings may be used to increase species diversity.

Prescriptions 11, 14: Lodgepole mixed with other conifers. Where lodgepole pine occurs in mixtures with other species, especially when dwarf mistletoe infestation is severe, the lodgepole with mistletoe will be selectively removed or reduced by fire and harvest by clear cut regeneration. Clear cut regeneration would involve the removal of trees in areas greater than 20 acres in size to prevent the spread of mistletoe. Species diversity would be favored by retaining ponderosa pine, Douglas-fir and Engelmann spruce. Trees exhibiting good growth and vigor would be left. Existing snags would be maintained with additional snag recruitment created by leaving the largest size class trees available regardless of dwarf mistletoe rating. Snag recruitment mortality would be stimulated by post treatment prescribed burning. Natural regeneration would occur after treatment and be monitored.

Prescription 7, 12: Density reduction for winter range. In winter range units (Management Area 5B) where lodgepole pine occurs in varying densities along with sagebrush and grass, tree density will be reduced through a combination of fire and harvest. Trees with dwarf mistletoe infestation rating greater than DMR 2 would be removed unless considered a recruitment tree to benefit for wildlife or course woody debris. A prescribed fire rotation of every 4 to 6 years may be needed to preserve understory forage. Existing snags would be maintained with additional snags created by leaving the largest size class trees available regardless of dwarf mistletoe rating. Mortality would be stimulated by post treatment prescribed burning. Natural regeneration after treatment would be monitored for weeds if needed.

Prescription 13: Snag areas for wildlife. In heavily mistletoe-infested units, mechanical removal combined with prescribed fire will be used to create patches of snags to enhance wildlife habitat. Intermediate and suppressed trees would be removed, with very small diameter trees cut and left for prescribed fire treatment. Codominant/dominant trees would be left and burned with prescribed fire to induce snag recruitment throughout the treatment units. Monitoring will determine the success of natural regeneration after treatment.

Prescription 19: Fire Use. Currently, the PSICC does not have fire use. Planning is currently underway at the Forest scale. If the decision from that planning effort authorizes fire use, then this area will be a candidate for the study and use of fire.

Prescription 21: Sagebrush – grass restoration. In areas having a dominant sage component or open lodgepole pine with grass understory, prescribed fire would used to restore grass and shrub diversity. After initial

treatment, it would be desirable to maintain this condition using prescribed fire every 4 to 6 years, depending on grass and sage growth. Existing snags would be maintained with additional snag recruitment created from largest size class trees. Snag recruitment and CWD mortality would be stimulated by prescribed fire.

Prescription 23: Defensible Fuels Zone: In areas adjacent to private property (i.e., urban interface), a thinning from below, salvage and sanitation strategy would be implemented. Slash would be treated by piling and burning. A defensible fuels zone would have a strategic placement along a corridor where federal land is adjacent to private property. Smaller diameter trees would be thinned away from the larger diameter trees to decrease the fuel ladders into the larger trees. Mountain pine beetle infested trees would also be removed to reduce the potential of infestation of additional trees from the beetle. This would be accomplished by thinning from below with removal of trees with active insect infestation. Trees to be removed would be: currently infested with an insect infestation that may spread to other trees; intermediate and suppressed trees that form a fuel ladder into the larger trees and mistletoe infested trees that would form a fuel ladder into the larger trees. No snags would be maintained in 200 feet of private property. Out side the 200-foot buffer, existing snags would be maintained with additional snag recruitment created from largest size class trees.

Implementation and Monitoring Plan

The implementation plan for Box Creek Environmental Assessment corresponds to the need for initiating action in areas of greatest response to treatment. For this project, treatment initiation in both mechanical and fire includes BLM and/or Forest Service entities. Conceptually, treatment of sage and grass types through the use of prescribed fire (prescription 21) will begin in 2004, with individual unit locations determined in the spring of 2004. Mechanical treatment of timber stands (especially prescription 12) will start on the east end of the planning area (east of the conduit) and move toward the west. Beginning in 2004, approximately 500 acres per year of mechanical harvest and prescribed fire will be needed to carry out this project. Most of the clear cut regeneration cuts (prescription 10 & 8) will be carried out simultaneously to aid in reduction of animal damage to the new stands by alleviating possible concentrations of big game. More complex sales and prescribed fire treatment (especially behind the gated administrative use roads) will occur later in the project implementation window. Road closures will accompany mechanical treatment units after all work has been done and should follow the east to west progression. Gating for seasonal closures will start in 2004 and should be finished by fall 2005.

The monitoring plan for the Box Creek Environmental Assessment will identify responses to the proposed action, in terms of measuring or quantifying expected outputs over actual observations. The following list of objectives will be used but will not preclude additional examinations within the project activity.

Lynx habitat – Improve the habitat quality for Canada lynx in both forage (acres of regenerated stands) and the amount of habitat suitable for denning (number of downed logs) in treated stands.

Snag and down woody debris (Course Woody Debris) – Improve wildlife habitat for species dependent on snags and course woody debris. Also, correlate the number of standing snags to fallen debris over time to address the effectiveness of snag longevity.

Forage in big game winter range – Improve forage quality and quantity of big game winter range.

Mistletoe – Decrease spread rates or changes in mistletoe ratings in all treatment areas.

Road densities – Improve security habitat for big game and other wildlife species.

Erosion measurements - Three erosion bridges would be located within the project area to begin to provide base line measurements to soil movement or identify areas exhibiting soil erosion. The locations will be identified by the Soil Scientist.

Fire Condition Classes – Measure changes in condition class 2 and 3, as identified through the Cohesive Strategy implementing the National Fire Plan.

Urban interface – Document treatment acres adjacent to private and urban areas that reduce the threat of wildfire occurrence and intensity.

Alternative B: Proposed Action

The proposed action (Map 5) would protect existing old-growth and candidate old-growth stands, down logs providing important wildlife habitat, healthy stands of young regenerating forest, large mature, pure aspen stands (mixed aspen-conifer stands will be treated), and wildlife habitat. Vegetation treatments include timber harvest, thinning, prescribed fire, and tree planting in selected stands.

Seasonal restrictions for motorized travel would be implemented in areas; routes no longer needed would be rehabilitated and decommissioned. Temporary roads and those roads scheduled for permanent closure may be used for timber sale work. These will be decommissioned, rehabilitated, and permanently closed after the treatment is completed. No new temporary roads will be constructed.

TIMBER MANAGEMENT activities would occur on approximately 3,096 acres of predominately lodgepole pine with a combination of silvicultural methods including thinning to improve forest health, salvage of mountain pine beetle infested trees, and clear-cut regeneration treatments to remove dwarf mistletoe infested trees.

- **Yarding systems** may include tractors, skidding equipment, horse logging, or logging over snow.
- **Harvest techniques** include thinning and clear-cut regeneration techniques. Thinning is defined as understory tree and shrub removal to limit stand overcrowding and competition for growth. Clear cut regeneration would involve the removal of all trees (greater than or equal to 20 acres) in areas heavily infected with mistletoe, effectively restart the growth of the stand and prevent the re-infestation of mistletoe.
- **Stand Improvement** treatments would include interplanting ponderosa pine, Douglas-fir, and Engelmann spruce in some current lodgepole pine units. Mistletoe reduction activities would occur.

FIRE MANAGEMENT activities would be applied to approximately 2,351 acres for this alternative.

- Prescribed fire at this time would not include allowing natural lightning ignited fires to burn. Existing features such as roads, trails, open areas of vegetation and hand constructed fuel breaks are considered as containment strategies for prescribed fire operations.
- Mechanical treatment, cutting and stacking or spreading of fuels may be needed to pre-treat target areas prior to ignition, either to reduce fuel loadings or to create sufficient fuels to carry a ground fire. Ignition methods may include helicopters equipped with fire ignition devices (i.e., helitorch or fire ignition ping pong balls), all terrain vehicles (ATVs) with rear mounted power torch and hand held drip torches.
- Prescribed fire is also a tool for treating fuels associated with harvest activities. Regeneration and thinning harvests can produce excess fuels; actions to reduce fuels may consider broadcast burning or pile burning.

Alternative C: Mechanical Treatment Emphasis

Alternative C primarily treats stands mechanically, although some units are also proposed to have prescribed fire (Map 6). Vegetation treatments include timber harvest, thinning, and prescribed fire. Seasonal restrictions for motorized travel would be implemented in areas; routes no longer needed would be rehabilitated and decommissioned. Temporary roads and those roads scheduled for permanent closure may be used for timber sale work. These will be decommissioned, rehabilitated, and permanently closed after the treatment is completed. No new temporary roads will be constructed.

TIMBER MANAGEMENT activities would occur on approximately 3,689 acres of predominately lodgepole pine with a combination of silvicultural methods including clear-cut regeneration treatment to remove dwarf mistletoe infested trees; thinning to improve forest health, salvage of mountain pine beetle infested trees, and removal of certain dwarf mistletoe infested trees.

- **Yarding systems** may include tractors, skidding equipment, horse logging, or logging over snow.
- **Harvest techniques** include thinning and clear-cut regeneration techniques. Thinning is defined as understory tree and shrub removal to limit stand overcrowding and competition for growth. Clear cut regeneration would involve the removal of all trees (greater than or equal to 20 acres) in areas heavily infected with mistletoe, effectively restart the growth of the stand and prevent the re-infestation of mistletoe.
- **Stand Improvement** treatments would include interplanting ponderosa pine, Douglas-fir, and Engelmann spruce in some current lodgepole pine units. Mistletoe reduction activities would occur.

FIRE MANAGEMENT activities would be applied to approximately 1,758 acres for this alternative.

- Prescribed fire at this time would not include allowing natural lightning ignited fires to burn. Existing features such as roads, trails, open areas of vegetation and hand constructed fuel breaks are considered as containment strategies for prescribed fire operations.
- Mechanical treatment, cutting and stacking or spreading of fuels may be needed to pre-treat target areas prior to ignition, either to reduce fuel loadings or to create sufficient fuels to carry a ground fire. Ignition methods may include helicopters equipped with fire ignition devices (i.e., helitorch or fire ignition ping pong balls), all terrain vehicles (ATVs) with rear mounted power torch and hand held drip torches.

- Prescribed fire is also a tool for treating fuels associated with harvest activities. Regeneration and thinning harvests can produce excess fuels; actions to reduce fuels may consider broadcast burning or pile burning.

Alternative D: Prescribed Fire Emphasis

Alternative D primarily treatment is prescribed fire, although some units would still be mechanically treated (Map 7). Seasonal restrictions for motorized travel would be implemented in areas; routes no longer needed would be rehabilitated and decommissioned. Temporary roads and those roads scheduled for permanent closure may be used for timber sale work. These will be decommissioned, rehabilitated, and permanently closed after the treatment is completed. No new temporary roads will be constructed.

TIMBER MANAGEMENT activities would occur on approximately 1,042 acres of predominately lodgepole pine with a combination of silvicultural methods including clear-cut regeneration treatments to remove dwarf mistletoe infested trees, thinning to improve forest health, salvage of mountain pine beetle infested trees, and removal of certain dwarf mistletoe infested trees.

- **Yarding systems** may include tractors, skidding equipment, horse logging, or logging over snow.
- **Harvest techniques** include thinning and clear-cut regeneration techniques. Thinning is defined as understory tree and shrub removal to limit stand overcrowding and competition for growth. Clear cut regeneration would involve the removal of all trees (greater than or equal to 20 acres) in areas heavily infected with mistletoe, effectively restart the growth of the stand and prevent the re-infestation of mistletoe.
- **Stand Improvement** treatments would include interplanting ponderosa pine, Douglas-fir, and Engelmann spruce in some current lodgepole pine units. Mistletoe reduction activities would occur.

FIRE MANAGEMENT activities would be applied to approximately 4,405 acres for this alternative.

- Prescribed fire at this time would not include allowing natural lightning ignited fires to burn. Existing features such as roads, trails, open areas of vegetation and hand constructed fuel breaks are considered as containment strategies for prescribed fire operations.
- Mechanical treatment, cutting and stacking or spreading of fuels may be needed to pre-treat target areas prior to ignition, either to reduce fuel loadings or to create sufficient fuels to carry a ground fire. Ignition methods may include helicopters equipped with fire ignition devices (i.e., helitorch or fire ignition ping pong balls), all terrain vehicles (ATVs) with rear mounted power torch and hand held drip torches.
- Prescribed fire is also a tool for treating fuels associated with harvest activities. Regeneration and thinning harvests can produce excess fuels; actions to reduce fuels may consider broadcast burning or pile burning.

Different prescriptions treatments will cause different results on the landscape (i.e. mechanical verses fire). However, the prescriptions will result in similar vegetation structural stages changes across the landscape.

Table 2-2. Comparison of Alternatives

	Alternative A	Alternative B	Alternative C	Alternative D
Timber Management (acres treated)	**70**	**3,096**	**3,689**	**1,042**
Prescribed fire (acres treated)	40	2,351	1,758	4,405
Closed and /or decommissioned roads (miles)	**0**	**14.57**	**14.57**	**14.57**

Table 2-3. Comparison of Alternative Effects

Issue	Alternative A – No Action	Alternative B – Proposed Action	Alternative C – Mechanical Treatment Emphasis	Alternative D – Prescribed Fire Emphasis
Forest Health Dwarf Mistletoe Management	Forest stands would continue to be homogeneous, dense, deformed, and predominately even-aged. Increase in crown fires may occur. Less snags and down woody debris would occur. On going treatments would help reduce some dwarf mistletoe but not to the extent of the action alternatives.	Increase in diversity of age class and structure would occur. Increase in aspen stands. Decrease in fuel ladder conditions, and crown fires. Reduce amount of mistletoe in about 60% of lodepole pine type. Reduce spread of mistletoe infections. Best mix of tools to meet objectives.	More precise removal of trees as compared to other alternatives. Would not result in as many acres of fire induced mortality over the landscape as would occur under Alternatives B and D. May result in somewhat less future mistletoe on affected acres than Alternative B. Less fire scaring and resulting decay. Forage production potential would be less than in Alternatives A and D. Less coarse woody debris as compared to other Action alternatives.	Less precise in tree selection as compared to manual selection. Natural regeneration of lodgepole pine would increase. Increase in coarse woody debris as compared to other action alternatives. More fire scaring and resulting decay. More forage production potential than Alternative C.
Travel Management	Some reduction in soil erosion because of current road closures. Unclassified roads would still be open, increasing soil erosion.	Produces least amount of sediment. Unclassified roads would be closed and/or obliterated.	Produces the most sediment due to management activities, but less than Alternative A. Unclassified roads would be closed and/or obliterated.	Produces less sediment than Alternative C, but more than B. Unclassified roads would be closed and/or obliterate.
Wildlife Habitat For other effects on MIS or Sensitive species please turn to Chapter 3 section on Wildlife	Would not increase diversity in stand structure, spatial patterns or effective habitat components. Road densities would not be decreased. Wildlife disturbance would still occur.	Would increase patches of snags and coarse woody debris. Would improve forage quantity and quality. Overall reduction in motorized route miles. May affect, but not likely to adversely affect Canada lynx, bald eagle and No effect on boreal toad.	Less fire scaring and resulting decay. Forage production potential would be less than in Alternatives A and D. Less coarse woody debris as compared to other Action alternatives. Overall reduction in motorized route miles. May affect, but not likely to adversely affect Canada lynx, bald eagle and No effect on boreal toad.	Would increase patches of snags increase in coarse woody debris as compared to other action alternatives. Would improve forage quantity and quality. Overall reduction in motorized route miles. May affect, but not likely to adversely affect Canada lynx, bald eagle and No effect on boreal toad.
Fire Condition Classes	Would not move towards reducing number of acres in fire condition classes 2 and 3 as effective as action alternatives.	Most effective in moving towards reducing number of acres in fire condition classes 2 and 3.	Less effective than Alternative B to move towards reducing number of acres in fire condition classes 2 and 3.	Less effective than Alternative B to move towards reducing number of acres in fire condition classes 2 and 3.

The following tables illustrate the changes in vegetation structural stages across the watershed from existing condition to all action alternatives.

Table 2-4. Treatment Acres Comparison of Box Creek Prescriptions by Alternative

Prescribed Fire Treatments	Alternative			
	A	**B**	**C**	**D**
Rx Fire Maintain Rx 3/4	0	0	0	188
Prescribed Fire Regenerate Rx 8/10	0	134	18	561
Prescribed Fire Winter Range Openings Rx 12	0	477	0	1548
Mechanical/Prescribed Fire Snag Restoration Rx 13	0	192	192	192
Prescribed Fire Conifer Enhancement/Sanitize Rx 11/14	0	199	199	567
[1]Prescribed Fire Patch Regeneration Rx 19	0	0	0	0
Prescribed Fire Sage/Grassland Rx 21	0	1349	1349	1349
Total Prescribed Fire Acres	*0*	*2351*	*1758*	*4405*
Mechanical Treatments with Prescribed Fire				
Thin and Maintain Rx 3/4	582	916	916	728
Thin/Sanitize Rx 7	0	61	61	0
Regeneration Harvest/RX Fire Rx 8/10	0	427	543	0
Conifer Enhancement/Sanitize Rx 11/14	0	510	510	142
Winter Range Mechanical Density Reduction w/ RX Fire Rx 12	0	1087	1564	16
Thin/ Salvage/Sanitize Harvest *Rx 23*	0	156	156	156
Total Mechanical Treatments with Prescribed Fire Acres	*582*	*3096*	*3689*	*1042*
Total Treatment Acres	*582*	*5447*	*5447*	*5447*

[1]Rx 19 (1,540 acres) will be analyzed for potential fire use in the future if approved, but would not be treated immediately in the Box Creek project.

Table 2-5. Comparison between No Action & Action Alternatives of Road Mileages, by Agency

Proposed	No Action Alternative			All Action Alternatives			NET DIFF
	Total	**BLM**	**USFS**	**Total**	**BLM**	**USFS**	
Open all year	48.23	21.11	27.13	8.67	2.62	6.05	-39.56
Gated seasonal closure	0.00	0.00	0.00	7.54	1.11	6.43	7.54
Gated all yr, admin	7.33	0.00	7.33	7.41	0.00	7.41	0.08
Closed & restored	0.00	0.00	0.00	31.95	17.38	14.57	31.95
TOTALS	55.57	21.11	34.46	55.57	21.11	34.46	0.00

Table 2-6. Existing Vegetation Type and Structural Stage Values

Vegetation Type	Structural Stage											
	11 WTR	12 BAR	10 GFS	20 STS	31 PSO	32 PSM	33 PSC	41 MTO	42 MTM	43 MTC	5 OTR	Area Totals
Alpine meadow	0	0	28	0	0	0	0	0	0	0	0	28
Alpine shrub	0	0	534	0	0	0	0	0	0	0	0	534
Sagebrush/grass	0	0	5,914	0	0	0	0	0	0	0	0	5,914
Barren	0	433	0	0	0	0	0	0	0	0	0	433
Water	352	0	0	0	0	0	0	0	0	0	0	352
Non-forest	352	433	6,476	0	0	0	0	0	0	0	0	7,261
Riparian	0	0	0	2,413	0	0	0	0	0	0	0	2,413
Aspen/conifer	0	0	0	0	322	137	781	0	0	0	0	1,240
Lodgepole	0	0	0	376	1,984	2,160	556	102	12	41	0	5,231
Mixed conifer	0	0	0	0	1	69	0	411	579	0	0	1,060
Spruce/fir	0	0	0	0	0	0	814	0	0	221	404	1,439
Forest total	0	0	0	2,789	2,307	2,366	2,151	513	591	262	404	11,383

The existing vegetation type is a description of the existing vegetation, barren areas, or water in a polygon. Structural stage values are defined as the size class and canopy cover of the vegetation type in a polygon. Data from thematic LANDSAT mapping data which has been ground verified.

Table 2-7. Predicted vegetation type and structural stage values under the Action Alternatives

Vegetation Type	Structural Stage												
	11 WTR	12 BAR	13 SED	10 GFS	20 STS	31 PSO	32 PSM	33 PSC	41 MTO	42 MTM	43 MTC	5 OTR	Area Totals
Alpine Meadow	0	0	0	28	0	0	0	0	0	0	0	0	28
Alpine Shrub	0	0	0	534	0	0	0	0	0	0	0	0	534
Sagebrush/Grass	0	0	0	5,914	0	0	0	0	0	0	0	0	5,914
Barren	0	433	0	0	0	0	0	0	0	0	0	0	433
Water	352	0	0	0	0	0	0	0	0	0	0	0	352
Non-forest	352	433	0	6,476	0	0	0	0	0	0	0	0	7,261
Riparian	0	0	0	0	2,413	0	0	0	0	0	0	0	2,413
Aspen/Conifer	0	0	16	0	0	652	96	476	0	0	0	0	1,240
Lodgepole	0	0	434	0	385	3,099	1,047	110	122	0	34	0	5,231
Mixed Conifer	0	0	0	0	0	70	0	0	535	455	0	0	1,060
Spruce/Fir	0	0	9	0	0	553	9	236	96	0	132	404	1,439
Forest total	0	0	459	0	2,798	4,374	1,152	822	753	455	166	404	11,383

Data from thematic LANDSAT mapping data, which has been ground verified.

Structural Stage Value Description

WTR 11: existing water ponds in a polygon
BAR 12: existing barren or rock areas in a polygon
SED 13: stand initiation stage after treatment consisting primarily of natural regeneration. Clumps of trees remaining the original stand prior to treatment would be interspersed.
GFS 10: grass/forb/ shrub; a composition of grasses, forbs and shrubs
STS 20 shrub/tree/ seedling; primary component is seedling/small trees 30 feet. high or less, with a dbh ranging from1.0 to 4.9 inches, and shrubs.
PSO 31 pole/sapling/open; primary component is trees with a dbh ranging from 5.0 to 8.9 inches and a canopy closure of 29 percent or less.
PSM 32 pole/sapling/moderate; primary component is trees with a dbh ranging from 5.0 to 8.9 inches and a canopy closure of 30 to 69 percent.
PSC 33 pole/sapling/closed; primary component is trees with a dbh ranging from 5.0 to 8.9 inches and a canopy closure of 70 percent and greater.
MTO 41 mature tree open; primary component is trees with a dbh ranging from 9.0 to 20.9 inches and a canopy closure of 29 percent or less.
MTM 42 mature tree moderate; primary component is trees with a dbh ranging from 9.0 to 20.9 inches and a canopy closure of 30 to 69 percent.
MTC 43 mature tree closed; primary component is trees with a dbh ranging from 9.0 to 20.9 inches and a canopy closure of 70 percent and greater.
OTR 50 old tree; primary component is trees 21 inches dbh and larger.

In the action alternatives, habitat structural stage values in the Alpine Meadow, Alpine Shrub, Sagebrush/Grass, Barren, Water, and Riparian are not predicted to change as these areas would either be restored to a similar structure or would not have treatment.

In comparison to current conditions, all action alternative treatments are predicted to change structural stage by an estimation of tree removal or fire mortality.

Table 2-8. Estimated Changes in Structural Stages in the Treated Stands

Structural Stage	Area before treatment (%)	Area after treatment (%)
Grass-forb	56	56
Seedling-Sapling	24	24
Open Sapling-Pole	20	38
Moderate Closed Sapling-Pole	21	10
Closed Sapling-Pole	19	7
Open Mature	5	7
Moderate Closed Mature	5	4
Closed Mature	2	1
Old Growth	4	4

Table 2-9. Estimated difference in acres from untreated to treated

Vegetation Types	Structural Stage											
	11 WTR	12 BAR	13 SED	10 GFS	20 STS	31 PSO	32 PSM	33 PSC	41 MTO	42 MTM	43 MTC	5 OTR
Aspen/Conifer	0	0	16	0	0	330	-41	-305	0	0	0	0
Lodgepole	0	0	434	0	9	1115	-1113	-446	20	-12	-7	0
Mixed Conifer	0	0	0	0	0	69	-69	0	124	-124	0	0
Spruce/Fir	0	0	9	0	0	553	9	-578	96	0	89	0

Aspen/Conifer:

- increase in the seedling-stand initiation stage **(16 acres)**
- increase in the pole/sapling/open stage **(330 acres)**
- decrease in the pole sapling moderate stage **(-41 acres)**
- decrease in the pole sapling closed **(-305 acres)**

Lodgepole:

- increase in seedling stand initiation stage **(434 acres)**
- increase in the pole/sapling/open stage **(1,115 acres)**
- decrease in the pole sapling moderate stage **(-1113 acres)**
- decrease in the pole sapling closed **(-446 acres)**
- increase in mature tree open **(20 acres)**
- decrease in mature tree moderate **(-12 acres)**
- decrease in mature tree closed **(-7 acres)**

Mixed Conifer:

- increase in the pole/sapling/open stage **(69 acres)**
- decrease in the pole sapling moderate stage **(-69 acres)**
- increase in mature tree open **(124 acres)**
- decrease in mature tree moderate **(-124 acres)**

Spruce/Fir:

- an increase in the seedling stage **(9 acres)**
- increase in pole sapling open **(553 acres)**
- decrease in pole sapling moderate stage **(-9 acres)**
- decrease in the pole/sapling /closed stage **(-578 acres)**
- increase in mature tree open stage **(96 acres)**
- decrease in mature tree closed stage **(-89 acres)**

PAST, ON-GOING OR FORESEEABLE FUTURE ACTIONS

The following projects are past, on-going or foreseeable future actions within or near the Project Area. The need to include these actions in the individual resource analysis is dependent on the cumulative effects area and duration of effects for each resource. Additional watershed assessments will be occurring in the future. No projects or plans have been developed from these assessments at this time.

- **Prescribed burns.**
    - Kaufman Ridge prescribed burn from Mushroom Gulch south to Castle Rock Gulch
    - Bassam Park prescribed burn (1,500 acres) from Bassam Park area and north to Castle Rock Creek.
    - Greens Gulch II prescribed burn (40,000 aces) from Highway 285 south to Turret between the Arkansas River and Aspen Ridge
- **Noncommercial sale of fire wood, post and poles.** 30 to 40 acres per year for public fuel wood, and 20 to 30 acres per year for other wood products such as post and poles for personal use. Annual volume sold is approximately 150 cords (192 ccf) of firewood at $15/cord per year and 117 ccf (one hundred cubic feet) post and pole material.
- **Slash Treatment.** Management units are treated for accumulated slash as needed after the units are closed. Prescribed fire sin the most common treatment although mechanical chipping is used in areas where fire is not an option. Acres treated each year vary based on burning conditions; approximately 40 to 100 acres are burned in a 1 to 3 year period.
- **Dwarf Mistletoe Treatment.** Maintenance activities to protect the regenerated trees from dwarf mistletoe infection include removal of infected mature trees for 66 feet, removal of infected trees in the stand, or girdling the infected trees to create snags. Felled trees are either sold as public fuel wood or retained on site. This activity began in 1998 and is expected to continue in the future. Approximately 5 to 50 acres are treated annually.

Chapter 3
Affected Environment and Environmental Consequences

The affected environment discussion describes the physical and biological components of the environment that could be affected by implementation of the alternatives. The environment is described in terms of specific resources. This discussion sets the stage for a discussion of the environmental consequences and comparison of alternatives.

Historical Condition

Historically, the pine forest was likely quite open with fewer trees, greater age diversity between stands, and larger openings than the area displays today. The forest would have been characterized by frequent low intensity fires, which were the primary disturbance factor in these forests. At times, large fires would move into the crowns and kill many trees. Crown fires played a critical role in maintaining the open stand structure and are likely to have occurred following wetter periods during which the understory vegetation had become established. This vegetation provided a ladder effect moving the fire from the ground into the canopy. In these types of events, the fire would have burned intensely in some locations, killing all trees in that area. In other areas of the same fire, the burning would have been limited to the surface, killing only some or smaller trees. Other areas would have been missed completely due to firebreaks. Smaller fires that did not move into the crowns would have limited the growth of Douglas- fir, which does not tolerate fire well, to sites where fires were infrequent, particularly wetter, north-facing slopes. The smaller fires would also have kept the forest more open by limiting growth of understory trees.

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

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

There is no direct documentation of the historic levels of dwarf mistletoe before European settlement at Lodgepole Flats and environs prior to European settlement. These parasites have been in North America at least 25 million years (Hawksworth 1978). The co-evolution of host and parasite, under the influence of factors such as fire and plant community dynamics, has resulted in a highly specialized relationship. Evidence suggests that, until settlement, the disease was widespread geographically but in limited patches on the landscape and not generally severe.

In 1860, gold was discovered in California Gulch and drew settlers to the area. Area population swelled during the silver rush, beginning in 1877 and ending when the U.S. Government quit buying silver in 1893. During this time, almost all accessible trees were cut to support Leadville and other nearby mining towns. They were needed for mine structure supports, smelters, house and business building, and heating during the long, cold winters.

Either the wood was burned directly, or it was used to make charcoal. After a time, wood became so scarce that local residents tell stories of their grandfathers and fathers digging out tree stumps to use for fuel in the early 1900's.

The widespread timber cutting resulted in the elimination of the seed sources of shade tolerant competitors. Because of it's tolerance of a wide range of environmental conditions, lodgepole pine grows in association with many understory species. It is the intense logging disturbance of the area during the mining boom, which is most responsible for the ecological condition in Lodgepole Flats area.

Evidence in the project area in the form of old stumps and fire scars, indicates a historical system much different than now. Charcoal near or at the surface has also been found in these stands from other species. The charcoal evidence is one factor in determining before the late 1800s, the area was considerately different in vegetation structure, species mixture, and fire frequency. Based on old dead and down ponderosa pine snags, bark from ponderosa pines laying on the ground under the down snags, and fire scares collected in the area, it is our belief the historical fire regimes were much more frequent (0-35 year fire return intervals), as observed in the fire scar records. More open and savannah like conditions likely existed and were perpetuated by this fire regime prior to the local mining era.

Affected Environment

FOREST HEALTH AND VEGETATION

The Box Creek Analysis Area consists primarily of mountain montane and mountain subalpine vegetation types. Forest species composition has shown an increase in disturbance dependent species such as lodgepole pine, due to activities such as mining, settlement fire sets, and logging practices.

Currently, lodgepole pine stands in the Box Creek Watershed are homogeneous, dense, predominantly even-aged, and heavily infected with dwarf mistletoe. As a result, many trees are deformed and have suppressed growth. The forest mostly consists of small diameter (8.9 inches diameter at breast height (dbh) and less) with scattered medium diameter (9.0 inches. dbh and greater) trees. There is a disproportionate amount of small diameter, crowded stands of mature lodgepole pine, and young trees (<80 years old) are poorly represented. Stand exams of the Box Creek Project Area indicate the average live tree basal area ranges from 60 square feet per acre to 180 square feet per acre. Snags large enough to provide of wildlife needs are low in the project area. Understory vegetation is limited in number of species, quality, and quantity.

FOREST INSECTS AND DISEASE

Current even age vegetation conditions are prone to insect and disease processes. Insect and disease populations are in departure from natural levels.

Decays. A moderate amount of decay in living and recently dead trees is an integral part of natural forest ecosystems. Such decay creates habitat for cavity-nesting birds, denning sites for small mammals, and habitat for fungi and insets. In addition, decay diseases cause some trees to die before trees of a similar age class leading to formation of canopy gaps and structural heterogeneity in stands.

Today, decay in standing lodgepole pine in the watershed is extremely rare. This is attributable to two factors. First, almost all the lodgepole pine is less than 120 years old. Amount of decay in living trees generally increases stand age. Second, fire has not been active on the landscape during the lives of trees. Mixed-severity and low-severity fires create basal scars (visible on stumps that are still present from the mining era) that serve as infection courts for fungi that cause decay diseases.

Mountain Pine Beetle. Because of the high elevation and limited growth potential associated with the dry climate, large, stand-replacing outbreaks of mountain pine beetle have historically been relatively rare over most of Box Creek Watershed. As Amman et al. (1977) state, the categories for the factors contributing to mountain pine beetle susceptibility are broadly defined. Continuous variables are divided into discrete classes, and local variation is to be expected. At this latitude (about 39° N), given stands with an average age >80 years and average diameter at 4.5 feet >8 inches, stands below about 9,500 feet are rated high risk (>50% mortality expected), stands from about 9,500-10,500 are at moderate risk (25-50% mortality) and stands above 10,500 are considered low risk. Lodgepole Flats is at approximately 10,000 feet. On the southern edge of the watershed, near housing developments, elevations range down to 9,500 feet and below. Aerial survey records of the last five years as well as ground observations show that mountain pine beetle has been actively killing lodgepole pine in this area, north and south of the housing development, in several patches of mortality on the north and south sides of the Mt. Elbert Forebay, and even farther north in some small patches in Lodgepole Flats itself. In the southern portions of the analysis area, where mountain pine beetle has been most active, some forests are composed of a scattered overstory of large, old ponderosa pine with an understory of lodgepole pine that have invaded during the past century. Mountain pine beetle has been killing the lodgepole pine.

Mistletoe. Mistletoe parasites have been in North America at least 25 million years (Hawksworth 1978). The co-evolution of host and parasite, under the influence of factors such as fire and plant community dynamics, has resulted in a highly specialized relationship. Most species of dwarf mistletoe are host specific, which means that only one or two tree species may be affected by any one species of dwarf mistletoe. Effects of these parasites include mortality of older trees, growth reduction, growth deformities, and an overall reduction in host vigor. Dwarf mistletoe also tends to increase fire predisposition, rate of spread, intensity, crowning, spotting and duration (Alexander and Hawksworth 1975). Thus, dwarf mistletoe that is unusually intense and continuous will lead to more intense and continuous fires. However, in most stands, and certainly in lodgepole pine in the Rocky Mountains, dwarf mistletoe becomes more intense (more trees infected and more infections per tree) over time as stands age (Hawksworth and Johnson 1989). Mistletoe seeds shoot just as high and far in a mature tree as they do in a juvenile tree, but trees grow in height more slowly as they age, so the mistletoe typically climbs higher in the trees over time. Currently, dwarf mistletoe infection is very severe and widespread As a whole, 16 % of the forested area was viewed as having no visible infections. 12% were viewed as having light infection (1/2 or less of the total number of branches infected). And, 72 % of the forested area having heavy infection (more than ½ of the branches or stems infected).

FIRE AND FUELS

The concept of Fire Regime Condition Classes was developed by the Forest Service (The National Fire Plan – Cohesive Strategy (GAO/RCED-99-65 2000)) to describe how different the current landscape is from the historic landscape, specifically in terms of potential fire behavior. The following describes characteristics associated with each Condition Class.

A Fire Regime Condition Class Analysis for the Box Creek project area was conducted using the Fire Regime Condition Class and Associated Data for Fire and Fuels Planning: Methods and Applications, (Hann, et al 2001). Current fire condition classes of the majority of the area are classes 3 and 2 (6339 and 3644 acres, respectively). More homes are now in the urban interface near FS and BLM lands than in the past.

Noxious Weeds

The term “weed” includes all plants defined as “noxious weeds” by Forest Service policy, which is “ . . . plants designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being non-native or new to or not common to the United States or parts thereof.” (FSM 2080.5)

Limited inventories have been conducted in the project area, so actual acres of noxious weed infestation have not been calculated. To date, Canada thistle is the only exotic or invasive plant (noxious weed) known to occur in the project area boundaries. A population of yellow toadflax is known to occur near the boundary of the project area at Twin lakes and is being treated annually with herbicides by the Chaffee County Weeds Department (Larry Walker pers. comm. 2002). Other species known to occur on FS land in the Upper Arkansas Valley include, oxeye daisy, dalmation toadflax, Houndstongue, and leafy spurge. The San Isabel National Forest is working cooperatively with BLM, state, and county agencies to eradicate, control, and prevent noxious weeds throughout the Upper Arkansas River Valley.

Botany

Habitat for many of the FS and BLM sensitive species is present within the project area, however most of the treatment areas do not contain suitable TES plant habitat. According to the 2001 Colorado Natural Heritage Program database, no TES plant species have been found within any proposed treatment units. Only plants that potentially occur in treatment areas are discussed further in this EA (Table 3.1). TES plants not listed in Table 3.1 are not expected to be effected by action alternatives and are not discussed further in this EA. Refer to the Box Creek Watershed Project Biological Evaluation in the project record for additional information and rationale for TES species.

Table 3.1. Sensitive Plant Species Further Discussed in the Environmental Assessment.

Common Name	Scientific Name	FS	BLM
Rocky Mountain Cinquefoil	*Potentilla rupincola*	✓	
Weber's monkey flower	*Mimulus gemmiparus*	✓	
Low northern sedge	*Carex concinna*		✓
Northern twayblade	*Listera borealis*		✓
✓ indicates agency designation as sensitive species			

There are approximately 8,970 acres of suitable forested vegetation types available for these species within the project area.

Rocky mountain cinquefoil

Populations of this Colorado endemic have been identified in Boulder, Clear Creek, Larimer, and Park counties. It prefers granitic outcrops or thin, gravelly soils with west or north exposure within ponderosa or limber pine communities at 6,900 to 10,500 ft. This cinquefoil blooms mid June to August (CNDIS 2002).

Weber monkey-flower

This member of the figwort family flowers in mid July. Its habitats are granitic seeps, slopes and alluvium in open sites within spruce-fir and aspen forests at elevations of 8,500 to 10,500 ft. It is endemic to Colorado (Grand, Jefferson, Larimer, and Park counties [CNDIS 2002]).

Low northern sedge

This member of the sedge family fruits in July. Its habitats are cool, moist forests with mosses, on rich peaty soil at elevations of 8,800 to 10,500 ft. Its distribution in Colorado includes Chaffee and Summit counties (CNDIS 2002).

Northern twayblade

This member of the orchid family flowers in mid July. Its habitats include moist, shady spruce forests at elevations of 8,700 to 10,800 ft. Its distribution in Colorado includes Chaffee and Lake counties (CNDIS 2002).

Air Quality

FEDERAL CLEAN AIR ACT

Congress passed the Clean Air Act in 1960 with major amendments to the Act in 1967, 1970, 1977, and 1990. In 1971 the United States Environmental Protection Agency (EPA) adopted National Ambient Air Quality Standards (NAAQS) under the authority of Section 109 of the Clean Air Act. These standards include acceptable levels of carbon monoxide, hydrocarbons, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Two different types of standards have been established. These standards include primary standards, which are levels of pollutants set to protect public health; and secondary standards, which are levels intended to protect public welfare. The standards are expressed in terms of different averaging times, e.g., annual, 24-hour, and 3-hour. The Clean Air Act requires the EPA to review public health standards every five years and update standards, if necessary, to protect public health, based on the latest, best available science.

The Clean Air Act also required the initiation of the Prevention of Significant Deterioration (PSD) program. The goals of this program are to; protect air quality in areas cleaner than that required by the NAAQS, protect air quality in certain National Parks and Wilderness Areas, and insure that economic growth in these areas is consistent with the preservation of the existing air resources. The PSD program established three air quality classes (I, II, III), each with defined allowable levels of air quality deterioration. The Class I increments allow for much less air quality deterioration than the Class II and Class III increments. The Clean Air Act designates certain national Parks and Wilderness areas as mandatory “Class I Federal Areas”. A class I designation imposes the most stringent restrictions and includes protecting visibility within these areas.

STATE REGULATIONS

The Clean Air Act gives individual states primary responsibility for implementing air quality programs. States carry out this responsibility through a State Implementation Plan (SIP), which is developed at the state level. How states achieve and maintain federal and state standards is described in the SIP. Each State is responsible for bringing non-attainment areas (those areas that do not currently meet NAAQS) into compliance. If an area is not in attainment of an NAAQS, then a SIP must be developed to attain the standard by a certain date by controlling the pollutant emissions from the responsible sources. States must also revise their SIPs to demonstrate attainment of new standards as they are developed.

The state of Colorado regulates air quality through a citizen board. The board is made up of nine commissioners advised by the Department of Health. The Commission was created by the Colorado Air Quality Control Act. The role of the Commission is to; 1) adopt an air quality program for the state, 2) assure the state’s program meets the requirements of the Federal Clean Air Act, and 3) issue or deny PSD permits and enforce orders (U.S. Forest Service, 1998).

US FOREST SERVICE AIR RESOURCE MANAGEMENT POLICY

It is Forest Service policy to integrate air resource management objectives into all resource planning and management activities. Air resource objectives for the agency includes

- Protecting air quality related values within Class I areas.
- Controlling and minimizing air pollutant impacts from land management activities
- Cooperating with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources.

All National Forest lands, except for Wildernesses established prior to August 7, 1977, are Class II air quality areas. The National Forest wilderness areas in the Project Area are Class II air quality areas. National Forest Service policy is to manage smoke from prescribed fires occurring in or adjacent to Class I Wilderness areas in a manner that causes the least impact to air quality related values (U.S. Forest Service, 1994). Regional Forest

Service policy states that since fire and the resultant smoke is part of the natural process, wilderness users may be provided the opportunity to experience this natural event (U.S. Forest Service, 1998).

The National Forests in the State of Colorado have signed a Smoke Management Memorandum of Understanding (MOU) with the Air Pollution Control Division and other federal and state land managers in Colorado. Under the current smoke management program, permits are issued by the Colorado Air Pollution Control Commission for prescribed burning projects on forest and rangeland. Signatories of the MOU are responsible for ensuring proper smoke management for any prescribed fires they conduct and obtaining a permit from the State before initiating prescribed burning (CAPCD, 2000).

Existing Air Quality

Seasonal Effects on Air Quality. The project area is located southwest of Leadville and the local air quality is affected by the urbanization of this adjacent area. Air quality in the Box Creek Watershed is currently very good. This may be due to relatively low emissions from stationary and mobile sources. The entire area is considered as attainment for all six criteria pollutants. Cold winters and moderate summers, light precipitation and much sunshine mark the climate of the Upper Arkansas Valley. At Leadville, about 80 percent of the annual precipitation occurs from April to October, most of it in scattered snow showers and thunderstorms that develop over the mountains and move into the valley during afternoon.

Particulate Matter and Public Health. Air pollutants called particulate matter include dust, dirt, soot, smoke and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires and natural windblown dust. Particulate matter is defined as tiny particles of solid or semi-solid material suspended in the air. Particles may range in size from less than 0.1 microns to 50 microns. Particles larger than 50 microns tend to settle out of the air quickly are not likely to affect public health. Particles 10 microns and smaller are considered inhalable and have the greatest health effects. Coarse particles, from 2.5 microns to 10 microns in diameter, come from many sources. In many cases windblown dust and dust kicked up on unpaved roads by vehicle traffic account for much of this fine particulate matter. These fine particles are major contributors to visibility problems because of their ability to scatter light.

Since July 1, 1987, EPA has used the indicator PM_{10}, which includes only those particles with aerodynamic diameter smaller than 10 micrometers. These smaller particles are likely responsible for most of the adverse health effects of particulate matter because of their ability to reach the thoracic or lower regions of the respiratory tract. Although we currently have a national standard for PM 2.5, Colorado currently has no non-attainment areas identified. As required by the Clean Air Act, in the next 2-3 years, EPA will complete the next periodic review of the PM air quality standards, including review by the Clean Air Scientific Committee. EPA will have completed its statutory determination before any designations of non attainment are made for the PM 2.5 standards and before imposition of any control strategies directed at PM 2.5.

Non-attainment Designation of the Watershed. Currently, there are no non-attainment areas in either Lake or Chaffee Counties. The nearest non-attainment areas are Aspen 22 air miles to the northwest and Lamar 210 air miles to the southeast. The closest Class I area is the Collegiate Peaks Wilderness to the west of the Box Creek Watershed Area.

The only commercial source producing more than 100 tons per year of PM_{10} was a bulk materials storage facility in Chaffee County producing 106 tons annually and in both counties, the greatest contributor to annual PM_{10} production is fugitive dust from unpaved roads (US EPA, 2001). Another important winter source for PM_{10} included wood burning emissions, 120 tons annually in Chaffee County but only 43 tons annually in Lake County.

Visibility is unique among air pollution effects in that it involves human perception and judgment. It has been described as the maximum distance that an object can be perceived against the background sky. The fabricated sources of these particulates include wood burning, electric power generation, industrial combustion of coal or oil, and emissions from cars, trucks, and buses. Visibility conditions vary considerably across the state. Usually,

visibility in Colorado is very good because of low humidity and minimal levels of visibility-degrading pollution. Nevertheless, visibility problems occur periodically through the state.

Wood burning haze is a concern in several mountain communities each winter. Denver and other major population centers in Colorado are concerned about the potential for worsening visibility. Monitoring performed in and near national parks, monuments, and wilderness areas shows pollution-related visibility impairment occurring in these areas in Colorado. The type of impairment most often affecting Colorado's important scenic mountain views is known as regional haze. It is characterized by having many sources and interstate or even regional scale transport between source areas and areas of impact.

Fuel loadings and Characteristics. Fuel materials typically include downed trees, fallen branches, decayed matter on the forest floor (duff), and small trees and shrubs. Tree crowns (i.e., branch wood and foliage) can also be burned in wildfires and prescribed fires. The fuel consumption in a fire will depend not only on the total pre-burn fuel loading, but also on the relative amounts of the different fuel types, and on the fuel condition. In prescribed fire, fuel loading and characteristics will be strongly affected by the type of burn (e.g., pile fire, windrows, understory burning, and concentration burning) and by preburn harvesting. Therefore, inventories should differentiate among different types of burn.

Recreation

The Project Area provides regional and local recreation opportunities for communities along the Front Range, Interstate-70 Corridor, and the Upper Arkansas River Valley. Important recreation resources in the Project Area include Mt. Elbert (the highest mountain in Colorado), the Colorado Trail, the Continental Divide National Scenic Trail (CDNST), the Lodgepole Flats area, and the Mt. Elbert Forebay area. Because of these resources and others, along with the area's proximity to moderately large population centers, the Project Area is frequently used for recreation especially during the summer season.

The Forest Plan has assigned Recreational Opportunity Spectrum (ROS) settings to all MAs. The ROS is a system developed by the Forest Service that classifies recreation settings on National Forest lands according to their physical, social, and managerial characteristics. These ROS settings are formally applied only to National Forest land and not adjacent private lands. However, the presence and condition of private lands influence the ROS settings assigned to National Forest lands. The ROS classes assigned to National Forest lands in the Project Area are: Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, and Rural. A description of these ROS setting from least developed, to most, is found below:

- **Primitive (P)** – A natural environment of large size. Interaction between users is very low and evidence of other users is minimal. Motorized use in the area is not permitted.
- **Semi-Primitive Non-Motorized (SPNM)** – a natural, or natural appearing, environment of moderate to large size. The concentration of users is low, but there is often evidence of other users. No roads are present.
- **Semi-Primitive Motorized (SPM)** – A natural, or natural appearing, environment of moderate to large size. Interaction between users in this setting is low, but there is often evidence of other users. Local roads used for other resource management activities may be present.
- **Roaded Natural (RN)** – A natural, or natural appearing, environment of moderate size with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed.

- **Rural (R)** – An area characterized by a substantially modified natural environment. The sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities for intensified motorized use and parking are available.

The Semi-Primitive Non-Motorized ROS setting is the most prevalent in the Project Area with approximately 4,758 acres. These areas are mostly located along the Colorado, or Main Range trail and CDNST corridor and areas to the west of this trail up to the summit of Mt. Elbert.

Roaded Natural is the second most common ROS setting with approximately 3,815 acres. There are large areas of RN in the area around Mt. Elbert Forebay and Lodgepole Flats where Forest Roads are plentiful. Approximately 1,476 acres of the Semi-Primitive Motorized ROS setting are also located in the Lodgepole Flats area north of Box Creek and west of Forest Development Roads (FDR) 130 and 160.

Recreation Resources in the Project Area

The bulk of the recreational use in the Project Area occurs along the Colorado Trail and Continental Divide National Scenic Trail corridor as many visitors hike this section of trail to gain access to the two main routes leading to the summit of Mt. Elbert, the highest mountain in Colorado. There is also considerable recreation use in the Lodgepole Flats and Mt. Elbert Forebay area. These areas contain a wide variety of resources and support an array of activities. The following describes the primary recreation resource areas in the Project Area.

Lodgepole Flats. The area locally known as Lodgepole Flats is comprised of the area to the east and west of Mt. Elbert Conduit or Pipeline Road, also known as FDR 130N and 130S. Most people view Lodgepole Flats a designated area for fuel wood and post-and-pole permits. It is also popular for a variety of recreational activities including walking, running, mountain biking, skiing, hunting, dispersed camping, target shooting, four-wheeling, and snowmobiling. Three commercial outfitters are permitted by the FS to operate specifically in the Lodgepole Flats area. The permitted activities include hiking, backpacking, and mountain biking. The number of service days allocated to commercial outfitters in the Lodgepole Flats area equals 254 person days per year. The Leadville Trail 100 Bike Race, a permitted recreation event, also takes place in the Lodgepole Flats area and is allocated 700 service days for the one-day summer event.

Big game hunting is also very popular in the Lodgepole Flats area mainly because it provides access to timbered areas further west up the Box Creek drainage whose ROS setting is Semi-Primitive Non-Motorized. Lodgepole Flats is in Game Management Unit (GMU) 48, which extends from Tennessee Pass to the north and Clear Creek Road to the south with the Continental Divide and Highway 24 serving as the west and east boundaries respectively. In 2001, approximately 900 hunters with deer and elk tags in GMU 48 contributed to over 4,000 total recreation days as reported by the Colorado Division of Wildlife (CDOW). Many of these hunters can be found in the Lodgepole Flats area – about 20 dispersed campsites are located in the Lodgepole Flats area.

Mt. Elbert Forebay. Mt. Elbert Forebay is a reservoir built as part of the Bureau of Reclamation's Fryingpan-Arkansas Project that supplies water to southeastern Colorado. Managed by the Bureau of Reclamation, it has 279 surface acres and 3 miles of shoreline popular for water-based activities such as fishing and boating. The National Forest System lands surrounding this area are also very popular for a variety of recreational activities, especially dispersed camping, and motorized recreation. As with Lodgepole Flats, there are many miles of user-created, nonclassified roads in the Forebay area, contributing to the approximately 70 fire rings and associated dispersed camping sites counted in the area in 1998. There are five commercial outfitters who are permitted by the FS to operate specifically in the Mt. Elbert Forebay area, also known as the "Lily Ponds" recreational carrying capacity compartment. The permitted activities include hiking, backpacking, winter skiing and mountaineering, mountain biking, horseback riding, and fishing. The number of service days allocated to commercial outfitters in the Lily Ponds Compartment equals 387 days per year. Portions of the Leadville Trail 100 Run and Training Runs pass through this area adding about 700 service days over a 2 to3 day period in the summer. The Mt. Elbert Forebay area is also included in GMU 48, which makes it a popular base for big game hunting because of the presence of roads, dispersed camping sites and reasonable access to the Corske Creek drainage.

Mt. Elbert, the Colorado Trail, and Continental Divide National Scenic Trail. The approximately 500-mile long Colorado Trail (CT) and 3,100-mile long Continental Divide National Scenic Trail (CDNST) passes for about 5 miles, from north to south, through the western part of the project area. This shared trail is one of the best-known trail systems in the nation. Additionally, the two main routes leading to the Mt. Elbert summit branch off this portion of trail. Fourteen commercial outfitters are permitted by the FS to operate specifically in the North Elbert and South Elbert recreational carrying capacity compartments. The permitted activities include hiking, backpacking, rock climbing, winter mountaineering, and backcountry skiing. The number of service days allocated to commercial outfitters in North and South Elbert Compartments equals 695 days per year. Portions of the Leadville Trail 100 Run and Training Runs pass through this area adding about 700 service days over a 2 to3 day period in the summer. Based on trailhead register data for 2001, there were approximately 2,034 people who hiked on the Colorado Trail starting at the North Elbert Trailhead in the Halfmoon Creek drainage. From the South Elbert Trailhead in 2001, there were approximately 4,086 people who registered there carrying out activities such as hiking, backpacking, skiing, mountaineering, and snowshoeing. Since many people choose not to register at FS trailheads, the numbers presented here not actual, and probably under represent current use levels. The Mt. Elbert area is also included in GMU 48, which in 2001 received approximately 900 deer and elk hunters contributing over 4,000 total recreation days as reported by the CDOW. Several drainages including the Box Creek drainage, west of the CT and CDNST, are popular areas for big game hunting, especially for hunters preferring a semi-primitive non-motorized recreation experience.

Visual Resource

The project area is visible mainly as a background landscape from Highway 24 on east and southeast facing slopes. The project area is partially visible from the Pan-Ark subdivision and to a lesser degree from Twin Lakes.

The project area is partially visible in the middle ground from the Mount Elbert and Colorado Trails. "Shore Pretty Drive" goes north and south along the eastern boundary of the project area. This is a road used primarily by local citizens and hunters in the fall. Other roads in the area are four wheel drive roads with limited use. Mountain biking is a popular activity in the area.

Transportation

Currently, there are 55.6 miles of roads on federal lands in the Box Creek Watershed. Fifty-two percent of these roads have been created by users and, therefore, are not included in the federal transportation system.

The transportation system has been built to FS specifications and is maintained as such. User-created roads often do not meet these specifications, and lack water diversion and erosion control structures, exceeding maximum grade percentages, and generally compromising resource values. All roads in the project area were analyzed via the roads analysis process (Box Creek Watershed Roads Analysis, 2003, Appendix C), and the interdisciplinary team of specialists made recommendations based on the roads analysis findings. All roads within the planning area were assessed as to their potential uses and effects on resources, including erosion hazards, influences on big game and other wildlife species, as well as threatened and endangered species of wildlife. Road densities were then examined and compared to Forest Plan standards, while still maintaining viable travel options for the recreating public.

The existing transportation system (including non-system roads) has several problems, such as parallel or duplicate roads and excessive road densities, as well as gullying, rutting, and accelerated erosion resulting from improper drainage problems.

Current road closure techniques have been very effective through the use of gates and barriers over the past decade.

Wildlife

The project area (Box Creek watershed) is also used as the analysis area for wildlife species unless stated otherwise.

There are ten major vegetation types in the project area as determined by LANDSAT thematic mapping and ground verified (described in Chapter 2). These habitat types were converted from LANDSAT types to the types used in a habitat capability model (HABCAP) model (Table 3.2). Discussion of the existing condition of these habitat types and their habitat structural stages can be found below.

Table 3.2. Current acres of vegetation by type and structural stage for National Forest lands in the Box Creek Watershed (Data from thematic LANDSAT mapping data and converted to HABCAP habitat types).

VEGETATION TYPE	STRUCTURAL STAGE[1] (ACRES)									Subtotal
	1	2	3A	3B	3C	4A	4B	4C	5	
Aspen	0	0	251	122	773	0	0	0	0	**1,146**
Cottonwood riparian	0	0	0	0	0	0	0	0	0	**0**
Douglas-fir	0	0	0	0	0	0	0	0	0	**0**
Gambel oak	0	0	0	0	0	0	0	0	0	**0**
High Elev. riparian	0	0	0	0	0	0	0	0	0	**0**
Lodgepole pine	0	275	1,165	1,822	413	102	13	37	0	**3,827**
Mountain grassland	0	0	0	0	0	0	0	0	0	**0**
Mountain shrub	0	0	0	0	0	0	0	0	0	**0**
Piñon juniper	0	0	0	0	0	0	0	0	0	**0**
Ponderosa pine	0	0	0	391	0	354	370	0	0	**1,115**
Sagebrush	989	0	0	0	0	0	0	0	0	**989**
Spruce-fir	0	0	0	0	815	0	0	216	393	**1,424**
Wet meadow	0	0	0	0	0	0	0	0	0	**0**
Subtotal	**989**	**275**	**1,416**	**2,335**	**2,001**	**456**	**383**	**253**	**393**	**8,501**

[1] Structural stage values are defined in the glossary.

Management Indicator Species

Table 3.3 below lists the MIS for the Pike and San Isabel (PSI) National Forests and those selected for this project. Direction for the selection of MIS comes from Forest Service Manual 2621.1:

> *Select management indicators for a forest plan or project that best represent the issues, concerns, and opportunities to support recovery of federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses.*

Based on this direction, species were selected that best represent the major cover (habitat) types affected by this project. These species are addressed in this section of the EA. Other wildlife species are discussed in the Biological Assessment (federally listed) and Biological Evaluation (sensitive) located in the project record.

Table 3.3. MIS of the PSI and rationale for selection/non-selection for the Box Creek Watershed Project. Habitat information from Forest Service (2001)

MIS SPECIES	PROJ MIS[1]	RATIONALE
Abert's squirrel *Sciurus aberti*	No	Unlikely this species would use project area. CNDIS and other distribution mapping sources do not include project area in species range.
Beaver *Castor canadensis*	No	Species' habitats (aquatic and riparian) not affected by Proposed Alternatives.
Bighorn sheep *Ovis canadensis*	No	It is unlikely that this species would use the project area. CDOW habitat mapping does not include the project area in species range.
Black-throated gray warbler *Dendroica nigrescens*	No	Species' habitats (pinyon-juniper forests with brush understory, Gambel oak, and cottonwood riparian do not occur in the project area.
Brook trout *Salvelinus fontinalis*	No	Species' habitats (aquatic) not affected by Proposed Alternatives.
Elk *Cervus elaphus nelsoni*	**Yes**	Species' habitats are affected by proposed alternatives and species specific FP S+Gs[2] applicable.
Greenback cutthroat trout *Onchorhynchus clarki*	No	Species not present and habitat not suitable for reintroduction in project area.
Green-tailed towhee *Pipilo chlorurus*	No	Species' habitats (shrubby hillsides dominated by Gambel oak at an average 7,300 ft elevation) do not occur in the project area.
Lewis' woodpecker *Melanerpes lewis*	No	Species is known to occur in the Wet Mountains in Custer and Pueblo counties. This distribution is outside of the project area.
Mallard *Anas platyrhynchos*	No	Species' habitats (aquatic and riparian) not affected by Proposed Alternatives.
Mountain bluebird *Sialia currucoides*	**Yes**	Secondary cavity nester occupying open woodland or edge habitat, usually above 7,000 ft.
Mule deer *Odocoileus hemionus*	**Yes**	Species' habitats are affected by Proposed Alternatives and species specific FP S+Gs[2] applicable.
American three-toed woodpecker *Picoides dorsalis*	**Yes**	Species requires old-growth/late seral forests of spruce-fir, lodgepole, possibly ponderosa. Large snags required for feeding and breeding.
Peregrine falcon *Falco peregrinus*	No	This species relies completely on cliff habitat for nest sites. Cliff habitat is not present in the project area.
American marten *Martes americana*	**Yes**	Species inhabits old-growth or mixed-aged spruce-fir/lodgepole, lodgepole, alpine. These habitats are affected by Proposed Alternatives.
Red-naped sapsucker *Sphyrapicus nuchalis*	**Yes**	Species is primarily associated with mature and advanced seral stages of aspen. Aspen infected with heart rot are selected for nesting.
Turkey *Meleagris gallopavo*	No	It is unlikely that this species would use the project area. CDOW habitat mapping does not include project area in species overall range.
Virginia's warbler *Vermivora virginiae*	No	Species' habitats (dense shrub lands, pinyon-juniper woodlands and open ponderosa pine savannahs with dense understory of tall shrubs) do not occur in project area.
Water pipit *Anthus spinoletta*	No	Species' habitats (alpine tundra) not affected by Proposed Alternatives.
Wilson's warbler *Wilsonia pusilla*	No	Species' habitats (willow and alder thickets of stream banks, lake shores and wet meadows) are not affected by Proposed Alternatives.

[1] Selected as MIS for this project. [2] Forest Plan Standards and Guidelines.

The following briefly describes the current condition of selected MIS for this proposed action on the PSI (from Forest Service 2001).

Mountain bluebird

Mountain bluebirds are secondary cavity nesters that occupy open woodland or edge habitat. This species is usually found above 7,000 ft during the breeding season in Colorado, and nest in natural cavities, old woodpecker holes in dead/dying trees with diameters 10 to 29 inch diameter at breast height (DBH), or nest boxes (FEIS 2001). Nest site availability is a limiting factor in mountain bluebird productivity. They prefer perches on dead branches near open areas with sparse ground cover, feed on insects on the ground, and are closely correlated with early post-fire conditions (FEIS 2001, Hutto 1995).

Population Trend: Population trend was estimated from the North American Breeding Bird Survey (NABBS, Sauer et al. 2003). Estimates generated from data collected 1966 to 2002 in the Southern Rockies Ecosystem and the State of Colorado indicates a decreasing, but non-significant trend (*ibid*). The state trend 95% Confidence Interval (CI) for the same period is -3.2 to 2.3 (*ibid*).

Habitat Trend: The open woodland vegetation type is decreasing forest-wide due to succession. Low levels of vegetation treatment activities and fire control efforts have permitted mature vegetation to become widespread on the Forest (Forest Service 1984). Mature forest vegetation is more influenced by wildfire and insects than the timber-related activities (Thinnes 2001). Fire suppression has reduced the fire-return interval in the lower montane forest and the small tree component of forested stands is denser today. The Box Creek watershed represents ~14% and 2% of the potential breeding habitat on the Leadville Ranger District (district) and San Isabel National Forest (SINF) respectively (Table 3.4). Action alternatives would increase suitable bluebird habitat within the Box Creek watershed by creating small openings and thinning stands. Action alternatives should maintain or enhance the current local mountain bluebird population.

Red-naped sapsucker

Red-naped sapsuckers are primary cavity nesters associated with mature and advanced seral stages of aspen (*Populus tremuloides*). The species favors live aspen with rotten heartwood as a nesting tree (Winkler et al. 1995).

Population Trend: Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) data do not specifically address red-naped sapsuckers. Data on a group of three sapsucker species indicate sapsucker trends from 1966 to 2002 are increasing (but not significantly) in Colorado and in the Southern Rockies Ecosystem (Sauer et al. 2003). The state trend 95% Confidence Interval (CI) for the same period is -3.2 to 9.1 (*ibid*).

Habitat Trend: The structure of aspen stands on the Forest as dominated by pole-sized trees with approximately 25% of the aspen stands in a mature or old-growth seral stage (Forest Service 1984). A decline in aspen is projected to continue over time due to conifer encroachment and lack of disturbance to regenerate existing aspen clones. Aspen represents less than 10% of the major forest habitat types yet is ranked as the second most important habitat type supporting wildlife. No habitat was classified as potential breeding habitat in the Box Creek oshed (Table 3.4) due to a lack of mature aspen stands. Action alternatives would promote advanced seral stages of aspen by thinning some pole-sapling stands. In the long term the Box Creek watershed should contribute to red-naped sapsucker habitat in the area.

American three-toed woodpecker

In Colorado, three-toed woodpeckers prefer spruce-fir, lodgepole and ponderosa pine forests in mature to late structural stages (Forest Service 1981). In Wyoming forests, this woodpecker was found only in large, unbroken stands of mature spruce-fire and lodgepole pine (BISON 2000). Fire killed conifers are sought for cavity nesting and beetle foraging.

Population Trend: North American Breeding Bird Surveys (Sauer et al. 2003). Results are sparse for Colorado (n=7 from 1966 to 2002) and a non-significant declining trend is reported. Similar results are reported for the Southern Rockies (n=9) along with a declining trend. The state trend 95% Confidence Interval (CI) for 1966 to 2002 is -70.1 to 39.6 (*ibid*).

Habitat Trend: Age classes and structure stages of these forested types are poorly distributed on the PSI. Low levels of vegetation treatment activities and fire control efforts have permitted mature vegetation to become widespread on the PSI (Forest Service 1984). The Box Creek watershed represents ~7% and <1% of the potential breeding habitat on the district and SINF respectively (Table 3.4). Action alternatives would slightly reduce habitat in the short-term, but would facilitate development of mature spruce-fir and lodgepole pine long-term by thinning dense, suppressed stands. The short term reduction of habitat would not be expected to be detected in three-toed woodpecker populations at the district or forest scale.

Mule deer

Mule deer are most likely to be found in open forested regions or on the plains and prairies (Snyder 1991). They prefer rocky or broken terrain at elevations near or at the subalpine zone in the mountainous regions of the west (Carpenter et al. 1981). They are also found in alpine, montane, and foothill zones. Mule deer seek shelter at lower elevations when snows become deep. In open prairie regions mule deer tend to concentrate in river breaks and brushy stream bottoms (Mackie et al. 1987). Open road densities greater than one mile per square mile of habitat are considered a limiting factor (Hoover and Willis 1984).

The Box Creek Watershed is entirely within the Cottonwood Creek Deer Area identified by CDOW. The Cottonwood Creek deer herd includes game management units (GMU) 48, 481, 56 and 561. There is some seasonal interchange of deer into and out of the units but the segments of the population that winter in the herd area are rather consistent. Like the mule deer population through out the west, this herd declined significantly in the early 1990s and is now showing some recovery. For the last three years the population trend has been upward. Current estimates place this population at approximately 6,300 animals with a long-term goal of 10,700. GMU 48 provides a much smaller percentage of the total deer population than it does of the elk population (J. Vayhinger, pers. comm., CDOW 2004).

Telemetry data from the Cripple Creek deer survival study has shown some movement by collared does and fawns from winter ranges north and northeast of Buena Vista, Colorado, into and through GMU 48 for spring, summer, and fall use. No radio-collared deer were located within the project area, but likely traveled through the area on their way to sites where they were subsequently located. A significant increase in deer in the project area during the spring-fall period probably occurs, as they tend to winter to the south and east of GMU 48 (J. Vayhinger, pers. comm., CDOW 2004).

For the last three years deer hunting for this herd has been for bucks only and hunter numbers have been limited through the application and drawing process. Hunter numbers were set at 66% of the historic (1996 through 1998) level and will remain at that level for the near future. Buck/doe ratios have improved as a result of this limitation as the population has also been slowly increasing (J. Vayhinger, pers. comm., CDOW2002).

Population Trend: Global and Colorado mule deer populations are known to be increasing (COVERS 2001). There was a population decline at the turn of the century, but mule deer now has an unprecedented distribution (Mackie et al. 1987). If hunting numbers are any indication of population trend, harvests have been increasing since 1975 (Fitzgerald et al. 1994). Colorado deer populations increased between 1975 and 1983, then stabilized after 1983 (population data from CDOW 1997).

Habitat Trend: Summer range for mule deer covers the entire project area. Winter range includes 8,500 acres (45%) of the project area and 3,600 acres (42%) of National Forest lands (CDOW 2002). The Box Creek watershed represents ~19% and 2% of the mule deer winter range on the district and SINF respectively (Table 3.4). Action alternatives would be expected to improve forage quantity and quality within treatment areas while maintaining adequate cover that occurs on the winter range. Fawning areas are unmapped, but occur in the general location of elk calving areas (T. Martin pers. comm., CDOW 2002).

Habitat Trend (mule deer and elk): The structure, composition, and landscape pattern of vegetation in many areas used by mule deer and elk in the PSI, particularly the lower montane zone, has been substantially altered from its pre-European conditions by cumulative human impacts. Before logging, grazing, and fire suppression, ponderosa pine stands along the Colorado Front Range were less dense, more open, and less vulnerable to diseases, insects, and large intense wildfires (Foster Wheeler 1999).

Scientists (Kaufmann et al. in prep., Huckaby et al. 2000, Kaufmann et al. 2000, Brown et al. 1999) have been studying historical landscape conditions on Denver Water's Cheesman Lake property with the Pike National Forest for the past six years. They showed that historically, the forests in the Cheesman Lake area were less dense, more open, and less vulnerable to large-scale fires than the surrounding forested landscape. As a result, the forest in this area now favors a crown fire regime, with a high risk of catastrophic stand-replacing fire.

Kaufmann and others (in prep.) describe four basic stand conditions in the area: 1) openings vegetated primarily with grasses and shrubs; 2) patches that are pure or nearly pure ponderosa pine; 3) patches having both ponderosa pine and Douglas-fir; and 4) patches of very old trees, persistent old-growth. Historically 15% of landscape had persistent old-growth patches, pure ponderosa pine patches probably accounted for 35 to 50% of the landscape, primarily on east, south, and west slopes. Ponderosa pine/Douglas-fir patches on north slopes and portions may have accounted for 20 to 30% of the landscape, and at least 25% of the landscape was open, with no more than 10% tree crown closure. Undoubtedly these proportions varied over time, especially when fires created openings, reduced tree densities, or killed young Douglas-fir trees invading patches (Kaufmann et al. in prep.).

These patch proportions shifted dramatically because of the effects of logging, grazing, fire suppression, and transplanting, all of which are likely to increase tree density within these stands. Logging decreased the amount of old-growth. Grazing probably reduced understory competition and establishment of new seedlings, and the lack of fire allowed seedlings to survive. The result was a sharp increase in tree density, expansion of the area having a significant Douglas-fir component, and the loss of openings that temporarily increased during intense logging during the late 1800's (Kaufmann et al. in prep.).

Elk

Elk tend to inhabit coniferous forests associated with rugged, broken terrain or foothill ranges. During summer elk spend most of their time in high mountain meadows in the alpine or subalpine zones or in streambottoms (Adams 1982). Elk may use more open areas during spring and summer because of earlier spring green-up (Edge et al. 1987). During hot summer months, elk seek shaded, cool habitats (Leege 1984). Use of forage areas depends on proximity to cover. Use is typically concentrated to within 200 to 600 ft of cover edge. Either cover or forage may be limiting to elk, particularly on winter ranges or calving habitats (Roderick and Milner 1991). A more recent study by Cook et al. (1998) illustrated that "it remains uncertain that thermal cover significantly influences the nutritional condition, survival, or productivity of wild ungulates". Cook et al. (ibid) found no significant, positive effect of thermal cover on elk condition, and in fact found that "dense cover provided a costly energetic environment, resulting in significantly greater overwinter mass loss, fat catabolism and (in 1 winter) mortality". Open road densities greater than 1.5 miles per square mile of habitat on summer range or one mile per square mile of habitat on winter range are also considered a limiting factor (Rodrick and Milner 1991).

The Box Creek Watershed Project is entirely within the Collegiate Elk Area as identified by CDOW. The Collegiate elk herd includes the same GMU 48 and uses the same boundaries as the Cottonwood Creek deer herd (see mule deer section above). There is some movement in and out of this area by elk, primarily yearling bulls exploring new territories, and wintering cow/calf groups temporarily crossing the east boundary. Generally,

however, this is a fairly autonomous group of elk. The current population estimate for this herd is 2,450 animals, of which approximately 600 remain in GMU 48 year-round in average to mild winters. In severe winters some of those animals move on south out of the unit. The summer population increases with wintering elk returning from winter ranges to the south of the unit and annual calf production (J. Vayhinger, pers. comm., CDOW 2004).

The long-term objective for this herd has been 2,200 animals for several years with the population fairly stable at the 2,100 to 2,450 level (J. Vayhinger, pers. comm., CDOW 2004). CDOW harvest objectives hope to return the population to approximately 2,200 in the near future. The CDOW manages this unit as a "quality unit" with limited licenses for both bull and cow hunters to reduce hunter crowding and improve bull/cow ratios to a minimum of 35/100 (J. Vayhinger, pers. comm., CDOW 2004).

Population Trend: Global and Colorado elk populations are known to be increasing (COVERS 2001). Elk are widespread throughout the northern United States and southern Canada. They are intensively managed and there are good data on population size and trends (Fitzgerald et al. 1994, Zeveloff 1988, Peek 1982). Elk are expanding their range due to reintroductions, management, and habitat conversion (COVERS 2001). Elk populations have increased in Colorado since 1975 (population data from CDOW 1997).

Habitat Trend: Summer range for elk covers the entire project area. Winter range and calving areas include approximately 11,800 acres (63% and 4,200 acres (22%) of the project area, respectively (CDOW 2002). Winter range includes approximately 4,275 acres (50%) of National Forest lands. The Box Creek watershed represents ~20% and 2% of the elk winter range on the district and SINF respectively (Table 3.4). Action alternatives would be expected to improve forage quantity and quality within treatment areas while maintaining adequate cover that occurs on the winter range. See mule deer habitat trend in section above for additional trend information.

American marten

The American marten is a furbearer and was historically trapped in Colorado (Fitzgerald 1999). Marten trapping ceased in 1995 when CDOW closed the season and a ballot initiative (amendment 14) in November 1996 closed the state to take of all furbearers by snares. In Colorado, martens occur at elevations between 7,874 and 13,124 ft. Principal winter habitat consists of spruce-fir and lodgepole pine forests with moderate to high density canopy closures (see Biological Evaluation for more information).

Population Trend: CDOW no longer collects harvest numbers for the species due to the state-wide closure to furbearer trapping (1996). The 2000 Marten Status Questionnaire (Zielinski, analysis in prep.) indicated an estimated increase in population trend from 1995 to 2000. This estimated trend is based on professional judgment, local knowledge and the assumption that the lack of trapping pressure is having a positive effect on population numbers. Byrne (1998) conducted a statewide winter track survey in the higher elevations of Colorado and found marten to be widely distributed across the state in suitable habitat and the fifth most common mammal behind red squirrels (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), weasel (*Mustela frenata spp.*), vole (*Clethrionomys gapperi spp.*), and coyotes (*Canis latrans*).

Marten population levels in Colorado are currently estimated as stable to increasing (Byrne1998). Contributing factors to this positive trend include stable condition of mature spruce-fir forest due to the long fire disturbance interval. A change in population trend could occur if there were large losses of mature habitat acreage due to wildfire, harvest, wind event, and/or insect epidemic.

Habitat Trend: Age classes and structure stages of these forested types are poorly distributed on the PSI. Low levels of vegetation treatment activities and fire control efforts have permitted mature vegetation to become widespread on the PSI (Forest Service 1984). Stand replacement fire in spruce-fir habitat and spruce-beetle outbreaks following landscape scale wind events probably occurred during pre-settlement historical range of variation (HRV) and are believed to produce both positive and negative impacts to marten habitat in Colorado. Fire and beetle killed trees are expected to produce structural components needed for denning and subnivean rodent habitat. A Mixed fire regime is expected to produce the best habitat in the long-term because of the snag component and mature tree patches mixed with younger trees. The Box Creek watershed represents ~3% and

<1% of the potential marten habitat on the district and SINF respectively (Table 3.4). Action alternatives would maintain or improve long-term marten habitat increasing recruitment of mature lodgepole pine, spruce-fir and Douglas-fir stands by mechanical and prescribed fire thinning. Action alternatives should maintain or enhance the current local marten population.

Table 3.4. Potential MIS habitat at the project area, district and San Isabel NF scales.

MIS Species	Habitat Type and Structural Stage[1]	Acres of Potential Habitat		
		Box Creek Watershed (All Ownership)	Leadville RD (NF Lands)	San Isabel NF (NF Lands)
Marten	SF, LP, DF 4A, 4B, 4C, 5	780	22,400	149,600
Three-Toed Woodpecker	SF, LP, PP, DF 4B, 4C, 5	1,257	19,100	153,700
Red Naped Sapsucker	AS 4A, 4B, 4C, 5	0	700	11,800
Mountain Bluebird	LP, DF, PP, AS, PJ 4A	513	3,700	24,300
		Winter Range[2]		
Elk		11,800	58,100	488,600
Mule Deer		8,500	44,000	447,200

[1]SF=Spruce/Fir, LP=Lodgepole Pine, DF=Douglas-fir, PP=Ponderosa Pine, AS=Aspen, PJ=Pinyon-Juniper. 4 and 5 represent "mature" and "old tree" size classes respectively, while A, B, and C represent open, moderate and closed canopy cover respectively. Additional structural stage information is located in the glossary. The Project record contains additional information on how potential MIS habitat was derived.

[2]Deer and Elk winter range obtained from CDOW GIS coverages and clipped to the FS ownership.

Threatened, Endangered, and Sensitive Species

Table 3-5 Summary of determinations made for FS and BLM sensitive species in the Box Creek Watershed Project Biological Evaluation

Forested Plants	
Rocky Mountain Cinquefoil	… may impact individuals (Rocky mountain cinquefoil), but is not likely to cause a trend to federal listing or a loss of viability.
Weber's monkey flower	… may impact individuals (Weber's monkey flower), but is not likely to cause a trend to federal listing or a loss of viability.
Low northern sedge	… may impact individuals (low northern sedge), but is not likely to cause a trend to federal listing or a loss of viability.
Northern twayblade	… may impact individuals (northern twayblade), but is not likely to cause a trend to federal listing or a loss of viability.
Amphibians and Reptiles	
Boreal toad	…will have no impact on the boreal toad.
Amphibians and Reptiles Continued	
Tiger salamander	…may impact individuals (tiger salamanders), but is not likely to cause a trend to federal listing or a loss of viability.
Birds	

Boreal owl	…may impact individuals (boreal owl), but is not likely to cause a trend to federal listing or a loss of viability.
Flammulated owl	…may impact individuals (flammulated owl), but is not likely to cause a trend to federal listing or a loss of viability.
Golden-crowned kinglet	…may impact individuals (golden-crowned kinglet), but is not likely to cause a trend to federal listing or a loss of viability.
Northern goshawk	…may impact individuals (northern goshawk), but is not likely to cause a trend to federal listing or a loss of viability.
Olive-sided flycatcher	…may impact individuals (olive-sided flycatcher), but is not likely to cause a trend to federal listing or a loss of viability.
Peregrine falcon	…may impact individuals (peregrine falcon), but is not likely to cause a trend to federal listing or a loss of viability.
Pygmy nuthatch	…may impact individuals (pygmy nuthatch), but is not likely to cause a trend to federal listing or a loss of viability.
Three-toed woodpecker	…may impact individuals (three-toed woodpecker), but is not likely to cause a trend to federal listing or a loss of viability.
Mammals	
American marten	…may impact individuals (American marten), but is not likely to cause a trend to federal listing or a loss of viability.
Dwarf shrew	…may impact individuals (wolverine), but is not likely to cause a trend to federal listing or a loss of viability.
North American wolverine	…may impact individuals (dwarf shrew), but is not likely to cause a trend to federal listing or a loss of viability.
Townsend's big-eared bat	…may impact individuals (Townsend's big-eared bat), but is not likely to cause a trend to federal listing or a loss of viability.

Boreal toad. Although suitable breeding habitat exists in the project area, surveys conducted by the CDOW indicate there are no known toads in the Box Creek Watershed. Suitable breeding habitat is in untreated areas and will not be affected by project activities and suitable non-breeding habitat will continue to be present following project activities. Should toads repopulate the area (naturally or by re-introduction), suitable habitat will continue to be present. All project activities include practices that retain coarse woody debris (CWD; downed logs). We are actually increasing the amount of CWD that will benefit the species. Because boreal toads over-winter in burrows excavated by small mammals and slash piles, the Proposed Project may have a beneficial effect on toads by increasing small mammal habitat (downed logs and slash piles) and increasing burrowing habitat used for over-wintering. Because this species is not known to be present in the area, it is our determination that the Proposed Project will have no effect on boreal toad.

Bald eagle. Bald eagles use the Arkansas River (including the eastern edge of the project area) during winter months. No evidence of nesting bald eagles has been observed in the project area. The possible nesting activity recently observed on the Leadville Ranger District suggests that bald eagles may breed in suitable habitats in Lake County. In the project area, the Arkansas River is contained in a wide valley, without cliff or forested habitats containing large trees that could be potential nest sites adjacent to the river. Therefore, suitable nesting habitats are not present in the project area. The Proposed Action does not include any treatments in riparian habitats, including the riparian habitats along the Arkansas River where bald eagles have been observed during winter months. However, it is possible that trees used by eagles for roosting may exist in the treatment areas. If the Proposed Action removed one of these trees, eagles would likely find another suitable tree for roosting. In addition, it is possible that areas thinned will no longer provide thermal protection, or protection from severe weather conditions. However, it is unlikely that treatment areas provide winter roost sites. This effect would be

small and of short duration. Therefore, it is our determination that the Proposed Project may affect, but is not likely to adversely affect, the bald eagle.

Canada Lynx. Proposed Project road reclamation will result in no net increase in groomed or designated over-the-snow routes and play areas and open motorized routes will be reduced below the 2 miles per square mile density suggested-in the Lynx Conservation Assessment Strategy (LCAS) used for prioritization of seasonal closures or restrictions. Because this action does not convert currently non-system roads into federal system roads, and there will be an overall reduction in open motorized route miles in potential lynx habitat by 68% (summer) and 85% (winter), there will be a beneficial effect to this species.

Proposed project mechanical and fire treatments may have short-term, small, negative effects from noise disturbance as discussed above. Proposed activities will treat some denning and foraging habitat and may make some of this habitat ineffective. These activities would represent treatment of less than 1% of lynx denning and foraging habitat currently available in the Tennessee Pass LAU. Further, the Proposed Action project design will maintain most existing lynx denning and foraging habitat while creating additional future denning and foraging habitat and connectivity. The Proposed Action is consistent with the LCAS conservation measures. In the long-term, these actions are expected to beneficially affect Canada lynx and its habitat. However, because of the potential for short-term affects from disturbance, it is our determination that the Proposed Project may affect, but is not likely to adversely affect Canada lynx or its habitat.

Cultural Resources

The cultural resources located in the Box Creek Project Area constitute a unique and important record of human habitation of the central Colorado mountains and valleys. The significance of individual 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 November 1, 2001, the FS and BLM has conducted one continuing and 12 prior cultural resource inventories in the Box Creek vicinity and has identified 21 archaeological sites. Sixteen of these sites are historic sites and five are prehistoric sites.

The 16 recorded historic sites are related to mining, ranching and logging. The mining related sites are associated with the Colorado High Country Mining Boom of the late 19th and early 20th century; local flurries of activity were based on the discoveries of promising ore deposits and their exploration. Mining sites in the Box Creek vicinity are expressed as prospect complexes, miner's cabins, charcoal processing areas, and mining camps. The ranching related sites are expressed as corrals and an earth dam and irrigation ditch. Charcoal processing sites were also identified. These sites are expressed as concentrations of charcoal, platforms, and depressions.

The five recorded prehistoric sites are generally characterized as surface areas of stone tools, and stone tool manufacturing debris. Concentrations of finished tools and manufacturing debris were noted at some of the 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 5 to 50. Prehistoric sites with relatively few surface items and with no recognizable materials concentrations are usually interpreted as resource procurement and processing areas; sites with relatively many surface items (30 or more) and material concentrations are thought to be seasonal camps. Thus, the prehistoric properties recorded in the Box Creek vicinity probably represent locations where small prehistoric social groups processed or consumed harvested resources. Based on assemblage variation and soil deposition, the majority of sites identified in the Box Creek 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. Only one of the prehistoric sites is eligible to the National Register of Historic Places (NRHP); this site contains archeological contexts that are a potential wealth of archeological and cultural information. This site is a potential source for addressing research problems in Colorado Mountain archeology, for example, calculating the time span of prehistoric occupation in the southern Rocky Mountains, or 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.

Watershed

This analysis covers approximately 29 square miles in the Box Creek Watershed (Hydrologic Unit Code 110200010116) on the San Isabel National Forest. There are approximately 32.3 miles of roads and trails in the watershed and approximately 14.3 miles of stream, most of which are intermittent. There is Mount Elbert Forebay Lake, and several beaver ponds along Corske and Box Creeks in the analysis area. The average annual precipitation in the watershed is approximately 30 inches, most of which comes in the form of snow during the winter months.

The State of Colorado has designated the waters in the analysis area as aquatic life cold 1, recreation 1, drinking water supply, and agriculture.

There have been several project specific analyses done in and around the Box Creek Watershed for a variety of projects. Most of these assessments were for timber harvest, livestock grazing, and recreational activities. There was one large landscape scale assessment completed that included the Box Creek Watershed. Information from these analyses indicates water quality is in good condition in the analysis area. Wetlands have been mapped by the FWS. There are approximately 0.5 square miles of wetlands in the analysis area; most are related to intermittent type streams. The wetlands in the analysis area are considered to be in good condition.

Soils

The area has been shaped by glaciation in the last 12,000 years. The landscape includes such glacial landforms as ground and lateral moraines, glacial valley bottoms, and cirques. Glacial processes are also responsible for rocky soils in the watershed. Much of the geology in Box Creek is a result of deposition from the Quaternary Ice Age. Gravels, alluviums, glacial drifts, and landslide deposits were laid down by the most recent ice activity. Unstable geologies include granitic and biotitic gneiss, schist, and migmatite of the Precambrian period. These strata are primarily located on the western-most boundary of the project area, on the face and at the toe of Mount Elbert.

Soils dominant in the watershed are coarse-textured and have greater than thirty-five percent coarse fragments, with sizes mainly between three and ten inches. This soil type is prone to exhibit hydrophobic conditions under coniferous canopy; however the current degree of hydrophobic conditions has not been assessed. These soils are nutrient-limited.

ENVIRONMENTAL CONSEQUENCES

FOREST HEALTH AND VEGETATION

Alternative A – No Action

Direct, Indirect and Cumulative Effects

Under this alternative, proposed activities would not be implemented. Ongoing or previously approved management activities in the area would continue such as recreation, personal use fuel wood gathering, and routine road maintenance.

Forest stands structure would continue to develop, but would not reach the desired conditions. Tree growth would continue to be suppressed in dense stands. The development of mature-old growth forest characteristics (large trees, snags, and down logs) would be limited. Stands already increasingly susceptible to mortality from insects and disease would not be treated to lessen their susceptibility. Changing the homogeneous characteristics of the lodgepole pine community to create diversity in stand structures and spatial patterns would not occur. Aspen age class and diversity would change very little over the short term.

Dwarf mistletoe at high levels severely suppresses tree growth and leads to deformity, top kill and premature mortality (Hawksworth and Johnson, 1975). These impacts of dwarf mistletoe make it less likely that true old-growth conditions will be reached in the watershed. The development of large, old trees, some with decay columns is less likely.

Mistletoe and insect infestations may lead to patch mortality, which will tend to provide some structural diversity and opportunities for other species. However, it may take many hundreds of years before such a system stabilizes. The potential is increasing of a large beetle outbreak, reestablishing a new homogeneous forest of low diversity. Present forest conditions are especially suitable for development of infestation levels not previously experienced historically. A consequence of greater infestation is an increase in the risk and severity of insect outbreaks. The regenerating units resulting from prior cuts will continue to be maintained by thinning and mistletoe reduction. This will maintain the health and vigor of these small units, but not the landscape as a whole.

Effects of dwarf mistletoe on other species may be positive or negative. Observations have been made of the use of lodgepole pine dwarf mistletoe for food by blue grouse (Wyoming) and blacked capped chickadee (Wyoming) (Hawksworth & Wiens, 1996). While a few mammals such as red squirrel, chipmunk and elk occasionally utilize mistletoe as a dietary supplement, none depend on it as a primary food source (Hawksworth & Wiens, 1996). The brooms may also be favored as nesting sites for some animals, although this has not been studied in the lodgepole pine system.

In the southeastern portion of the watershed, near the housing developments, it is likely the forest will continue to become less diverse. Lodgepole pine will continue to invade open ponderosa pine stands. The dominant ponderosa pine will be increasingly susceptible to mountain pine beetle mortality, and lodgepole will become the dominant species.

Forest stands and habitat conditions would continue to slowly develop, but would be more susceptible to larger disturbance events. Tree growth would continue to be suppressed in dense stands, the development of different stand structures and age classes would continue to single aged. Aspen stands would continue to decline unless stimulated by conifer removal by natural process such as mountain pine beetle or wildfires. Large stands of mature, or late seral aspen, currently in healthy condition would remain on the landscape except where natural disturbances occur.

Alternative B – Proposed Action

Direct and Indirect Effects

Under all Action Alternatives, treatments would include prescribed fire and mechanical treatments. The treatments would approximate the nature and intensity of past disturbances, and develop and sustain the structures resulting from such disturbances. The Proposed Action would result in a mosaic of size class, structure, and species from varying treatment intensities.

This alternative would result in early seral forest stands and habitat conditions that would develop as natural lodgepole regeneration occurs. Species diversity would be improved through interplanting of mixed conifer species. The stands would not be as susceptible to disturbance events such as insect and disease outbreaks, until reaching sapling/pole stage.

Tree vigor and health would be improved; however, tree growth could be suppressed if the natural regeneration is not monitored and evaluated for tree weeding in the first few years of seedling establishment. The development of different stand structures and age classes would be a mosaic across the landscape depending on the intensity of the treatment applied.

This alternative (and all Action Alternatives) would reduce dwarf mistletoe in most of the treated lodgepole pine stands. This will bring the disease in line in its HRV and allow trees in treated stands to develop increased growth potential. Wildfire is probably the primary factor governing the distribution and abundance of dwarf mistletoe. Relatively complete burns tend to reduce mistletoe in the infested stands because trees usually reinvade burned areas faster than the mistletoe (Jones 1974).

In prescriptions 8/10, 10.7% of the mistletoe in lodgepole acres type will be reduced (561 acres out of 5,447 total acres). This percentage is an overestimate because the denominator is based on Forest Service System lands only. Cumulative with the 485 acres of mistletoe reduction treatment over the last 40 years, this will result in reduction of mistletoe on less than 20% of the lodgepole pine stands in the area. Other prescriptions (7,11/14 and 12) are intended in part to reduce the intensity of mistletoe to residual stands but not as extensively as the treatment discussed above. Although the project should reduce the amount of mistletoe in about 60% of the lodgepole pine type, most of the mistletoe infested lodgepole acreages will still have mistletoe after the project. Therefore, there would still be enough mistletoe to provide benefits.

Placing borders of regeneration units where there is little or no infestation outside the unit will help prevent re-infection of regeneration. Clear-cut regeneration units will be large enough (>20 acres) so that the rate of re-infestation is low and the majority of the new stand will be un-infested at maturity.

After a stand-replacing fire, lodgepole pine regenerates much more quickly than the parasite can return to the site. The result is regeneration of high density, even-aged lodgepole pine in a patch corresponding to the fire. In a future year, fire may return to adjacent older, heavily infected patches. A mosaic of stands at different stages of development is maintained, with mistletoe primarily limited to areas where infected trees have survived at the edge of a fire and have the potential to infect younger trees nearby.

Where abundance of mistletoe infection is low, mistletoe reduction thinning can be considered. It is nearly impossible to eliminate mistletoe from a stand by mistletoe reduction because recent infections may remain undetectable for several years. However, stand condition can be improved. Because thinning can stimulate preexisting mistletoe infections, making them more vigorous and resulting in more seed and witches' brooms, any partial cutting must involve consideration of mistletoe reduction.

In those areas where there is an adequate supply of serotinous cones, clear-cutting followed by prescribed burning to dispose of the slash is probably the most practical method to keep many of these stands healthy and productive (Lotan, 1975). Uneven-aged management or even partial cutting is seldom practical because lodgepole pine trees are not wind firm and often blow down after being thinned (Lotan 1975). Moreover, in the Rocky Mountain area,

partial cutting encourages the spread and intensification of dwarf mistletoe (Alexander and Hawksworth 1975, Lotan 1975).

Because mistletoe spreads rapidly from overstory to understory trees, improper use of uneven-aged management could also increase mistletoe abundance. Dwarf mistletoe is an active member of the plant community, and it provides numerous ecological benefits where host-pathogen levels are in natural range.

Fire or mechanical treatments will replace heavily infested stands. Both treatments mimic natural fires that regulated dwarf mistletoe in the past. The new stands would have mistletoe diminished to more historic conditions.

Implementation of prescriptions would result in resource objectives being met. As with any disturbance event, effects on soil, water, and vegetation will depend on the intensity of prescribed fire or wet season equipment use.

The treatments would also increase growth of trees by removing trees that are suppressed in growth that use up moisture and nutrients that would improve the growth of larger trees.

Prescriptions 3 and 4 - Previously regenerated lodgepole In areas regenerated in the past, mistletoe reduction will be conducted by removing infected trees near the unit margins. This will reduce the spread of mistletoe infection, which is particularly critical in the smaller units.

Increased tree density has reduced the abundance and diversity of the understory plants, and since most of these stands feature smaller trees, there will be an increase in surface fuels created by the slash from the thinning. Slash disposal methods here should include a range of tools and methods including chipping, lopping and scattering, and or jackpot burning which may favor good seed beds for seedling establishment by mixed-conifer species and to create planting spots.

Prescription 7 - Mistletoe reduction and thinning of lightly infected stands Lodgepole pine that has relatively low infection by dwarf mistletoe (below DMR 2) will be treated for density reduction. These residual trees will grow with improved health and vigor as a result. The proposed treatments would encourage healthy and vigorous tree conditions

Prescriptions 8 and 10 - Restoration and regeneration of lodgepole pine and mixed conifer With one exception, forest regeneration treatments are focused on severely mistletoe infected lodgepole pine stands. Stand replacement by fire and succession to non-host species are nature's only means of changing such conditions.

Using a mixture of fire and harvest, this alternative will mimic these processes. Where other natural regeneration possibilities are present (ponderosa pine sources, aspen root systems) such regeneration will be encouraged. Aspen stands with treatments would stimulate aspen regeneration and would result in a mosaic of early seral aspen occurring across the landscape. Ponderosa pine and Douglas-fir will be planted in some cases. Healthy new stands of lodgepole pine in the majority of areas would occur, replacing diseased stands of lodgepole. Greater species diversity would occur, providing reduced likelihood of host-specific insect and disease outbreaks. Increased landscape diversity, with structural heterogeneity would occur reducing the likelihood of catastrophic disturbances (e.g. fire, insect and disease outbreaks).

Prescription 11 and 14 - Lodgepole mixed with other conifers Where lodgepole pine occurs with other species, especially when dwarf mistletoe is severe, the lodgepole component will be selectively removed or reduced by a combination of fire and harvest. This will reduce dwarf mistletoe, both by direct reduction and by conversion to resistant species.

This will result in residual stands with less mistletoe, and trees exhibiting good vigor and health. Size class and species diversity would be enhanced through removal of suppressed trees. Some natural regeneration would occur after treatment. Post treatment maintenance (e.g., monitoring, weeding and spot mistletoe infection removal) may be necessary to maintain a healthy vigorous growing stand.

Growth potential would be enhanced for residual trees to move towards a desired condition of a forest with larger tree characteristics and fire resiliency, through removal of competing intermediate and suppressed small diameter trees.

In the southeastern portion of the watershed, where lodgepole has been invading ponderosa pine stands, this treatment is particularly important to reduce the threat of mountain pine beetle. This section of the watershed has seen increased mountain pine beetle activity in recent years. Mistletoe and density reduction may increase tree vigor and lower the level of mountain pine beetle activity.

Prescription 12- Density reduction for winter range In the winter range units (Management Area 5B) occupied by lodgepole pine heavily infested with dwarf mistletoe, tree density will be reduced with a combination of fire and harvest.

These overstocked, even-aged stands of predominately lodgepole pine are currently lacking understory vegetation. Tree diameters and heights are very similar. There are few snags or logs in these stands.

Thinning emphasizing removal of mistletoe infested lodgepole, followed by prescribed fire, would result in encouraging forage species (grasses and forbs). The result of tree removal and prescribed fire would also be natural lodgepole regeneration. Post treatment maintenance (e.g., monitoring, prescribed fire rotation or weeding) may be done to encourage desirable forage and healthy, vigorous regeneration of lodgepole pine.

Continued growth in the current overstocked condition will eventually result in tree mortality due to direct competition, wind throw, or insect attacks. Reducing stand density by the proposed treatments should result in larger tree crowns and constant or accelerated diameter growth in the healthiest stands.

In all of the partial treatments (not stand replacement) involving fire, some surviving tree will have fire scars. Fire scars may serve as entry points for decay fungi that colonize stems, roots, or the butt of the tree. This defect will reduce the timber value, but will provide habitat for cavity-nesting birds, denning sites for small mammals, habitat for a variety of fungi and insects, and ultimately lead to formation of canopy gaps and resulting in-stand heterogeneity.

All treatments, (both stand replacement and partial treatments), that leave dead stems on site (standing or down, even if partially burned) would contribute to CWD accumulation. Although in some circumstances it contributes to fire hazard, CWD also enhances soil stability, contributes to moisture and nutrient retention, and provides habitat for mycorrhizae, denning habitat for small mammals and resources for many other organisms (Bull et al. 1997, Harmon et al. 1986, Harvey et al. 1976, Harvey et al. 1978).

Prescription 13 - Snag patches for wildlife In one heavily mistletoe-infested unit, a mechanical treatment followed by prescribed fire will be used to create patches of snags to enhance wildlife habitat. Side effects will be reduction of bark beetle. The impact on dwarf mistletoe over the long term will depend on the fire pattern and intensity. If the fire kills all infected trees in large patches (greater than 20 acres), the reduction of mistletoe will be effective over the life of the regenerating stand. If the patches are smaller or not completely eliminated by the fire, dwarf mistletoe may quickly infect the regeneration at high levels.

This prescription would result in a disturbance mosaic with natural regeneration of lodgepole. Snags would be interspersed with high-density regeneration. Post treatment monitoring and evaluation for regeneration weeding would be desirable for improved tree growth and vigor.

Prescription 19 - Fire Use If the decision authorizes fire use, then this area will be a candidate for the study and use of fire.

Prescription 21 - Sagebrush – grass restoration The sagebrush/grass restoration prescription would result in the re-establishment of grasses and forbs. A maintenance prescribed fire rotation every 4 to 6 years may be required to maintain the establishment, as sagebrush would eventually reestablish in the area. Burning the sagebrush intermix will reestablish a quicker nutrient cycling, adding nitrogen and organic matter to the soil.

Prescription 23 - Defensible Fuels Zone In the urban/wildland interface, a defensible fuels zone is planned along a corridor where federal land is adjacent to homes. This zone will also serve to reduce dwarf mistletoe infestation and mountain pine beetle susceptibility.

Alternative C – Mechanical Harvest Emphasis

Direct and Indirect Effects

While the tools vary between Action Alternatives, the prescriptions will have similar direct and indirect effects. In general, this alternative would be more precise in the selection of trees to be removed; however, the effects of prescribed fire would not be realized as compared to the Proposed Alternative. There will be proportionally less fire scarring of residual trees and resulting decay. Mechanical treatment may damage residual trees through tree removal and felling.

In prescriptions 8/10, 10.7% of the mistletoe in lodgepole acres type will be reduced (561 acres out of 5,447 total acres). This percentage is an overestimate because the denominator is based on Forest Service System lands only. Cumulative with the 485 acres of mistletoe reduction treatment over the last 40 years, this will result in reduction of mistletoe on less than 20% of the lodgepole pine stands in the area. Other prescriptions (11/14 and 12) are intended in part to reduce the intensity of mistletoe to residual stands but not as extensively as the treatment discussed above. Although the project should reduce the amount of mistletoe in about 60% of the lodgepole pine type, most of the mistletoe infested lodgepole acreages will still have mistletoe after the project. Therefore, there would still be enough mistletoe to provide benefits.

Prescription 8, 10 - Restoration and regeneration of lodgepole pine and mixed conifer Removing dwarf mistletoe infected lodgepole to encourage nearby aspen; manual cutting instead of fire would remove infected lodgepole. In Prescription 10, removal and regeneration of infected lodgepole would be accomplished more precisely with cutting rather than burning.

Prescription 12 – Density reduction for winter range Thinning infested lodgepole, to encourage wildlife forage, prescribed fire would be necessary after removal to result in meeting the objectives. Harvesting would result in allowing increased selection for removal of infected trees. Fire would need to be introduced to restore grasses and forbs.

This alternative would not result in as many acres of fire induced mortality over the landscape as would occur under Alternatives B and D. Placing borders of regeneration units where there is little or no infestation outside the unit will help prevent re-infection of regeneration. Clear-cut regeneration units will be large enough (>20 acres) so that the rate of re-infestation is low and the majority of the new stand will be un-infested at maturity.

This alternative permits more precise implementation and selection of infected trees, which should result in somewhat less future mistletoe on affected acres than does the Proposed Alternative. There will be proportionally less fire scarring of residual trees and resulting decay. This will result in less defect and higher long-term timber values, but also less cavity-nesting habitat, denning habitat, and gap-phase heterogeneity.

Alternative D – Fire Tool Emphasis

Direct and Indirect Effects

Under this alternative, acres are shifted from harvest to fire tool as compared to the Proposed Alternative.

Natural regeneration of lodgepole pine would increase with fire treatments, as lodgepole is an early seral disturbance species. Grasses and forbs would initially increase in areas with forage grass re-establishment objectives; however, the lodgepole would eventually be the dominant structure if a prescribed fire cycle or mechanical treatments were not implemented.

Prescribed fire is less precise in tree selection compared to manual cutting selection of suppressed, intermediate, or mistletoe-infected trees. In thinning/mistletoe reduction treatments, where healthy, vigorous lodgepole are to be left, fire may take out some of these trees. This alternative (and all Action Alternatives) would reduce dwarf mistletoe in most of the treated lodgepole pine stands. In prescriptions 8/10, 10.7% of the mistletoe in lodgepole acres type will be reduced (561 acres out of 5,447 total acres). This percentage is an overestimate because the denominator is based on Forest Service System lands only. Cumulative with the 485 acres of mistletoe reduction treatment over the last 40 years, this will result in reduction of mistletoe on less than 20% of the lodgepole pine stands in the area. Other prescriptions (7, 11/14 and 12) are intended in part to reduce the intensity of mistletoe to residual stands but not as extensively as the treatment discussed above. Although the project should reduce the amount of mistletoe in about 60% of the lodgepole pine type, most of the mistletoe infested lodgepole acreages will still have mistletoe after the project. Therefore, there would still be enough mistletoe to provide benefits. This will bring the disease in line in its HRV and allow trees in treated stands to develop increased growth potential. Wildfire is probably the primary factor governing the distribution and abundance of dwarf mistletoe. Relatively complete burns tend to reduce mistletoe in the infested stands because trees usually reinvade burned areas faster than the mistletoe (Jones 1974). Placing borders of regeneration units where there is little or no infestation outside the unit will help prevent re-infection of regeneration. Clear-cut regeneration units will be large enough (>20 acres) so that the rate of re-infestation is low and the majority of the new stand will be un-infested at maturity.

After a stand-replacing fire, lodgepole pine regenerates much more quickly than the parasite can return to the site. The result is regeneration of high density, even-aged lodgepole pine in a patch corresponding to the fire. In a future year, fire may return to adjacent older, heavily infected patches. A mosaic of stands at different stages of development is maintained, with mistletoe primarily limited to areas where infected trees have survived at the edge of a fire and have the potential to infect younger trees nearby.

Where abundance of mistletoe infection is low, mistletoe reduction thinning can be considered. It is nearly impossible to eliminate mistletoe from a stand by mistletoe reduction because recent infections may remain undetectable for several years. However, stand condition can be improved. Because thinning can stimulate preexisting mistletoe infections, making them more vigorous and resulting in more seed and witches' brooms, any partial cutting must involve consideration of mistletoe reduction. In those areas where there is an adequate supply of serotinous cones, clear-cutting followed by prescribed burning to dispose of the slash is probably the most practical method to keep many of these stands healthy and productive (Lotan 1975). Uneven-aged management or even partial cutting is seldom practical because lodgepole pine trees are not wind firm and often blow down after being thinned (Lotan 1975). Moreover, in the Rocky Mountain area, partial cutting encourages the spread and intensification of dwarf mistletoe (Alexander and Hawksworth 1975, Lotan 1975).

With the shift from harvest to prescribed fire in this alternative as compared to the Proposed Alternative, smoke and air quality regulations could limit implementation due to air quality and burn day restrictions.

Because there is less mechanical harvest, and assuming the trees felled during preparation work or killed directly by fire are neither completely consumed nor removed, there will be an increase of CWD left on site. This will provide more soil stability, moisture and nutrient reservoirs, and habitat for roots and many small organisms compared to the other Action Alternatives.

Fire will be less precise than manual cutting in selecting mistletoe infected trees. This is particularly true in thinning/mistletoe reduction treatments, where some lodgepole are to be left.

Prescription 21 – Sagebrush – grass restoration would be treated with prescribed fire to create successional diversity in the sagebrush/grassland type. The use of this tool would encourage the establishment of early seral vegetation such as grass, forbs, and shrubs. Past prescribed fire treatments in similar areas, resulted in good establishment of grasses and forbs, providing improved habitat and forage conditions for many wildlife species. These burns are along the east side of the project area and would interface with Prescription Areas 8, 12, and 14.

Cumulative Effects for all Action Alternatives – B, C and D

The action alternatives will increase the acres of healthy forest, reduce the amount of dwarf mistletoe and help move fire condition classes to lower levels.

Fire and Fuels

Alternative A – No Action

Direct, Indirect and Cumulative Effects

Under this alternative, proposed activities would not be implemented. Ongoing or previously approved management activities in the area would continue such as recreation, personal use fuel wood gathering, and routine road maintenance.

Forest stands structure would continue to develop, but would not reach the desired conditions. Stands already increasingly susceptible to mortality from crown fire hazard (Appendix E) would not be treated to lessen their susceptibility. Changing the homogeneous characteristics of the lodgepole pine community to create diversity in stand structure, spatial patterns and an overall reduction in crown fire hazard would not occur. Eventually, wildfires would create early seral stage development in aspen and lodgepole stands.

Mistletoe will continue to affect the forest until a disturbance event occurs. Through time, tree mortality, stunted trees, witches brooms, resin-infiltrated stem cankers, and an increase in accumulated dead fuels will continue to increase potential fire behavior and flammability. In areas with heavy mistletoe, the mistletoe will enhance vertical fuel continuity and the likelihood that ground fires will burn out individual tree crowns. Dwarf mistletoe also tends to increase fire predisposition, rate of spread, intensity, crowning, spotting and duration (Alexander and Hawksworth, 1975). Thus, dwarf mistletoe that is unusually intense and continuous will lead to more intense and continuous fires.

There is an increasing potential of a high intensity wildfire fire reestablishing a new homogeneous forest of low diversity. The regenerating units resulting from prior cuts will continue to be maintained by thinning and mistletoe reduction. This will decrease the potential of a high intensity fire in these small units, but not the landscape as a whole. The fuel quantities and fire intensity potential may increase as trees killed by dwarf mistletoe eventually fall down and dead fuels accumulate. Dead fuels include dead trees and shrubs and dead branches lying on the ground or still attached to living plants.

With the lack of fire on the landscape, there will continue to be a lack of fire-scarred trees. Decay will slowly increase as trees age because of fungi that do not require obvious wounds, such as *Phellinus pini*. Decay associated with fire-scarring will be lacking, as will the associated habitat values.

Areas of the project in fire condition class 2 would move towards condition class 3, where fires would be a relatively high risk. Areas in condition class 1 move start to move towards condition class 2. As more of the area becomes condition classes 2 and 3, fires begin to burn more intense. At these intensities, wildland fires have a greater potential to kill all of the trees, even the large ones that, at lower fire intensities, would normally survive. (The National Fire Plan – Cohesive Strategy (GAO/RCED-99-65 2000).

Alternative B – Proposed Action

Direct and Indirect Effects

Under all Action Alternatives, treatments would include prescribed fire and mechanical treatments. The treatments would approximate the nature and intensity of past disturbances, and develop and sustain the structures resulting from such disturbances. The Proposed Action would result in a mosaic of size class, structure, and species from varying treatment intensities.

In this alternative, small, slow moving fires will be most common because understory fuels are sparse, and fire spread into the crowns is difficult because they are elevated well above the forest floor (Appendix E). These stands will become more flammable as they age because dead woody fuels accumulate on the forest floor. In the Box Creek Watershed, these large fuels are scattered at best and would have resulted primarily from insect and disease outbreaks, which are common such as dwarf mistletoe and mountain pine beetle. Implementation of prescriptions would result in resource objectives being met. As with any disturbance event, effects on soil, water, and vegetation will depend on the intensity of prescribed fire or wet season equipment use.

Prescriptions 3 and 4 - Previously regenerated lodgepole Increased tree density has reduced the abundance and diversity of the understory plants, and since most of these stands feature smaller trees, there will be an increase in surface fuels created by the slash from the thinning. Slash disposal methods here should include a range of tools and methods including chipping, lopping and scattering, and or jackpot burning which may favor good seed beds for seedling establishment by mixed-conifer species and to create planting spots.

Prescription 7 - Mistletoe reduction and thinning of lightly infected stands The proposed treatments would encourage healthy, vigorous tree condition, which has a positive effect on keeping the fire hazard low. Fuel ladders would be reduced by removal of intermediate and suppressed trees to reduce potential for high intensity wildfire.

Prescriptions 8 and 10 - Restoration and regeneration of lodgepole pine and mixed conifer With one exception, forest regeneration treatments are focused on severely mistletoe infected lodgepole pine stands. Stand replacement by fire and succession to non-host species are nature's only means of changing such conditions. Using a mixture of fire and harvest, this alternative will mimic these processes. Increased landscape diversity, with structural heterogeneity would occur reducing the likelihood of catastrophic disturbances (e.g. fire, insect and disease outbreaks).

Prescription 11 and 14 - Lodgepole mixed with other conifers Fuel ladders would be reduced by removal of intermediate and suppressed trees to reduce potential for high intensity wildfire. Growth potential would be enhanced for residual trees to move towards a desired condition of a forest with larger tree characteristics and fire resiliency, through removal of competing intermediate and suppressed small diameter trees.

In the southeastern portion of the watershed, where lodgepole has been invading ponderosa pine stands, this treatment is particularly important to improve fire condition. With housing developments, a primary concern is to meet National Fire Plan direction for fuels treatments. These should maintain fuel conditions levels that permit fire suppression forces to meet fire protection objectives for the area.

Prescription 12- Density reduction for winter range In all of the partial treatments (not stand replacement) involving fire, some surviving tree will have fire scars. Fire scars may serve as entry points for decay fungi that colonize stems, roots, or the butt of the tree. This defect will reduce the timber value, but will provide habitat for cavity-nesting birds, denning sites for small mammals, habitat for a variety of fungi and insects, and ultimately lead to formation of canopy gaps and resulting in-stand heterogeneity.

All treatments, (both stand replacement and partial treatments), that leave dead stems on site (standing or down, even if partially burned) would contribute to CWD accumulation. Although in some circumstances it contributes

to fire hazard, CWD also enhances soil stability, contributes to moisture and nutrient retention, and provides habitat for mycorrhizae, denning habitat for small mammals and resources for many other organisms (Bull et al. 1997, Harmon et al. 1986, Harvey et al. 1976, Harvey et al. 1978).

Prescription 13 - Snag patches for wildlife In one heavily mistletoe-infested unit, a mechanical treatment followed by prescribed fire will be used to create patches of snags to enhance wildlife habitat.

Prescription 19 - Fire Use If the decision authorizes fire use, then this area will be a candidate for the study and use of fire.

Prescription 23 - Defensible Fuels Zone In the urban/wildland interface, a defensible fuels zone is planned along a corridor where federal land is adjacent to homes.

In all of the Action Alternatives, treatments designed to thin stands and reduce ladder fuels, would reduce the risk of crown fires. Fuel break effectiveness is increased if multiple property owners work together to create defensible space on private property

In the defensible fuels zone in the urban interface, a thinning from below, salvage and mistletoe reduction prescription would result in fuel conditions that allow for efficient and safe suppression of wildland fire ignitions. Fires are controlled through initial attack in all but the most severe weather conditions.

Thinning, biomass removal, pile burning, and low intensity prescribed fire, would result in a reduction in surface fuel loading and fuel ladder conditions. The live crown base height has sufficient separation between surface fuels and live base crowns (minimum average of 10 feet). Mechanical removal of the small tree boles would reduce overall emissions from smoke and particulate matter when piles are burned. The prescription would improve residual tree survival in the event of a high intensity wildfire and reduce the potential for crown fire occurrence.

Alternative C – Mechanical Harvest Emphasis

Direct and Indirect Effects

While the tools vary between Action Alternatives, the prescriptions will have similar direct and indirect effects. In general, this alternative would be more precise in the selection of trees to be removed; however, the effects of prescribed fire would not be realized as compared to the Proposed Alternative. There will be proportionally less fire scarring of residual trees and resulting decay. This will result in less defect and higher long-term timber values, but also less cavity-nesting habitat, denning habitat, and gap-phase heterogeneity.

Alternative D – Fire Tool Emphasis

Direct and Indirect Effects

Under this alternative, acres are shifted from harvest to fire tool as compared to the Proposed Alternative. Prescribed fire would result in mimicking past disturbance events creating a mosaic of trees with fire-induced mortality.

Prescribed fire is less precise in tree selection compared to manual cutting selection of suppressed, intermediate, or mistletoe-infected trees. In thinning/mistletoe reduction treatments, where healthy, vigorous lodgepole are to be left, fire may take out some of these trees.

With the shift from harvest to prescribed fire in this alternative as compared to the Proposed Alternative, smoke and air quality regulations could limit implementation due to air quality and burn day restrictions.

Because there is less mechanical harvest, and assuming the trees felled during preparation work or killed directly by fire are neither completely consumed nor removed, there will be an increase of CWD left on site. This will provide more soil stability, moisture and nutrient reservoirs, and habitat for roots and many small organisms compared to the other Action Alternatives.

Cumulative Effects for all Action Alternatives – B, C and D

All action alternatives would result in lower intensity wildfires and would be easier to suppress. Resistance to control would less difficult and ground fires, as they occur, would be expected to burn at lower flame lengths (Appendix E). Fuel ladders would not be common and the ability for a fire to spread through tree crowns would be significantly reduced. Fires within untreated areas would be easier to suppress once they moved into treated areas. Areas of the project in fire condition class 2 and 3 would move towards condition class 1 and 2, where fires would pose less of a risk.

Noxious Weeds

Alternative A – No Action

Direct and Indirect Effects

Without ground disturbing activities such as prescribed fire and timber harvest, opportunities for spread or new infestation would be limited in the project area in the short term. In the long term, without proposed vegetation treatment, risk of catastrophic fire is increased. Catastrophic fire would result in large areas of severe ground disturbance creating opportunity for noxious weeds to take over on a much larger scale as they are able to out-compete native vegetation when colonizing a site.

Cumulative Effects

As population growth increases, recreational impacts are likely to increase in the project area. Noxious weeds have potential to spread to new areas by transport on people, pets, and vehicles traveling on roads and trails. Most of the known populations of noxious weeds are restricted to roads and trails at this time. With the limited personnel and noxious weed treatment funds, it is likely noxious weeds will continue to spread at a slow but constant rate through the project area.

All Action Alternatives – B, C and D

Direct, Indirect, and Cumulative Effects

Wildland fire is a natural process that often helps to maintain or improve health and productivity of native plant communities. However, when noxious weeds are present in the area, native plant communities can be threatened.

Various plants respond differently to fire. Weeds may rapidly infest burned areas as seedbeds are prepared, competition from native plants is reduced, and increased nutrients are released into the soil. The spread of Canada thistle can be reduced or enhanced by fire. Response to fire is variable and may be affected by season of burn, burn severity, site conditions and plant community composition and phenology before and after the fire.

Pre-treatment for prescribed burns may include construction of control features such as dozer lines or handlines. Construction of these control features creates soil conditions favorable for seed germination, establishment, or spread of noxious weed populations.

Timber harvest activities may create areas of bare ground as the surface of the ground is disturbed and vegetation is removed. Equipment used for timber harvest may carry and distribute noxious weed seed into newly disturbed sites and promote the establishment of new populations or increase distribution of existing populations.

The use of mitigation and recommended measures in this EA, combined with the noxious weed management plan should minimize the spread of noxious weeds.

Botany

Alternative A – No Action

Direct, Indirect and Cumulative Effects

Without ground disturbing activities such as prescribed fire and timber harvest, there is no affect to sensitive plants species that potentially occur in the project area. However, without proposed vegetation treatment, risk of wildland fire is increased. Fires would result in the loss of plant habitat.

All Action Alternatives – B, C and D

Direct, Indirect, and Cumulative Effects

As a result of the relationship between plant flowering and climate (phenology), prescribed burns that occur during the spring or summer may adversely affect forested plant species by eliminating future contributions to the seed bank. Further, ground disturbance from mechanized equipment have the potential to destroy existing populations of theses species. Proposed prescribed burns occurring in the fall and winter will occur after plant populations have gone to fruit, contributing to the existing seed bank.

Air Quality

Alternative A – No Action

Direct, Indirect Effects

Alternative A would have no direct adverse effect on air quality. Without the silvicultural treatments and associated prescribed burning, no new emissions would be created in the short-term under this alternative. In the long-term, large quantities of emissions could be released if a large wildfire developed due to an abundance of hazardous fuels in the area. A large wildfire has the potential to emit large amounts of smoke that could remain in the local air sheds for a few days to several weeks depending on the size and intensity of the fire.

This alternative will not add new emissions to the air shed in the short term. However, long term increased fuel loads will allow new wildfire ignitions to have potential to become large fires and would produce more emissions. Recent fire seasons in 2000 and 2002 have shown us how uncontrolled wildfire emissions can be high, of long duration, and detrimental to public health.

Cumulative Effects

Since no prescribed burning is proposed in this alternative, there would not be a cumulative increase in the demand for airshed when combined with other projects.

Alternative A would have no effect on the scheduling of other prescribed burns in the adjacent National Forest or BLM areas.

These include the following reasonably future foreseeable prescribed burns:

- Pile burns on existing projects in the Box Creek Watershed
- Kaufman Ridge Prescribed Burn from Mushroom Gulch, includes Kaufman Ridge, and runs south all the way to Castle Rock Gulch
- Bassam Park Prescribe Burn (1,500 acres) from Bassam Park area and north to Castle Rock Creek
- Greens Gulch II Prescribed Burn (40,000 acres): from Highway 285 south to Turret between the Arkansas River and Aspen Ridge.

It is predicted that only pockets of trees smaller than 0.5 acres will receive stand replacement fire. Some of these areas will probably be burned in the next couple of years and some are in the planning stages.

All Action Alternatives – B, C and D

Direct, Indirect Effects

The Action Alternatives would have a direct short-term effect on air quality in the analysis area. Under these alternatives, PM_{10} would be released because of prescribed burning operations. Acres treated with prescribed fire under Alternatives B, C, and D range from 4,408 to 6,962. Alternative D, which emphasizes the use of fire as a preferred tool for accomplishing the Desired Future Condition would result in a greater short-term effect on air quality because a greater amount of fuel would be burned.

The Colorado Air Pollution Control Division controls the amount of burning conducted in any one air shed. Therefore, none of the alternatives would be expected to result in a violation of NAAQS.

Indirect effects of the Action Alternatives include a potential reduction for PM_{10} released from wildfires in the area. These alternatives would reduce the amount of standing live fuels as well as ground fuels in the area. In addition, the arrangement of thinned stands across the landscape following treatment would create natural fuel breaks. This would reduce the amount of fuel that could be burned during a wildfire and limit the extent of wildfires in the area. These effects would result in reducing the amount of emissions from wildfires in the area.

Crown fires tend to release high levels of PM_{10} because of the amount of live fuel that typically burns at crown fire intensities. Prescribed fires implemented under the Action Alternatives would generally burn at lower intensity (less than 100 British thermal units (btus) /sq ft/sec, and less than 4 foot flame lengths), producing lower emissions than would be produced under wildfire conditions. Using this treatment method reduces the potential for future, higher emission wildfires. A recent scientific report (Martinson and CSO, 2002) analyzing the effects of prescribed fire and other fuel treatment methods in reducing wildfire severity indicates crown fire hazard (e.g., height to crown, crown bulk density, stand density, and basal area), fire resistance (e.g., height and diameter), and fire severity (e.g., scorch height, crown volume scorch, stand damage, and depth of ground char) were compared between previously treated and untreated areas. The results indicate treated stands experience lower fire severity than untreated stands burned under similar weather and topographic conditions.

Prescribed burning would produce 83 tons per year of PM_{10} emissions. If these same areas were to burn in a wildfire, 2302 tons of PM_{10} could be released over a period of a few days.

The prescribed burning proposed by each of the Action Alternatives would have a direct, short-term effect on air quality in the Box Creek Watershed. SASEM Modeling results indicate an average of 332 tons of PM_{10} would be released from the proposed prescribed burning projects. If these burns were conducted over a 4-year period, an

average of 83 tons per year of PM_{10} would be released. The estimates for emissions are based on the acres treated in each alternative and the assumption all areas proposed for burning would be treated, and ground fuels are continuous across the area burned. In reality, there would be natural openings in some areas, other areas with lighter fuels. Actual emissions would likely be less than these estimates for the reasons above.

By conducting burning over a 4-year period and burning only under fair to excellent dispersion days, this alternative would meet the guidelines and standards for PM_{10} in Colorado. Since the amount of burning conducted in any one air shed is monitored and controlled by the state, these alternatives would not be expected to result in violations of air quality standards.

Fire management activities on public lands must also meet the State standards for air and water quality. Activities must be conducted in accordance with Colorado Regulation 9, the current State of Colorado Smoke Management Plan and Memorandum of Understanding (MOU) and have an approved open burning permit issued by the Colorado Department of Public Health and Environment, Air Pollution Control Division.

Smoke Sensitive Receptors

The prescribed burning proposed in the Action Alternatives would increase the number of smoky days in the local area, affecting local communities such as Leadville, Pan-Ark, Granite, Mount Massive Lakes, and other local subdivisions. Downwind communities such as Alma and Fairplay may also be affected.

Smoke would stay in the local air shed a relatively short time (few hours to several days depending on weather). Generally, areas to the west and south of the burning would not be affected due to prevailing winds blowing smoke away from these areas. However, there could be some smoke settling into the river valley along the Upper Arkansas River during the evenings.

Smoke trapped in low-lying areas would be expected to dissipate once morning temperatures rose and the nighttime inversion lifted. Prescribed burning would be conducted when weather conditions are predicted to be fair to excellent for smoke dispersal. Under these conditions, the smoke would be expected to lift to the mixing layer and then be transported aloft out of the air shed.

The action alternatives could result in an indirect effect on the public in the project vicinity from the smoke generated from burning piles composed of small tree thinning slash. Depending on weather conditions at the time of pile burning, smoke sensitive areas could be affected in locations downwind of the project areas. Smoke sensitive areas would be identified in the Prescribed Fire Burn Plan and associated permits.

Cumulative Effects – B, C and D

The activities proposed by the projects listed in the No Action Alternative may cause delays in burning due to the increased demands for air shed, but most of these concerns will be mitigated by scheduling at the local administrative level and by prioritizing treatment areas.

Burning in the project area may require 5-10 years to complete. Older piles created by current projects in Box Creek Watershed are ready to be burned, and additional areas are being treated. These areas will probably be burned in a couple of years.

Impacts on the local air quality are not usually evident once the emission source is removed due to dispersion. The cumulative effects from past emissions would be negligible. This is also true for future emissions released after emissions from the proposed actions have dispersed. The greatest cumulative effects would be from activities that might be releasing emissions at the same time as the proposed actions or from sources continually emitting PM_{10} into the local air shed. Activities that could have a cumulative effect on air quality include other

prescribed burns scheduled for the same time. Future and foreseeable activities include proposed prescribed burning on adjacent BLM and FS lands.

The procedures and burning restrictions imposed by the State's smoke management program would limit any cumulative impacts of the Action Alternatives and any foreseeable future actions. Taking the Chaffee and Lake County emission inventory as a surrogate for the rest of the project area, the additional emissions from the proposed actions, even in the short term should not violate NAAQS (National Ambient Air Quality Standards) or the State of Colorado's air quality standards and cause minimal degradation to visibility and regional haze.

Recreation

Alternative A – No Action

Direct, Indirect Effects

Alternative A would not have any direct effects on the recreational resource. An indirect effect of the alternative would be a continuation of the trend towards increasing fuel loads. This alternative would have the greatest potential for a large, catastrophic fire that could substantially damage recreational resources in the Project Area. A major fire in the Project Area could result in the temporary or permanent loss of recreational opportunities. For example, the Hayman Fire on the Pike National Forest, which burned over 137,000 acres, destroyed many recreational facilities such as trails and campgrounds causing much of the area to be closed to recreational use.

Alternative A does not propose to close, restore or restrict system or non-system roads in the Project Area. Recreationists using these roads would continue to disturb riparian areas and wildlife habitat, erode stream banks and hill slopes, potentially degrading water quality and fish habitat. Over time, the increasingly degraded road conditions would negatively affect the recreation experience and could compromise the safety of some recreationists.

Cumulative Effects

Future foreseeable actions in the Project Area include noncommercial sale of firewood and post-and-pole, slash treatment using prescribed fire and mechanical chipping, and dwarf mistletoe treatment. These activities would primarily affect recreation by increasing management activity in the Project Area and by creating smoke and noise, which could negatively affect the recreation experience. These effects are minor and short-term.

Alternative B – Proposed Action

Direct, Indirect Effects

Alternative B would have only minor, short-term adverse effects due to the proposed activities. These effects would primarily be due to the actual harvest activities and prescribed burning.

In the long-term, the recreational resources would be improved by this alternative. The harvest treatments would move towards reducing fire condition classes, which would reduce the potential for damage of recreational resources due a large, catastrophic fire. Alternative B would improve the safety and aesthetics of the roads system in the Project Area, preventing further resource damage and rehabilitating some of the areas already damaged by overuse. This alternative is consistent with the Forest Plan direction for management of recreational resources.

Effects of Vegetation/Timber Stand Treatment on Recreation

The proposed vegetation/timber stand treatments would have the greatest long-term, direct effect on recreation by changing the character of portions of the Project Area where recreation takes place. When the project is completed, the appearance of the treatment areas would be different from the appearance of the existing forest. The treatment areas would still have a natural appearance, but the forest would be less dense and there would be numerous created openings.

The action alternatives could result in a short term indirect effect of increased illegal off road recreation use of areas after vegetation treatments are completed. A more open forest would have potential for an increase of non-system roads or undesirable Off- Road Vehicle use. Implementation of road activities (road closures by gates or barriers, fencing, placement of boulders, obliteration and treatment buffer strips – see Appendix B, Design Criteria) would decrease the off road use.

Effects on ROS settings

The actions proposed by Alternative B would not change the ROS settings of the Project Area. No new permanent roads would be constructed and the vegetation treatments would not change the long-term recreational use. Treatments would utilize existing roads.

Effects on Recreation Resource Areas

The following discussion presents the likely effects vegetation/timber stand treatment would have on high concentrations of recreational activity areas.

Lodgepole Flats. The majority of vegetation/timber stand treatments are proposed for the Lodgepole Flats area especially along the Mt. Elbert Conduit Road, or FDR 130A and 130B, and FDR 130, west of the Conduit Road.

Short-term effects of the treatments would include noise, visual activity, smells, and smoke that could affect the experience of people using this area.

Traffic associated with the harvest and prescribed burning would also affect recreationists in the Lodgepole Flats area. The primary affect of the increase in traffic would be noise and dust along the road corridors.

Before burning, logging slash would be noticeable to visitors. Although these effects would be considered minor, some recreationists may choose to avoid the affected areas while harvest activities are being conducted.

Recreationists may also avoid the areas being burned because of smoke. This would temporarily reduce the use of the area, however, the duration of the effect is short, and therefore, the overall effect of the burning would be considered minor.

The primary long-term effect to visitors in Lodgepole Flats would be visual. Areas where the forest has been thinned would have a different visual character than the existing, dense forest. The effect of this change would depend upon the sensitivity of the individual.

The overall difference in appearance would be a change to a more open mosaic of vegetation size class, structure, and species. The treated areas would retain a natural character more closely resembling the past forest conditions. The change in appearance of the treated areas may be noticeable but would not cause an adverse effect to recreationists.

Mt. Elbert Forebay. Several of the treatment areas would be in the Mt. Elbert Forebay area, primarily affecting dispersed camping along FDR 125D and 125F. In 1998, approximately 70 fire rings and associated dispersed campsites were counted on NFS lands surrounding the reservoir. During treatment, these campsites and access to them may be closed for varying periods. After treatment, visitors utilizing these areas would observe a more open ponderosa pine forest. The treatments would not affect their ability to use the area or adversely affect their recreational experience.

Possible short-term effects to recreation facilities located south of the Project Area in the vicinity of the Twin Lakes Recreation Area would be noise related to the increased traffic from logging trucks and treatment activities, and possibly smoke from the prescribed burns. Other short and long-term effects to the area would be similar to those discussed above for Lodgepole Flats.

Other Effects. An indirect effect of the vegetation/timber stand treatments would be the reduction of fuel loads and the potential for damage to recreational resources due to a catastrophic fire. The Proposed Action, which would result in a mosaic of vegetative size class, structure, and species beneficial to wildlife, could also increase the opportunities for wildlife watching, bird watching, hunting, and aspen viewing. These recreational activities could augment Lake County-based tourism opportunities.

Effects of Road Reclamation on Recreation

The seasonal road closures would take place on FDR 160, 130 (west of intersection with 130A), 130B and 136. Since the seasonal road closures would take place primarily during the snow months, the effects on summer-motorized recreationists would be minor.

The closure and obliteration of the non-system roads in the Project Area could potentially affect those recreationists who have become accustomed to using these roads. The effect should be minor since there are still existing system roads providing the same level of recreational access but in a sustainable manner. The reclamation could also affect any individuals who may use the non-system roads for hiking or mountain biking but there are many other opportunities in the area for these activities so the effect would be minor.

Cumulative Effects

Mechanical harvest treatments and prescribed burning combined with the proposed actions would result in a cumulative increase in management activity in the Project Area. For a period when activities are concurrent, the cumulative effect may increase the feeling of crowding and negatively affect the recreation experience. This effect would be short term while activities are completed. The long-term cumulative effect of these combined actions would be a reduction in the potential for adverse effects to recreational resources due to a large catastrophic fire.

Another potential cumulative effect in the Project Area is the increased popularity of the area for recreation activities since the actions would provide substantial improvements to a moderately used recreation resource.

Alternative C – Mechanical Harvest Emphasis

Direct, Indirect Effects

Alternative C would have the same direct and indirect effects on recreation as Alternative B except as described below.

Alternative C proposes a harvest emphasis compared to the Proposed Alternative. This shift in tools is proposed for prescriptions located in the Lodgepole Flats area only. This alternative, in general, would result in more precise tree removal and less fire scarring of residual trees and resulting decay. It would appear Alternative C would result in a decrease of smoke produced since there is a shift to harvest tools, however, prescribed fire would also be used.

Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects on Alternative B.

Alternative D – Fire Tool Emphasis

Direct, Indirect Effects

Alternative D would have the same direct and indirect effects on recreation as Alternative B except as described below.

Alternative D proposes a fire emphasis compared to the Proposed Alternative. This shift in tools is proposed for prescriptions located in the Lodgepole Flats area only. This alternative, in general, would result in less precise selection of tree mortality compared to manual cutting causing a proportional increase in fire scarring and subsequent decay.

With the shift from harvest to fire in this alternative as compared to the Proposed Alternative, there would be an increase for smoke produced from these sites. However, these areas would still be subject to prescribed burning in Alternative B, and the additional smoke produced from the downed trees may not be noticeable to most visitors.

An indirect effect of this alternative is the short and long-term effects on recreation due to the change in wildlife risk. Because of the increased CWD left on the ground, this alternative would have a greater increase in short-term fire risk as compared to Alternative B. The long-term reduction in fire risk would be the same for both alternatives.

Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects on Alternative B.

Visual Resource

Alternative A – No Action

Direct, Indirect Effects

Under this alternative, the vegetation will continue to decline and a loss of scenic quality will result. The area would then not comply with the LRMP standards.

The general decline in scenic quality would affect recreation use as well. This decline could also lead to an increased potential for a catastrophic wildfire, which would result in a total, lose of recreation opportunities in the area.

Cumulative Effects

A continual decline in this area along with a general decline in other areas would result in a loss of scenic quality throughout the San Isabel National Forest.

All Action Alternatives B, C and D

Direct, Indirect and Cumulative Effects

The treatments will be visible to people driving through on the road system. Due to the topography of the area, the treatments, for the most part, will not be very visible from the highway or most housing developments. In the long term, the vegetation will improve and scenic quality should improve.

There will be less risk of a catastrophic wildfire, which also lessens the risk of large, intense burn areas.

Transportation

Alternative A – No Action

Direct, Indirect Effects

The No Action Alternative will not implement seasonal closures, additional administrative use only road miles, or convert a small section of non-system road to a non-motorized trail.

The No Action Alternative will not alleviate the resource problem the excessive number of travel routes is causing. However, if closures of user-created routes are implemented through other actions, such closures will mitigate some of the resource damage.

The current FS policy limits travel to National Forest System Roads (NFSR) designated with a number and marked on the ground by a white arrow (Forest Order # 91-01, 9/3/1991), which stands and this will occur regardless of the decision on this project.

The BLM manages the area as a “limited” travel management area, meaning travel is restricted to existing roads and trails, or those present before May 1996 (when the RMP was signed).

Depending on the timing of this action, or stages thereof, indirect effects of not adopting road closures as part of the Box Creek project could include proliferation of additional non-system roads created by users.

Cumulative Effects

The cumulative effects of No Action Alternative on the transportation system**,** with the addition of more user-created roads, could be that the ever-increasing road network would channel so much water that the roads (including maintained system routes) would not be sustainable.

All Action Alternatives – B, C and D

Direct, Indirect Effects

All action alternatives would close approximately 30.5 miles of roads (14.9 miles of non-system and 1.3 miles of system roads on BLM lands and 11.6 miles of non-system and 2.6 miles of system roads on FS lands), and include approximately 7.5 miles of seasonal closures (Map 4). All roads not assigned as a System Road on FS and BLM lands following this decision will be permanently closed and rehabilitated. Closure may include ripping and seeding, use of a closure order, gates, barriers or a combination of methods. Road rehabilitation may include ripping, recontouring and seeding with native grasses, fencing, gates, and/or placement of boulders to ensure rehabilitation efforts are undisturbed. Motorized activities will be restricted to system open roads. Newly created routes will be closed as soon as possible after discovery. Forest Protection Officers will monitor closures once implementation begins, make public contact to inform and educate about the closures, as well as issue violation notices. Nonmotorized uses will be allowed on closed roads. Seasonal closures for resource protection from December 1 through May 31 will be placed on identified roads.

Implementation of road closures and obliteration of non-system roads would decrease road densities allowing for a decrease in erosion, benefit wildlife, and allow for a more effective transportation system. Use of gates, barriers and road rehabilitation are proven effective measures for road closures. Protecting rehabilitation would allow the road to be effectively closed.

Seasonal closures for resource protection from December 1 through May 31 will be placed on roads identified on the transportation map. Four seasonal closure gates will be installed for these closures and the wildlife closure described above. Administrative use (i.e., official use by BLM or FS authorized personnel) may occur at times.

Cumulative Effects

Cumulatively, reduction in miles of road will make the transportation network easier to manage. There will be less resource damage from erosion from unclassified roads. The reduced road density will allow wildlife to utilize more of the project area. Keeping users on properly built and maintained roads will make motorized recreation safer in the Box Creek project area.

All Action Alternatives being equal regarding the transportation system, the table below shows the net difference in mileage between the No Action and Action Alternatives.

Table 3-6. Mileage Breakdown by Current Road Status

Proposed	BLM			Forest Service			TOTAL
	Total Miles	System	Non-system	Total Miles	System	Non-system	
Open all year	2.62	2.15	0.47	6.05	5.29	0.76	8.67
Gated seasonal closure	1.11	1.11	0.00	6.43	6.43	0.00	7.54
Gated all yr, admin. Use	0.00	0.00	0.00	7.41	7.09	0.32	7.41
Closed & restored	16.24	1.31	14.93	14.17	2.59	11.58	30.41
GRAND TOTAL	21.11	5.06	16.05	34.46	21.40	13.06	55.57

Table 3-7. Mileage Breakdown by Alternative

Proposed	No Action Alternative			All Action Alternatives			NET DIFF
	Total	BLM	USFS	Total	BLM	USFS	
Open all year	48.23	21.11	27.13	8.67	2.62	6.05	-39.56
Gated seasonal closure	0.00	0.00	0.00	7.54	1.11	6.43	7.54
Gated all yr, admin	7.33	0.00	7.33	7.41	0.00	7.41	0.08
Closed & restored	0.00	0.00	0.00	30.41	16.24	14.17	30.41
TOTALS	55.57	21.11	34.46	55.57	21.11	34.46	0.00

Wildlife

The effects of the alternatives on wildlife are based on expected changes in habitat and specific criteria contained in the Forest Plan and Resource Management Plans. Table 3.3 lists the MIS for the PSI and those selected for this project. These species are addressed in this section of the EA. Other wildlife species are discussed in the Biological Assessment (federally listed,) and Biological Evaluation (FS and BLM sensitive) located in the project record.

For habitat capability analyses (HABCAP) in this section, the habitat types determined by LANDSAT thematic mapping and ground verified were selected on National Forest lands and were converted to cover types used by the HABCAP program (Table 3.2).

FOR ALL ALTERNATIVES

No treatments will occur within the water influence zone (or 300 ft of streams).

Alternative A – No Action

Direct, Indirect Effects

Vegetation Treatments

The habitat capability for MIS addressed in this assessment would remain at the existing level for the short-term (Table 3.8). There would be no direct effects to wildlife under this alternative. This alternative would result in forest conditions similar to current conditions. Tree growth would continue to be suppressed in dense stands, and habitat structure would continue to be homogenous. Species associated with late successional/old-growth forests

(three-toed woodpecker and marten) would continue to use forested stands where these conditions occur. However, these species' presence would likely be limited by the availability of these forest characteristics. Similarly, species associated with early successional habitats for foraging (bluebird, deer, elk) and species associated with snags and CWD (bluebird, sapsucker, three-toed woodpecker, marten) would continue to be limited by the relative lack of these habitats and structures within forested areas. This alternative provides an abundance of ungulate cover at the expense of quality foraging habitat (Tables 3.8 and 3.9). As a result habitat capability for mule deer and elk is somewhat limited in the area.

ROAD RECLAMATION

This alternative would result in no change in the current road system within the watershed (Tables 3.6 and 3.7, road summaries). Summer and winter mule deer and elk habitat effectiveness (Table 3.8) remains very low in all management areas because of the number of roads in the area.

Unlike the modeling efforts that generate relative effects of road densities for deer and elk, the specific number or density of roads required to cause affects to most species are not well known. The following is a discussion of general effects of roads on wildlife without specific effects. Many of these effects likely occur in relation to the number and density of roads within the watershed.

Roads convert large areas of habitat to non-habitat (Hann et al. 1997, Wisdom et al. 2000). Construction of roads removes habitat that could otherwise be continuous interior forest habitat and creates new edge habitat. Increasing edge diversity of avian species may adversely affect interior species (Anderson et al. 1977, Hanowski and Niemi 1995). In addition to effects caused by the conversion of habitat to road surface, forest roads cause changes in habitat and animal behavior, which result in changes in wildlife populations (Lyon 1983). Roads fragment habitats by changing the structure of the landscape. Roads dissect patches of vegetation, which increase the area of edge habitat and decrease the area of interior habitat.

The presence of a forest road and not its associated use can have adverse effects on populations by creating barriers to dispersal. Some small mammals will not cross roads (Oxley et al. 1974, Swihart and Slade 1984). Both of these studies suggest that the inhibitory effect of roads may have adverse effects on population genetic diversity. The avoidance of roads, causing displacement, is common in large and small mammals. Areas of off-road vehicle use have a lower diversity, density, and biomass of small mammal species (Bury et al. 1977). Road avoidance is common in large mammals such as elk, bighorn sheep, and mule deer and avoidance distances of approximately 328 to 656 ft have been reported for these species (Lyon 1983).

Some forest interior species suffer increased rates of parasitism and predation through increased numbers of edge species. Robinson et al. (1995) found that as percent forest cover decreased, nest parasitism by brown-headed cowbirds increased for nine species of birds. They also found increased nest predation rates for nine species of birds and associated the decrease with forest fragmentation.

Table 3.8. MIS habitat capability and habitat effectiveness predicted by HABCAP in the Box Creek watershed.

	MIS **Habitat Capability** by Management Area[1] (Excludes Road Effects)								MIS **Habitat Effectiveness** by Management Area[2] (Includes Road Effects)							
Management Area	All		3A		4B		5B		All		3A		4B		5B	
Alternative	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**	**A**	**BCD**
Mule deer summer	0.82	0.95	0.69	0.92	0.77	0.93	0.88	0.97	0.79	0.92	0.69	0.92	0.75	0.92	0.83	0.93
Mule deer winter	0.53	0.59	0.09	0.14	0.42	0.48	0.69	0.72	0.51	0.59	0.09	0.14	0.41	0.48	0.65	0.70
Elk summer	0.64	0.85	0.48	0.76	0.60	0.86	0.73	0.87	0.40	0.59	0.47	0.76	0.42	0.74	0.39	0.50
Elk winter	0.60	0.71	0.38	0.38	0.54	0.62	0.72	0.82	0.38	0.59	0.37	0.38	0.38	0.62	0.39	0.58
Mountain bluebird[3]	0.27	0.35	0.16	0.35	0.13	0.19	0.39	0.44								
Red-naped sapsucker[3]	0.28	0.26	0.29	0.28	0.26	0.24	0.29	0.27								
American three-toed woodpecker[3]	0.20	0.15	0.38	0.29	0.12	0.10	0.17	0.13								
American marten[3]	0.18	0.14	0.40	0.32	0.21	0.18	0.08	0.07								

[1]The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife population. Higher habitat capability means an increased likelihood that the species needs will be supported in the area.

[2]The degree to which a physical wildlife habitat (food, water, shelter) is free from disturbances, and therefore attractive for wildlife occupancy. In habitat free from disturbance habitat effectiveness equals habitat capability.

[3]Quantitative road effects have not been established for these species.

Table 3.9. Potential Mule Deer and Elk Timbered Thermal and Hiding Cover on NFS lands within the Box Creek Diversity Unit (DU).

Area	FS Acres within Diversity Unit (DU)	FS Potential Forested Hab Acres	FP Cover Standards		Alt A Acres Timber Cover		Alts B, C, D Predicted Acres Timber Cover	
			% Hiding (acres)	% Thermal (acres)	Hiding	Thermal	Hiding	Thermal
DU 108	12,364	8,172	40 (3,269)	20 (1,634)	6,308	2,944	3,051	1,142
MA3A	5,670	2,048	No additional MA standards		1,348	1,222	631	432
MA4B	2,940	2,768	50 (1,384)	30 (830)	2,081	1,069	834	295
MA5B	2,675	2,335	50 (1,168)	20 (467)	1,934	355	641	117
Other non-treated MA's within DU	1,079	1,021	No additional MA standards		945	298	945	298

The LRMP FEIS defines hiding cover as "Vegetation capable of hiding 90 percent of a standing adult deer or elk from the view of a human at a distance equal to or less than 200 feet". Timbered vegetation contributing to hiding cover has generally been interpreted as pole/sapling, mature and old growth stands with greater than 30% canopy closure. This does not account for hiding cover provided by understory species, topography, or a combination of topography and vegetation.

Thermal cover is defined as "Cover used by animals for protection against effects of weather". In the past this has been interpreted as pole/sapling, mature and old growth stands with greater than 70% canopy closure.

Cover calculations for all alternatives in Table 3.9 only reflect Timbered Cover in the size and age classes described above. Quantitative measurements for estimating the value of topography and understory vegetation for hiding cover is not feasible. Cover requirements for deer and elk survival would be met following implementation of action alternatives, indicated by increased habitat effectiveness and habitat capability in Table 3.8. Additionally, recent literature (Cook et al. 1998) indicates that what is traditionally considered thermal cover (including the above timbered definition) can in fact have a negative energetic effect.

Based on the fact that 1) there is no direction for quantitatively evaluating thermal and hiding cover, 2) recent scientific literature brings into question what has traditionally been considered thermal cover, and 3) deer and elk habitat effectiveness and capability would be improved following implementation of action alternatives, forest plan cover standards would be met following implementation of action alternatives.

Travel along the existing road system may provide opportunities for the introduction of pests and may increase the presence of noxious weeds and forest diseases. Building and maintaining roads as well as travel on roads, may create wounds on trees as well as tree stumps, which provide infection areas for annosus root disease. This disease may spread to adjacent areas of suitable habitat. Increased levels of forest tree disease from roads and road use may contribute to already infected stands of trees.

Human use of the existing road system may cause reduced nesting and/or denning success. Human disturbance to nesting raptors such as northern goshawk are suspected as a cause of nest abandonment (Reynolds et al 1992). Female wolverines are sensitive to disturbance in their natal den sites and desertion has been documented by Copeland (1996) in Idaho.

Habitat loss and modification may also occur indirectly as a result of increased human activities facilitated by road access. Many species considered in this analysis are dependant on CWD and are adversely affected by increased harvest of snags and downed logs along roads (Hann et al. 1997). Human access facilitated by roads may also increase the likelihood of human caused wildfires. Wildfire has the potential to destroy habitat for all of the species considered in this analysis.

Human use of the existing road system causes some amount of road kill. Most forest roads are designed for low-speed travel. Therefore, direct mortality on forest roads is not usually an important consideration for large mammals (Lyon 1984). Forest roads present a greater hazard to small mammals, amphibians, and reptiles. Small mammals are often "trapped" within the roadbed by roadside burns. Although some levels of mortality from road kill occurs within the analysis area, it is unknown what effect this has on animal populations.

This alternative leaves 10.7 miles of open motorized routes on National Forest System (NFS) lands within elk production areas and therefore, does not meet the Forest Plan standard for protecting these areas from disturbance from May 15 to June 30.

Cumulative Effects

Cumulative effects are those effects of past, present, and future federal, state or private activities that are reasonably certain to occur within the action area.

Historic mining activities have occurred periodically since the 1850's and have had great impacts on wildlife. Much of the mixed conifer was harvested for mining timbers, fuelwood, and charcoal. The snags and CWD important for denning habitat was also harvested for fuel. Within most of the watershed, only lodgepole and aspen were regenerated, reducing species diversity. Following this period, the area incurred fire suppression, which prevented natural thinning of the predominately lodgepole stands and limited tree growth. These small, dense lodgepole stands were relatively homogenous and 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. Within the spruce-fir (subalpine) zone, harvest activities associated with mining also occurred, but probably occurred on a smaller scale because of steeper terrain. Fire suppression within the subalpine zone has created predominately mature stands of spruce and fir with pockets of aspen and lodgepole. In summary, 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). These features are inconsistent with high quality wildlife habitat.

Recreation activities have greatly influenced the travel system in the project area. Increased use of four-wheel drive vehicles for recreational use has resulted in an extensive "user-created" network of travel routes (unclassified routes; Table 2-5). These new routes become more established over time and eventually are viewed by the public as roads. The creation of new roads has decreased habitat effectiveness and capability within the project area. Other recreational activities within the project area have the potential to affect wildlife populations through disturbance. There are currently 3 non-motorized trails in the project area: 1) Colorado Trail/ Continental Divide National Scenic Trail (approximately 5 miles); 2) North Elbert Trail

(approximately 2 to 3 miles); 3) South Elbert Trail (approximately 2 to 3 miles). There are 17 permitted outfitter and guide operations providing 1,336 public service/user days with activities including hiking, backpacking, skiing, mountaineering, and horseback riding. There are actually 3 separate recreational events occurring under one special use permit within the project area. These Leadville trail races include a 100-mile mountain bike race (one day, 700 participants), a 100-mile trail run, and a 100-mile training run.

There are no developed recreation sites within the project area. Most dispersed recreation in the project area occurs within the Lodgepole Flats and Mt. Elbert Forebay area. In Lodgepole Flats, many people utilize the extensive roads network (both system and non-system) to walk their dogs, run, bike, hunt, target shoot, drive four-wheel vehicles, cross-country ski, and snowmobile. There are approximately 20 dispersed campsites in the Lodgepole Flats area used primarily by hunters in the fall season. Mt. Elbert Forebay is popular for dispersed camping with about 70 fire rings and associated dispersed camping sites in the area.

Other recreational activities within the project area include big game hunting and mountain peak climbing. The project area is entirely within Game Management Unit (GMU) 48. In 2001, there were approximately 900 hunters with deer and elk tags in GMU 48 that contributed to over 4,000 total recreation days as reported by the Colorado Division of Wildlife. Many of these hunters can be found in the project area because of good road access and dispersed camping opportunities in the Lodgepole flats and Forebay areas.

Based on trailhead register data for 2001, there were approximately 2,034 people who hiked on the Colorado Trail starting at the North Elbert Trailhead in the Halfmoon Creek drainage. From the South Elbert Trailhead in 2001, there were approximately 4,086 people who registered there carrying out activities such as hiking, backpacking, skiing, mountaineering and snowshoeing. Since many people choose not to register at FS trailheads, true user numbers are probably twice the recorded number.

Human access facilitated by roads may also increase the likelihood of human caused wildfires. Wildfire has the potential to destroy habitat for all of the species considered in this analysis. However, access facilitated by roads also allows firefighting personnel to shorten their response time to wildfire incidents and may decrease the potential of wildfire spread.

Wild and prescribed fire (past and planned) and the absence of fire change wildlife habitats within the project area. Since 1955, there have been more than 15 fire starts in the project area. Little acreage has burned to date but current fuel loading presents opportunity for that pattern to change. Planned burning projects within the project area include slash and pile burning within designated public fuelwood areas.

Most legal land claims found within the project area were established for right-of-way access needs. Holders of these permits and easements include the Bureau of Reclamation, Lake County, and the State of Colorado Department of Highways. These uses are long-term and are likely in perpetuity. The Box Creek project area is also transected by the Homestake water transmission pipeline, owned and operated by the Cities of Colorado Springs and Aurora. This use is also perpetual. There are no filings or proposals submitted to the Lake County Building Department for state or private expansions or developments adjacent to the project area.

The BLM is currently in the process of obtaining 160 acres of the Hallenbeck Ranch and 1,410 acres of the Hayden Ranch through a land acquisition that would move these lands into federal ownership and managed by the BLM. Although the acquisition is not part of this decision, the roads on these properties have been identified, and should the acquisition be completed, all roads are being analyzed in this document for closure. There are no known land transactions outside of the Hollenback/Herrington land exchange.

The latest BLM records (11/06/2002) show 13 active mining claims in the Box Creek project area. The same claimant, Corske LLC, owns all the active mining claims. Corske LLC does not have a Plan of Operations or Notice of Intent filed with the Leadville Ranger District. Field visits indicate no significant surface disturbing activity is taking place. Due to location of claims and the nature of mineral extraction, it is unlikely that heavy equipment will be used in the future. Hand tools, sluice box, and small suction dredging operations are applicable activities for the extraction of free flowing gold mineral in a placer operation. Although hand tool

activity requires a Notice of Intent to the local Ranger District, it does not require approval or NEPA analysis. If significant surface disturbance occurs, the District Ranger will request a plan of operation and a full NEPA analysis will occur. Due to the lack of mineral concentration and poor economic feasibility, it is unlikely mineral activity will increase. BLM records show an approximate total of 1,025 closed mining claims within the project area. Historical surface disturbance within the project area and the amount of closed claims in the area suggests historical mining activity, or mineral interest.

Claims cannot be staked in areas closed to mineral entry under certain acts, regulations, or public land orders. This is referred to as "withdrawn lands." Approximately 3,781 acres are withdrawn to mineral entry within the Box Creek project area. A significant amount of land was acquired by the bureau of Reclamation in the 1960s and was transferred to the National Forest System under the Frying Pan-Arkansas Project Act of 08/16/1962.

Compliance with laws regarding use of legal routes is confounded by the presence of unmarked existing roads. Public confusion about legal travel routes in the analysis area may, in part, because illegal route users to continue to create additional user created illegal routes (T. Martin, pers comm. CDOW 2002).

All Action Alternatives - B, C and D

Direct and Indirect Effects

Vegetation Treatments

Under these alternatives, vegetative conditions would change (Table 3-10) and have subsequent effects on wildlife habitat (Tables 3-8 and 3-9).

Table 3-10. Estimated acres of vegetation by type and structural stage for National Forest lands in the Box Creek Watershed following implementation of the Action Alternatives
Data from thematic LANDSAT mapping data and converted to HABCAP habitat types

VEGETATION TYPE	STRUCTURAL STAGE[1] (ACRES)									
	1	2	3A	3B	3C	4A	4B	4C	5	Subtotal
Aspen	0	0	686	90	361	0	0	0	0	**1,137**
Cottonwood riparian	0	0	0	0	0	0	0	0	0	**0**
Douglas-fir	0	0	0	0	0	0	0	0	0	**0**
Gambel oak	0	0	0	0	0	0	0	0	0	**0**
High Elev. riparian	0	0	0	0	0	0	0	0	0	**0**
Lodgepole pine	336	295	2,539	747	6	155	0	0	0	**4,078**
Mountain grassland	0	0	0	0	0	0	0	0	0	**0**
Mountain shrub	0	0	0	0	0	0	0	0	0	**0**
Pinyon juniper	0	0	0	0	0	0	0	0	0	**0**
Ponderosa pine	0	0	139	0	0	506	218	0	0	**863**
Sagebrush	989	0	0	0	0	0	0	0	0	**989**
Spruce-fir	8	0	782	9	39	153	0	54	384	**1,429**
Wet meadow	0	0	0	0	0	0	0	0	0	**0**
Subtotal	**1,333**	**295**	**4,146**	**846**	**406**	**814**	**218**	**54**	**384**	**8,496**

[1] Structural stage values are defined in the glossary.

COMMON TO ALL SPECIES

An increase in early seral stage habitats and a decrease in the stem density of other habitats will create an overall forest condition that is less susceptible to disturbance events (wildfire, insect and disease outbreaks) that are out of HRV. This would reduce the threat to large-scale loss of habitats for all species.

Project activities including mechanical harvest and prescribed burning will cause habitat modification. In the short term, vegetation treatments could directly remove cover, forage, nests, dens, and possibly juvenile wildlife that are unable to disperse. Decreases in cover could reduce concealment of nests and dens for species addressed in this evaluation (i.e., mountain bluebird, American three-toed woodpecker, marten, and other wildlife species), and could increase predation until under-story vegetation reestablishes and/or the over-story canopy fills in. Treatments opening the over-story canopy will increase the amount of herbaceous vegetation, with a subsequent increase of prey species, such as microtine rodents (e.g., red-backed voles). Beneficial effects to martens and other wildlife species could result from an increase prey. Change in small mammal communities in response to treatments is affected by individual sites (e.g., elevation, slope, aspect, size, vegetation community), and intensity, and time of individual treatments.

Prescribed fire and equipment associated with vegetation treatments may create opportunities for the introduction of noxious weeds. However, one action common to all action alternatives involves monitoring and removal of all such weeds. Smoke from prescribed fires may also disturb wildlife activities. These effects are largely temporary; species should return to these areas when the disturbance has ended.

MATURE FOREST SPECIES

Tree growth would be facilitated within dense stands of lodgepole pine treated with a thinning prescription and habitat structure within the watershed would be less homogenous. Species associated with late successional/old growth forests (three-toed woodpecker and marten) would continue to use forested stands where these conditions occur. The action alternatives will result in maintaining much of the suitable habitat for these species and provide for recruitment of habitat in the future.

SNAG AND CWD DEPENDENT SPECIES

Natural processes result in all living trees to become snags or CWD at some time. For many species of wildlife, CWD provides places for foraging, denning, hiding cover, hibernacula, increased moisture content, and nutrient recycling. All areas treated under action alternatives will retain and create additional CWD that are important habitat features of many of the species addressed in this document. Selecting retention trees within clumps will likely mimic the natural and historic distribution of snags on the landscape as disturbance events (insects, disease, fire, wind) generally occur within localized areas. This will benefit snag and CWD dependent species by providing these structural components in those areas in which these species would naturally use them.

Retention guidelines of a minimum of 40 retention trees per 5 acres of treatment area in these alternatives should target estimates of snag densities required for a variety of snag-dependant species (red-naped sapsucker, three-toed woodpecker, and marten). One of the highest snag density requirements for a species occurring within the Box Creek Watershed (hairy woodpecker) has been estimated at approximately eight snags per acre. Managing for species requiring the highest number of snags should facilitate management of species requiring lower snag densities.

Woodpeckers are territorial and only one pair of each species will occupy the same territory. Therefore, the eight snags per acre should be averaged over an area that approximates the smallest territory size of a management species. Territory size is variable, but estimates for species with the smallest territories (nuthatches, creepers) range from 3 to 5 acres. Therefore, managing for 40 retention trees per 5 acres should estimate the number of snags required to attain the maximum density of cavity nesters.

Current Forest Plan standards and guidelines call for the retention of 33 to 50 linear ft per acre of 10 to 12 inch diameter down-dead logs. This equates to approximately one average-sized downed tree per acre within the Box Creek Watershed. Although some studies have estimated the number of snags required by snag dependant species, guidelines from studies estimating the number of downed logs have not been well researched. However, inventories from the 1990's occurring in late to old-growth stands in the Pacific Northwest (Spies et al. 1988; reviews in Bull et al. 1997) suggest that the number of logs occurring in these stands may be closer to 100 per acre (6 in by 8 ft). Therefore, CWD retention guidelines in excess of Forest Plan minimums and incorporated into all project alternatives should increase the habitat quality for those species dependent on CWD. Slash pile creation guidelines will also benefit these species.

The increase in snags and CWD from retention and creation from mixed-severity fire will benefit red-naped sapsucker, three-toed woodpecker, marten, and other wildlife by creating additional snags that could be used for nesting and foraging. Mountain bluebirds will gain additional foraging and perch sites from additional snags. Marten will benefit from the increased numbers of snag and CWD dependent prey species that should accompany the increased number of snags and downed logs provided by the action alternatives.

Selected MIS for this project that have a stable or increase in habitat capability or effectiveness as predicted by the HABCAP model will have stable or improved population viability under the Action Alternatives. The population viability for the three species that have a decrease in habitat capability or effectiveness as predicted by the HABCAP model (i.e., red-naped sapsucker, American three-toed woodpecker, American marten**)** are discussed below.

Current LRMP MA standards are to maintain capability for MIS species at 70% or more of potential in MA3A and 80% or more of potential in MA4B and MA5B. All three species for which HABCAP predicts a short-term decrease in habitat capability have a habitat preference for advanced habitat seral stages. This decrease is not surprising, given the manner in which HABCAP generates capability estimates. In general, this is because land managers can convert later seral stage habitats to early stage habitats faster than they can convert early seral stage habitats to late stage habitats. It is not possible to create additional late seral habitat from earlier seral habitat in the short-term. This watershed project has as objectives, the retention of all old-growth seral stage habitats, and the conversion of some earlier seral stage habitats to old-growth habitats. The

long-term increase in late seral stage habitats as a result of implementation of the Action Alternatives will benefit these species despite reduced habitat capability in the short term.

In addition to changes in habitat types and structural stages, Action Alternatives include a reduction in the number of motorized route miles. The HABCAP model does not reflect the Action Alternative's decrease in motorized routes, which will increase the effectiveness of these species habitats. The HABCAP model predicts a very small immediate (0.02 to 0.05%) overall decrease in habitat capability for these species following implementation of Action Alternatives (Table 3.2-4). The HABCAP model includes various habitat structural stages when calculating habitat capability. In order to produce more late seral stage habitats, a small number of acres of these habitat types will temporarily be converted into less dense crown closures under the Action Alternatives. Because HABCAP cannot produce short-term increased habitat capability estimates for these species, decreased motorized route miles will increase habitat effectiveness, the project will generate additional late seral habitats in the long-term, and the decrease is very small and temporary, these populations are not anticipated to have adverse effects as a result of Action Alternatives. All MIS species analyzed for the Box Creek project action alternatives will maintain long-term habitat capability at least 80% of the no action alternative. Most MIS species also exceed 80% habitat capability of the no action alternative immediately following full project implementation illustrated in Table 3.8. In actuality ~1,100 acres in area 19 are now only being considered for fire use, and even though the project was analyzed to incorporate effects as if the area would be burned it is unknown when that may occur. Therefore, short term habitat capability is likely to exceed 80% of current habitat capability for all analyzed MIS species for Box Creek.

UNGULATES

LRMP forest wide standards require 20% of the Diversity Unit (DU) provide deer or elk thermal cover and 40% in hiding cover (p.III-32-33). The majority of the DU is comprised of Management Area (MA) 3A where emphasis is on semiprimitive nonmotorized recreation in roaded or nonroaded areas. MA 3A has no additional standards and guidelines regarding deer or elk cover requirements, so the forest wide standards of 40% and 20% of hiding and thermal cover respectively will be applied. The Forest Plan does not require any particular method of calculating thermal or hiding cover.

Thermal cover has generally been defined as habitats having crown closure 70% or greater. However, thermal cover exists on a continuum of crown closures and degrees of thermal cover are possible (i.e., habitats with 65% closure provide some thermal cover). Our method of determining crown closure (defined in Section 3.0) places habitats into categories (e.g. 30 to 70% and greater than 70% canopy closure) and therefore, would not reflect habitats with some thermal cover. Additionally, topographic relief can also provide both thermal and hiding cover. Cook et al. (1998) provided evidence that what has generally been considered thermal cover was in fact a costly energetic environment. While action alternatives provide a lower level of both traditional thermal and hiding cover than the no action alternative, Forest Plan cover standards will still be met when traditional thermal cover, other forested habitats, and topographic relief are considered. Additionally, action alternatives increase mule deer and elk habitat capability and habitat effectiveness (due to an expected increase in forage available in habitats converted to an early successional stage), indicating an improved situation compared to the no action alternative (Table 3.8).

ROAD RECLAMATION

The proposed road system is the same under all Action Alternatives Tables (Tables 3-6 and 3-7) and represents a decrease in open motorized route miles. Habitat effectiveness for elk increases from 0.40 to 0.59 in the summer and from 0.38 to 0.59 in the winter with these alternatives. Habitat effectiveness for mule deer increases from 0.79 to 0.92 (summer) and from 0.51 to 0.58 (winter) under these alternatives. Action alternatives are consistent with Forest Plan standards of maintaining at least 80% habitat effectiveness

because effectiveness is increased compared to the no action alternative (over 100% habitat effectiveness maintained).

Other general effects of roads on terrestrial wildlife (e.g., habitat loss and modification, changes in behavior, barriers to dispersal, displacement, increased rates of parasitism and predation, introduction of pests and forest diseases, reduced nesting and/or denning success, and road kill as describe under Alternative A) would occur in each of the action alternatives at levels less than under the No Action Alternative.

These alternatives would close 10.7 miles of open motorized roads currently open in elk production areas during the calving season. Action alternatives would leave zero miles of open motorized routes on NFS lands within elk production areas during the period May 15 to June 30 and therefore, meet the Forest Plan standard for protecting these areas from disturbance.

Cumulative Effects

Ongoing actions that would contribute to cumulative effects under this alternative would be similar to those discussed under Alternative A (No Action).

Alternative B – Proposed Action

Direct, Indirect Effects

Vegetation Treatments

Because the desired future condition remains constant under all Action Alternatives, this alternative will result in similar cover types and habitat structural stages as Alternatives C and D. The Proposed Action Alternative includes 3,101 acres of mechanical harvest and 4,994 acres of prescribed fire. A more detailed description of the differences can be found in the Vegetation Section above.

The portion of the watershed being treated with mechanical harvest would allow for a more precise removal of the targeted removal than prescribed fire and allow greater precision in determining the residual habitat characteristics. However, for any given sized area, mechanical treatment is more time consuming than prescribed fire and potential disturbance to wildlife species from noise of equipment would last longer than treatment with prescribed fire.

The portion of the watershed being treated with prescribed fire would result in less precise removal of the targeted removal than mechanical harvest. However, prescribed fire would likely result in mimicking natural disturbance events and creating a more natural mosaic of fire-killed trees. For any given area, prescribed fire can be implemented faster than mechanical treatments and potential disturbance to wildlife species from noise and smoke would not last as long as mechanical treatment.

ROAD RECLAMATION

See effects discussed under “Common to All Action Alternatives (B, C, and D)” section above.

Cumulative Effects

Ongoing actions that would contribute to cumulative effects under this alternative would be similar to those discussed under Alternative A (No Action).

Alternative C – Mechanical Harvest Emphasis

Direct, Indirect Effects

Because the desired future condition remains constant under all Action Alternatives, this alternative will result in similar cover types and habitat structural stages as Alternatives B and D. The harvest emphasis alternative calls for 585 acres to be shifted from fire to harvest tools, compared to the Proposed Alternative. A more detailed description of the differences can be found in the Vegetation Section above. Except for the small number of acres being treated with a different tool emphasis, the effects to wildlife of Alternative C are similar to Alternatives B and D discussed above.

Because more treatments would be implemented with mechanical treatments, there would be a more precise removal of the targeted removal than prescribed fire and more precision in determining the residual habitat characteristics. However, both mechanical and fire treatments are designed to mimic natural disturbance events. Therefore, there should be very little difference in the effects to residual vegetation composition and structure among the alternatives.

For any given sized area, mechanical treatments are more time consuming than prescribed fire and potential disturbance to wildlife species from noise in this alternative last longer than treatment with prescribed fire would in Alternatives B and D.

ROAD RECLAMATION SEE EFFECTS DISCUSSED UNDER "COMMON TO ALL ACTION ALTERNATIVES (B, C, AND D)" SECTION ABOVE.

Cumulative Effects

Ongoing actions that would contribute to cumulative effects under this alternative would be similar to those discussed under Alternative A (No Action).

Alternative D – Fire Tool Emphasis

Direct, Indirect Effects

Because the desired future condition remains constant under all Action Alternatives, this alternative will result in similar cover types and habitat structural stages as Alternatives B and C. The fire emphasis alternative calls for 1,959 acres to be shifted from harvest to fire tools, compared to the Proposed Alternative. A more detailed description of the differences can be found in the Vegetation Section above. Except for the small number of acres being treated with a different tool emphasis, the effects to wildlife of Alternative D are similar to Alternatives B and C above.

Because more treatments would be implemented with prescribed fire, there would be less precise removal of the targeted removal than mechanical treatments and less precision in determining the residual habitat characteristics. However, both mechanical and fire treatments are designed to mimic natural disturbance events. Therefore, there should be very little difference in the effects to residual vegetation composition and structure among the alternatives.

For any given area, prescribed fire can be implemented faster than mechanical treatment and potential disturbance to wildlife species from noise in this alternative would be shorter than mechanical treatment in Alternatives B and C.

Cumulative Effects

Ongoing actions that would contribute to cumulative effects under this alternative would be similar to those discussed under Alternative A (No Action).

Threatened, Endangered, and Sensitive Species

Table 3-11 Summary of determinations made for FS and BLM sensitive species in the Box Creek Watershed Project Biological Evaluation

Forested Plants	
Rocky Mountain Cinquefoil	… may impact individuals (Rocky mountain cinquefoil), but is not likely to cause a trend to federal listing or a loss of viability.
Weber's monkey flower	… may impact individuals (Weber's monkey flower), but is not likely to cause a trend to federal listing or a loss of viability.
Low northern sedge	… may impact individuals (low northern sedge), but is not likely to cause a trend to federal listing or a loss of viability.
Northern twayblade	… may impact individuals (northern twayblade), but is not likely to cause a trend to federal listing or a loss of viability.
Amphibians and Reptiles	
Boreal toad	…will have no impact on the boreal toad.
Tiger salamander	…may impact individuals (tiger salamanders), but is not likely to cause a trend to federal listing or a loss of viability.
Birds	
Boreal owl	…may impact individuals (boreal owl), but is not likely to cause a trend to federal listing or a loss of viability.
Flammulated owl	…may impact individuals (flammulated owl), but is not likely to cause a trend to federal listing or a loss of viability.
Golden-crowned kinglet	…may impact individuals (golden-crowned kinglet), but is not likely to cause a trend to federal listing or a loss of viability.
Northern goshawk	…may impact individuals (northern goshawk), but is not likely to cause a trend to federal listing or a loss of viability.
Olive-sided flycatcher	…may impact individuals (olive-sided flycatcher), but is not likely to cause a trend to federal listing or a loss of viability.
Peregrine falcon	…may impact individuals (peregrine falcon), but is not likely to cause a trend to federal listing or a loss of viability.
Pygmy nuthatch	…may impact individuals (pygmy nuthatch), but is not likely to cause a trend to federal listing or a loss of viability.
Three-toed woodpecker	…may impact individuals (three-toed woodpecker), but is not likely to cause a trend to federal listing or a loss of viability.
Mammals	
American marten	…may impact individuals (American marten), but is not likely to cause a trend to federal listing or a loss of viability.
Dwarf shrew	…may impact individuals (wolverine), but is not likely to cause a trend to federal listing or a loss of viability.
North American wolverine	…may impact individuals (dwarf shrew), but is not likely to cause a trend to federal listing or a loss of viability.

Forested Plants	
Townsend's big-eared bat	…may impact individuals (Townsend's big-eared bat), but is not likely to cause a trend to federal listing or a loss of viability.

Boreal toad. Although suitable breeding habitat exists in the project area, surveys conducted by the CDOW indicate there are no known toads in the Box Creek Watershed. Suitable breeding habitat is in untreated areas and will not be affected by project activities and suitable non-breeding habitat will continue to be present following project activities. Should toads repopulate the area (naturally or by re-introduction), suitable habitat will continue to be present. All project activities include practices that retain coarse woody debris (CWD; downed logs). We are actually increasing the amount of CWD that will benefit the species. Because boreal toads over-winter in burrows excavated by small mammals and slash piles, the Proposed Project may have a beneficial effect on toads by increasing small mammal habitat (downed logs and slash piles) and increasing burrowing habitat used for over-wintering. Because this species is not known to be present in the area, it is our determination that the Proposed Project will have no effect on boreal toad.

Bald eagle. Bald eagles use the Arkansas River (including the eastern edge of the project area) during winter months. No evidence of nesting bald eagles has been observed in the project area. The possible nesting activity recently observed on the Leadville Ranger District suggests that bald eagles may breed in suitable habitats in Lake County. In the project area, the Arkansas River is contained in a wide valley, without cliff or forested habitats containing large trees that could be potential nest sites adjacent to the river. Therefore, suitable nesting habitats are not present in the project area. The Proposed Action does not include any treatments in riparian habitats, including the riparian habitats along the Arkansas River where bald eagles have been observed during winter months. However, it is possible that trees used by eagles for roosting may exist in the treatment areas. If the Proposed Action removed one of these trees, eagles would likely find another suitable tree for roosting. In addition, it is possible that areas thinned will no longer provide thermal protection, or protection from severe weather conditions. However, it is unlikely that treatment areas provide winter roost sites. This effect would be small and of short duration. Therefore, it is our determination that the Proposed Project may affect, but is not likely to adversely affect, the bald eagle.

Canada Lynx. Proposed Project road reclamation will result in no net increase in groomed or designated over-the-snow routes and play areas and open motorized routes will be reduced below the 2 miles per square mile density suggested in the Lynx Conservation Assessment Strategy (LCAS) used for prioritization of seasonal closures or restrictions. Because this action does not convert currently non-system roads into federal system roads, and there will be an overall reduction in open motorized route miles in potential lynx habitat by 68% (summer) and 85% (winter), there will be a beneficial effect to this species.

Proposed project mechanical and fire treatments may have short-term, small, negative effects from noise disturbance as discussed above. Proposed activities will treat some denning and foraging habitat and may make some of this habitat ineffective. These activities would represent treatment of less than 1% of lynx denning and foraging habitat currently available in the Tennessee Pass LAU. Further, the Proposed Action project design will maintain most existing lynx denning and foraging habitat while creating additional future denning and foraging habitat and connectivity. The Proposed Action is consistent with the LCAS conservation measures. In the long-term, these actions are expected to beneficially affect Canada lynx and its habitat. However, because of the potential for short-term affects from disturbance, it is our determination that the Proposed Project may affect, but is not likely to adversely affect Canada lynx or its habitat.

Cultural Resources

Cultural resources are to be protected and preserved during the implementation of the treatments stipulated in the line officer's Decision Notice. Direct impacts to cultural resources can result from the actions of prescribed fire, road construction, and mechanical tree harvesting. These activities can negatively affect a site through the mixing or disturbing of archaeological soils. Vehicles can trample artifacts causing them to break or be altered and vehicle tires can wear away archeological soils or do worse damage in wet conditions. Vehicles and fire can damage or destroy standing historic structures or destroy archeological deposits. Indirect effects, primarily water erosion, are potentially just as damaging to archeological sites as direct

forces. Fire can reduce the amount of vegetation allowing soils to be stripped away by water exposing archaeological material.

Alternative A – No Action

Direct and Indirect Effects

This action would increase the likelihood of a high intensity wildfire that could damage standing historic structures. Fire would destroy standing trees and surface vegetation increasing erosion and loss of archaeological material.

Cumulative Effects

There should be no cumulative effects resulting from implementation of the No Action potential future actions will trigger NHPA mandated studies that contain assessments of effects cultural resources and recommendations for mitigation of harmful effects.

All Action Alternatives B, C and D

Direct and Indirect Effects

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

Cumulative Effects

Cumulative effects 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.

Watershed

Alternative A – No Action

Direct, Indirect Effects

The Watershed Effects Checklist, Table 3-13, and lists all effects required by the CWA, Multiple Use-Sustained Yield Act, NFMA, and the NEPA. This checklist ensures that all required effects are analyzed, gives a snapshot of effects, and identifies items to dismiss from rigorous analysis. A blank means no effect, "x" means minor effect and "xx" means substantial effect.

Table 3-12 - Watershed Effects Checklist

Aquatic Ecosystems	*Alt. A*	*Alt. B*	*Alt. C*	*Alt. D*
Sediment	***X***	***X***	***X***	***X***
Bed and Bank Stability	***X***	***X***	***X***	***X***
Flow Regimes	***X***	***X***	***X***	***X***
Temperature and Oxygen	***X***	***X***	***X***	***X***
Water Purity	***X***	***X***	***X***	***X***
Aquatic Life	***X***	***X***	***X***	***X***
TES Species	***X***	***X***	***X***	***X***
Soil Productivity				
Soil Erosion	***X***	***X***	***X***	***X***
Soil Compaction	***X***	***X***	***X***	***X***
Nutrient removal	***X***	***X***	***X***	***X***
Soil Heating	***X***	***X***	***X***	***X***
Regeneration Hazard	***X***	***X***	***X***	***X***
Geologic Hazards				
Landslides				
Soil Failures				
Earthquakes				
Special Areas				
Riparian Ecosystems	***X***	***X***	***X***	***X***
Wetlands	***X***	***X***	***X***	***X***
Floodplains	***X***	***X***	***X***	***X***
Cumulative Effects				
Aquatic Ecosystem	***X***	***X***	***X***	***X***
Soil Productivity	***X***	***X***	***X***	***X***
Riparian Ecosystems	***X***	***X***	***X***	***X***

The Special Designation Checklist identifies special values of concern.

Table 3-13 - Special Designation Checklist

Riparian management area	***X***
Drinking supply watershed	***X***
Impaired/threatened stream	
Jurisdictional wetlands	
Critical habitat (TES)	***X***
Wild and scenic river	
Critical watershed	***X***
Research Natural Area	
Rare ecosystem	

The special designations checklist provided in the Region 2 NEPA streamlining protocol identified special values that might require increased concern and protection. The special items that could be affected by alternatives in the Box Creek assessment are riparian management areas, drinking supply watershed, critical habitat for TES species and critical watersheds.

All Action Alternatives B, C and D

Direct and Indirect Effects

Sediment: Connected disturbed areas, like roads and other disturbed soils, near streams can deliver sediment directly to the stream system during runoff events. This sediment can be deposited in the stream, affecting insect populations and fish habitat. If severe enough, sediment can reduce a stream's productivity and diversity.

Several roads in the project area are connected to the drainage network. Some roads have inadequate buffers between the road and aquatic ecosystem to adequately filter sediments before they reach the streams. In addition, there are several stream crossings, most of which are culverts, in the analysis area, which also affect the aquatic ecosystem.

For this project, no new road construction is needed due to previous projects establishing the existing road network. Potential impact associated with roading of the area should be minor.

Alternatives B, C and D will produce more sediment in the short term than Alternative A. However, over the long term, total sediment loads produced will be lower under the Action Alternatives, due to the application of BMPs and Watershed Conservation Practices (WCPs) standards to the existing road system, the removal of roads from sensitive areas, disconnecting the road from the drainage systems, and the reduction of the risk of catastrophic fires in the area.

Of the Action Alternatives, Alternative B produces the least amount of sediment followed by Alternative D. Alternative C produces the most sediment due to management activities. These sediment increases are considered to pose minor effects on the watershed.

Bed and Bank Stability: Streambed and stream bank stability can be damaged from management activities. If sediment enters the stream channel, pools can fill with sediment, streams may become wider and shallower, and aquatic habitat could be lost. Unstable stream banks could become increasingly unstable through management activities, increasing the potential risk of unacceptable impacts to the aquatic ecosystem.

Under all Action Alternatives, minimal activity is planned in riparian areas. Colorado Forest Stewardship Guidelines (BMP's) will be followed. The issue of affecting wetlands and riparian areas was addressed in the design of the Action Alternatives.

The effects on streambed and stream bank stability posed by management activities in this analysis will be minor.

Flow Regimes: Flow regimes can be altered through major changes in cover type conversions or through removal of ground cover. Chemical, physical, and biological parameters can all be impacted through major changes in the flow regimes.

Under all Action Alternatives the changes in flow regime will be minor because of the type of proposed vegetative treatments and site preparation being planned. The increases in stream flow and water yield that will occur under any of the Action Alternative will return to pretreatment levels overtime, in approximately 30 years, as the stand become vegetated. This effect is considered short-term. Vegetating of disturbed areas will also accelerate the recovery rates of water yield increases in the analysis area.

Table 3-14 displays a relative comparison of water yield and sediment yield projections for all Action Alternatives.

Table 3-14 -Summary of Water and Sediment Yields

Water Yield (AF/Yr)					
Pristine	*Existing Increase*	*Alt. A*	*Alt. B*	*Alt. C*	*Alt. D*
11,032	***158***	***158***	***1,960***	***2,319***	***2,575***
Sediment Yield (T/Yr)					
Pristine	*Existing Increase*	*Alt. A*	*Alt. B*	*Alt. C*	*Alt. D*
349	***351***	***351***	***1,724***	***2,071***	***1,950***

AF/Yr = Acre Feet per year
T/Yr = Tons per year

Temperature and Oxygen: During the winter water temperatures decrease while during the summer months water temperatures increase. Removing of streamside vegetation can alter stream temperature during the summer months. Oxygen typically is not a problem in mountainous streams because of the step/pool stream system. However, dissolved oxygen can be reduced in summer months if water temperature is increased. Dissolved oxygen is important to the life cycles of aquatic biota.

There will be no effect upon water temperature and oxygen levels under Alternative A. Alternatives B and C pose the least effect on temperature and oxygen of the Action Alternatives. This is due primarily to the placement of the harvest units. Alternative D poses the greatest risk to water temperature and oxygen levels because of the number of acres to be burned under this alternative.

Water Purity: Having concentrated pollution sources near the drainage network can impact water purity. Impacting water purity can degrade water quality beyond designated beneficial uses and degrade the aquatic ecosystem.

Of the Action Alternatives, Alternatives B and C pose the least affect to water purity because of the placement of the harvest units on the landscape, the power to control potential impacts through a timber sale contract and the ability to implement conservation measures. Alternative D poses the greatest risk to water purity because of the large area to be burned, increases in organic carbon concentrations and limited ability to provide effective protection measures for controlling pollution sources.

There will be no effects to the Public Water Supply from any of the Action Alternatives.

Aquatic Life Uses: Aquatic life can be degraded by migration barriers, changes in flow regime, reduced riparian and wetland conditions, and through large influxes of sediment or chemicals.

At each stream crossing there is a potential to create a barrier to aquatic life migration. Culverts, if not properly installed or sized, can restrict aquatic biota movement. Also, leaving the culverts in while the road is closed leads to increased maintenance cost and the potential for culvert failure. This leads to long-term potential impacts from increased sediment loads as well.

Impacts from all Action Alternatives would be minor because the road network for this management activity exists and the ability to improve conservation measures and BMP's for roads through this proposal. Alternative B poses the least effect on aquatic life due to the placement of harvest units and maintenance that will be done for the timber sale under the timber sale contract, followed by Alternatives C and D. All roads scheduled for rehabilitation and closure will have the culverts removed and the stream channel banks will be re-contoured to their original conditions.

Soil erosion: Severe erosion can impair long-term soil productivity if soils are heavily disturbed on shallow or highly erodible soils. Because the road network is already in-place, the potential to increase erosion over existing conditions is minor. Alternative B poses the least affect to soil erosion followed by Alternatives C and D. Following conservation practices and requiring revegetation of all disturbed sites will reduce potential impacts from soil erosion.

Soil Compaction: Soil compaction is caused by weight of vehicles and animals. It impairs infiltration, root growth and soil biota.

Soils in the project area are subject to compaction by heavy equipment; log landings and temporary roads if operations occur when soils are wet. The effect of all Action Alternatives will be minor with the application of conservation measures and application of timber sale contract provisions, such as pre-approval of skid trails.

Nutrient Removal: Soil fertility depends on organic matter and nutrients. Soil productivity can be degraded if humus and topsoil, including excess leaves and limbs, are taken off-site.

Because of the type of silvicultural treatments proposed the potential impact from all Action Alternatives will be minor. Alternative B poses the least risk to nutrient removal followed by Alternative C. Alternative D poses the greatest risk to nutrient removal because of the large area to be burned. These nutrients could be flushed further down in the watershed during rainfall and snowmelt runoff events.

Soil Heating: Severe fires that consume the humus and litter layer of the soil cause soil heating. Soil heating can sterilize the soil and removes nutrients from the site.

Alternative D poses the great risk to soil heating from all Action Alternatives. Because of the large area to be burned under this alternative it is likely that hydrophobicity of the soil will be increased. Although all treated acres will receive a light burn to deal with slash and reduce fuel loads, Alternative D proposes vegetative treatments with the use of fire. This requires a much hotter burn to accomplish the treatment objectives. Alternatives B and C pose the least risk to soil heating and to soil hydrophobicity from fire.

Regeneration Hazard: Forested stands must be restocked in 5 years after a final silvicultural treatment. Regeneration of a site can be affected by seedling mortality, plant competition, and other factors.

Because the soils are stony and nutrient limited in the analysis area, the potential for reforestation is moderate. With scarification provided by logging, and based upon the evidence of regeneration from past harvests, the degree to which the stoniness of the soils will effect reforestation will be minor under all Action Alternatives.

Geologic Hazards: Soil creep, debris avalanches and flows, slumps and earthflow can occur on unstable slopes if management activities occur on unstable ground. The degree of hazard will depend on the type of disturbance, nature of the material and water content.

Because the existing road network is already in-place, and the proposed treatments are on slopes less than 25 percent, the potential impact for all alternatives is minor.

Special Areas: Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to the aquatic ecosystem. They also provide wildlife habitat, migration corridors, sediment storage and releases, and surface-ground water interactions. Composition and structure of riparian vegetation can be changed by actions that remove certain species and age classes.

Emphasis was placed on location of the silvicultural units to minimize effects on riparian ecosystems and the timber sale contract provides for protection of riparian areas. For these reasons, the effect from Alternatives B and C will be minor. Effects from Alternative D will be much higher than Alternatives B and C because of the limited protection that could be provided to riparian areas, burning of the riparian vegetation and loss of vegetative vigor of the riparian area.

Wetlands: Wetlands control runoff and water quality. They also recharge ground water and provide special habitat for wildlife. Actions impacting wetlands can impair these special values.

The effects of the timber harvest in the Action alternatives will be minor due to the avoidance of them during the planning of the harvest units and the application of conservation measures during the implementation of the activity. In addition, all Action Alternatives provide for disconnection of the existing road system to

wetland through the obliteration and rehabilitation measures. Alternatives B and C pose the least effect to wetlands while Alternative D poses the greatest risk to wetland functions.

Floodplains: Floodplains are natural escape areas for flood flows. They also control flood stages and velocities during flooding events.

The effects on floodplain functions will be minor from all Action Alternatives. The rehabilitation and obliteration of roads, removal of culverts and re-contouring of stream banks will remove current stream channels constrictions leading to reduced risk of flood damages during flooding events.

All Action Alternatives B, C and D

Cumulative Effects

Factors related to watershed cumulative effects were considered during the analysis of this project. Special consideration was given to:

- Additive effects of past and present activities.
- Location of proposed disturbances related to sensitive areas and degraded systems.
- Severity and duration of the disturbances and their effects.
- Potential effects on State designated beneficial uses of the water.
- Potential effects on aquatic life limiting factors.
- Potential effects on soil productivity.
- Potential recovery of watershed conditions and the potential of the project to aid in improving watershed conditions.

There are several activities currently occurring in the Box Creek Watershed. There is a subdivision in the lower portion of the watershed and a public water supply pipeline crossing the project area. In addition, the Box Creek Watershed is also used for dispersed recreation activities such as fishing, hunting, hiking, driving for pleasure, and off road vehicle use. All these activities pose potential impacts to the water resource and aquatic life. There is a certain level of risk taken when management activities pose impacts to a watershed. Additional risk is posed by periodic natural disturbances, which vary in size, duration, and intensity. However, by following Watershed Conservation Practices/Best Management Practices, listed in Appendix B, and properly implementing them the risk to watershed conditions and designated beneficial uses posed by this project can be reduced to acceptable levels.

Soils

Alternative A – No Action

Direct and Indirect Effects

The No Action Alternative would see increased or maintained erosion rates due to the continued use of non-system roads. These roads do not have erosion control structures such as water bars and are often steep and rutted. This may be worsened with continued and/or increased usage.

Without any vegetation treatment, the area will remain in dense lodgepole pine stands, and no understory growth will be stimulated without a large-scale disturbance.

Cumulative Effects

The proliferation of more user-created spurs off of the existing unclassified routes would cause additional erosion. Increased recreation will continue to negatively impact the soil resource. Compaction will also be negatively affected if such routes are allowed to be created and utilized.

There is an active gravel pit just to the north of the project area. It is on flat ground and there are no watercourses close by for sediment to impact. This should not cumulatively add to erosion or take away from overall soil productivity in the area.

Historically, this area has undergone heavy resource impacts. Much of the lower part of the watershed was deforested and stumps were burned in-situ for charcoal around the turn of the century. Charcoal can still be found today just below the soil surface, indicating that stump-burning and possibly other types of fire were prevalent across the landscape. These impacts are still evident today, and to what extent this disturbance has affected the succession of this ecosystem can not be quantified. However, the historical use of Box Creek could be responsible for erosion and lack of soil productivity, both past and current. This is because revegetation of the area consisted of dense "dog hair" stands of lodgepole pine, which has restricted understory growth.

Common to All Action Alternatives

Harvesting will affect compaction negligibly. This is due to the coarse-textured soils and till substratum in the area. Sediment will increase initially; however, design criteria and mitigations outlined in Chapter 2 and Appendix B will alleviate these short-term increases. Surface fire is favorable for nutrient cycling and the regeneration of certain vegetation to help stabilize slopes.

Vegetative treatments create the opportunity for understory species to revegetate the area, slowly increasing soil productivity and deterring erosional processes. Opening stands with mechanical and/or fire treatments is beneficial for long-term soil functionality.

Alternative B – Proposed Action

Direct and Indirect Effects

This alternative would reduce erosion by implementing road closures. It would likely contribute to lessened erosion indirectly by reducing the probability of a catastrophic wildfire in the project area, which is more likely to occur under Alternative A. This alternative will produce more short-term erosion than the No Action Alternative, but will reduce erosion over the long-term.

Mixed severity fire would have the ability to increase hydrophobicity in the watershed. This usually occurs in moderate to high severity burn areas in granitic soils under coniferous cover. This will slow infiltration, thereby increasing runoff. In decomposed granite soil types at dry sites, the resulting erosion can last several years. The Forest Plan dictates no more than 15 percent of soils in a project area will be left in a severely burned and/or eroded condition, so keeping high severity fire to a minimum will ensure compliance. Minimizing high severity burn areas will also reduce nutrient removal.

Soil compaction would be negligible due to harvest. Due to the very rocky and coarse-textured nature of the upland soils, harvest operations in the dry season should not increase compaction more than the threshold 15 percent. However, length of skid trails should be minimized, especially where existing roads are not present to reduce soil disturbance and displacement. Disturbing soils that have so little organic matter, duff, or vegetation to stabilize them will increase the erosion potential at the activity site.

Cumulative Effects

There is an active gravel pit just to the north of the project area. It is on flat ground and there are no watercourses close by for sediment to impact. This should not cumulatively add to erosion or take away from overall soil productivity in the area.

The impacts from historical use of this area are still evident today. The effects of this disturbance has affected the succession of this ecosystem are not easily quantified. Past use in Box Creek could be responsible for erosion and lack of soil productivity, both past and current due to restricted understory growth.

Alternative C – Mechanical Harvest Emphasis

Direct and Indirect Effects

This alternative increases harvest acreage and decreases proposed burn acreage by 3 percent each from Alternative B. The acres treated on the ground for Alternative C are the same as alternative B are the same spatially; therefore, erosion hazard potential does not change due to treatment polygon location, rather by the treatment itself.

It depends on the proposed harvest method and how much soil will be displaced, as opposed to how much of the mixed severity fire becomes moderate or high severity as to how much soil can potentially be moved downslope.

The proposed harvest acres in Alternative C will produce the most sediment due to mechanical harvesting. This will result in more short-term erosion than the No Action Alternative, but will reduce erosion over the long-term. Road closures will help counteract some of the short-term erosion increase.

Compaction should be negligible if Forest Plan guidelines for operating during the dry season areas followed due the very rocky and coarse-textured nature of the upland soils in the watershed.

As outlined in the Actions Common to All Action Alternatives section in Chapter 1, it is recommended that some limbs and other debris from harvest remain on-site to minimize nutrient removal.

Cumulative Effects

Road closures must be enforced to ensure reduced erosion under this alternative. If not enforced, the closures may not be effective and, as in Alternative A, more user-created routes may be created.

There is an active gravel pit just to the north of the project area. It is on flat ground and there are no watercourses close by for sediment to impact. This should not cumulatively add to erosion or take away from overall soil productivity in the area.

The past impacts contribute to current erosion rates. Revegetation of lower Box Creek with understory species after vegetative treatments will counteract years of minimal nutrient cycling at such sites, adding to soil productivity overall.

Alternative D – Fire Tool Emphasis

Direct and Indirect Effects

This alternative increases fire acreage and reduces harvest acreages of the project area,. Alternative D poses the most risk to soil heating and hydrophobicity of all the Action Alternatives, but may also stimulate understory growth the fastest.

Soil heating would potentially affect soils by increasing nutrient removal, and hydrophobicity, thereby decreasing infiltration. This is a short-term impact with hydrophobicity residence times in granitic soils shown to be less than two years (Huffman, et al., 2000).

Cumulative Effects

Road closures must be enforced to ensure reduced erosion under this alternative. If not enforced, the closures may not be effective and, as in Alternative A, more user-created routes may be created.

There is an active gravel pit just to the north of the project area. It is on flat ground and there are no watercourses close by for sediment to impact. This should not cumulatively add to erosion or take away from overall soil productivity in the area.

How the historic use impact will add to proposed effects is hard to predict, but should, at a minimum, alleviate the past effects of total devastation to the lower project area.

Comparison of Effects

Road closures will be implemented except for the No Action Alternative. All Action alternatives are very similar acreages being treated. Alternative D has the fewest proposed acres of treatment.

Alternative C has the least proposed fire acreage (mixed severity and surface) and therefore, the lowest potential for soil heating and hydrophobicity: Alternative B would shave a similar potential. Alternative D has the highest potential for soil heating and hydrophobicity amongst the Action Alternatives.

Nutrient removal could be positively or negatively impacted with any of the action alternatives. Nutrient removal could be high in the fire emphasis Alternative (D) initially, but would provide long-term benefit via the re-establishment of understory species. Alternatives B and C have very similar acreages proposed in both fire and harvest acreage and therefore have very similar risks for nutrient loss. Emphasizing debris from harvest be left on-site will mitigate other nutrient loss. Such debris will also help prevent soil erosion after mechanical and prescribed fire treatments take place.

Alternative C has the most acres proposed for harvest and D the least. Compaction should be negligible for all of the Action Alternatives due to harvest, though the harvest emphasis alternative has the greatest potential to compact soils.

The possibility of wildfire in Box Creek, though not a “reasonably foreseeable” event, exists due to recent drought conditions and current stand structure. Watersheds denuded by wildfire are vulnerable to accelerated rates of soil erosion and can yield large amounts of post-fire sediment.

Alternative B has a balanced mix of tools to achieve the desired vegetative conditions that will produce a mosaic on the landscape. This will allow the soil resource to move toward its desired future condition as part of a more diverse and productive system.

Econonmic Efficiency

Economic efficiency is a comparison of those costs and benefits that can be quantified in terms of actual dollars spent or received within the project. Present Net Value (PNV) is an indicator of economic efficiency and is one tool used in conjunction with many other factors in the decision making process.

Economic efficiency considers the benefits and costs associated with implementing each alternative. This analysis will display timber value market costs and benefits, although there are many non-market benefits and costs. Examples of non-market benefits are watershed and wildlife habitat improvement, and activities to reduce the spread of noxious weeds. Examples of non-market costs are erosion, sediment into streams and invasion of weeds onto forested lands. These resource values are discussed under each resource in the EA. This is not to imply that such values are not important, but recognizes that non-market values are difficult to represent with approximate appropriate dollar figures.

Management of the forest is expected to yield positive benefits, but not necessarily financial benefits. Economics are assessed within the managerial context of the Forest Plan and other policy and law, as a part of an integrated approach to multiple-use management. Net public benefits represent the sum of priced outputs (PNV) plus the net benefit of non-priced outcomes. Net public benefits cannot be expressed as a dollar value because many of the outcomes of management are not quantifiable in monetary terms.

Table 3-15 displays the economic efficiency analysis for quantifiable costs and benefits that change by alternative. This analysis utilized the Quicksilver Economic Model. Inputs used were from fiscal year 1998 timber costs (TSPSIRS) 3 year averages for harvest administration, sale preparation and appropriated reforestation. Brush disposal, gate installations, prescribed fire and fuel treatment inputs were based on previous District project costs. Actual timber volumes could differ from the amount used in this analysis. Historically small tree products are low in value.

Table 3-15. Estimated Costs and Revenue by Alternative

	Discounted Total Costs	Discounted Total Benefits	Discounted Present Net Value
Alternative A	-$234,483	$67,325	-$167,155
Alternative B	-$633,545	$822,539	$188,994
Alternative C	-$616,740	$822,539	$205,799
Alternative D	-$202,091	$452,238	-$250,146

Alternative A – No Action

Direct and Indirect Effects. This Alternative would have benefits totaling $67,325 from current stewardship personal permit for post and pole/ firewood activities. Costs to prepare stewardship sales including road slope stabilization, stewardship sale preparation and administration and brush disposal would run $234,483 leaving a Present Net Value of -$167,155. Road closure and/or obliteration costs were not considered because the roads in this alternative are currently under closure orders. There is no resource benefiting treatments identified in the costs.

Costs:

Activity	Years	Quantity	Value

Road Slope Stabilization	**One time**	**2.0 miles**	**$1,200.00**
Stewardship Sale Prep	**Annual for 1-8 years**	**500.CCF**	**$46.83 / CCF**
Stewardship Sale Admin	**Annual for 1-8 years**	**500 CCF**	**$17.96 / CCF**
Brush Disposal	**Annual for 1-8 years**	**500.CCF**	**$1.50 / CCF**

Benefits:

Activity	Years	Quantity	Value
Stewardship Sale Revenue	**Annual**	**500 CCF**	**$42.00 / CCF**

Alternative B– Proposed Action

Direct and Indirect Effects. This alternative would have benefits totaling $822,539 including some timber value (1,000 CCF per year). Costs considered under this alternative included road obliteration and closures; fuel treatments, prescribed fire treatments, stewardship sale preparation and administration would be approximately $633,545 leaving a Present Net Value of $188,994. Wildlife habitat values were not interpreted with an economic value.

Costs:

Activity	Years	Quantity	Value
Road Obliteration	**One Time**	**14.17 miles**	**$300.00 / mile**
Gate Installation	**One Time**	**3 gates**	**$800.00 / each**
Fuel Treatment	**Annual 1-8**	**25 acres**	**$110.00 /acre**
Prescribed Fire	**Annual 1-8**	**100 acres**	**120.00 / acre**
Reforestation	**Annual 1-8**	**20 acres**	**$140.36 / acre**
Appropriated TSI	**Annual 1-8**	**25 acres**	**$101.17 / acre**
Stewardship Sale Prep	**Annual 1-8**	**1000 CCF**	**$46.83 / CCF**
Steward ship Sale Admin	**Annual 1-8**	**1000 CCF**	**$17.96 / CCF**

Benefits:

Activity	Years	Quantity	Value
Stewardship Sale Revenue	**Annual**	**1000 CCF**	**$42.00 / CCF**

Alternative C – Mechanized Treatment Emphasis

Direct and Indirect Effects. This alternative would have benefits totaling $822,539 including some timber value (1,000 CCF per year). Costs considered under this alternative included road obliteration and closures; and mechanical harvest treatments for a cost of $616,740 leaving a Present Net Value of $205,799. Wildlife habitat values were not interpreted with an economic value.

Costs:

Activity	Years	Quantity	Value
Road Obliteration	**One Time**	**14.17 miles**	**$300.00 / mile**
Gate Installation	**One Time**	**3 gates**	**$800.00 / each**
Fuel Treatment	**Annual 1-8**	**120 acres**	**$110.00 /acre**
Appropriated TSI	**Annual 1-8**	**25 acres**	**$101.17 / acre**
Appropriated Reforestation	**Annual 1-8**	**20 acres**	**$140.36 / acre**
Stewardship Sale Prep	**Annual 1-8**	**1000 CCF**	**$46.83 / CCF**
Steward ship Sale Admin	**Annual 1-8**	**1000 CCF**	**$17.96 / CCF**

Benefits:

Activity	Years	Quantity	Value
Stewardship Sale Revenue	**Annual**	**1000 CCF**	**$42.00 / CCF**

Alternative D – Prescribed Fire Treatment Emphasis

Direct and Indirect Effects. This alternative would have benefits totaling approximately $452,238. Costs considered under this alternative included road obliteration and closures and prescribed fire treatments for a cost of $202,091, leaving a Present Net Value of $230,146. Wildlife habitat values were not interpreted with an economic value.

Costs:

Activity	Years	Quantity	Value
Road Obliteration	**One Time**	**14.17 miles**	**$300.00 / mile**
Gate Installation	**One Time**	**3 gates**	**$800.00 / each**
Prescribed Fire	**Annual 1-8**	**300 acres**	**$120.00 /acre**

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Glossary

A

Affected Environment - The physical, and human-related environment that is sensitive to changes resulting from the proposed actions.

Air Quality - Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206:Jan., 1988.

Alternative - A mix of management prescriptions applied to specific land areas to achieve a set of goals and objectives. The alternative provides management direction for the proposed project, which reflects, identified public and management concerns for the Decision Area.

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

Arterial Road - Roads, which provide service to large land areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes.

B

Background - That part of a scene, landscape, etc., which is furthest from the viewer, usually from three miles to infinity from the observer.

Basal Area - The area of the cross section of a tree stem near the base, generally at breast height and inclusive of bark.

Big Game - Large mammals normally managed for sport hunting (e.g., deer, elk, etc.).

Biological Assessment - FS or BLM document that analyses the potential effects of FS or BLM actions on U.S. Fish and Wildlife Service federally listed and candidate species and critical habitat.

Biological Diversity (Biodiversity) - The relative distribution and abundance of different plant and animal communities and species within an area.

Biological Evaluation - FS or BLM document that analyses the potential effects of FS or BLM actions on U.S. Forest Service Region 2 (FS) sensitive species, and Colorado BLM State Director's sensitive species.

BLM - Bureau of Land Management

Board Foot (bf) - The amount of wood equivalent to one foot by one inch thick.

Broadcast Burn - Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of a fuel hazard or as a silvicultural treatment , or both.

C

Candidate Species - Plant and animal taxa considered for possible addition to the list of endangered and threatened species under section 4 of the Endangered Species Act of 1973, as amended (ESA). These are taxa for which the Fish and Wildlife Service (FWS) has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions.

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees.

Chipping - The reduction of woody residue by a portable chipper to chips that are left to decay on the forest floor.

Cirque – a semicircular, concave bowl-like area with a steep face resulting from erosive activity of a mountain glacier

Classified Road – A road that is constructed or maintained for long-term highway vehicle use. Classified roads may be public, private, or forest development.

Clearcut Harvest - A harvest regeneration method under an even-aged silvicultural system in which the existing stand of trees is removed with a rotation length of 100-150 years. System of reproducing stands of trees which naturally grow in even ages and which reproduce themselves in nature through fire, windstorm, earth movement, or other disturbances.

Coarse Wood Debris - Downed woody material such as trees, branches, or tops that have fallen to the forest floor.

Codominant Tree –Trees or shrubs with crowns receiving full light from above, but comparatively little from the sides. Crowns usually form the general level of the canopy. (In stagnated stands will be small-sized and crowded on the sides).

Collector Road - These roads serve smaller land areas than do the arterial roads and are usually connected to a Forest arterial or public highway. They collect traffic from Forest local roads or terminal facilities.

Colluvial – referring to material, such as rock fragments, that have been moved solely by gravity

Commercial Thinning - Tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

Compaction - The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Compartments - A geographic area delineated by a sub-watershed drainage for management planning purposes.

Condition Class - A grouping of timber stands into size-age-stocking classes for Forest planning.

Conifer - Any of a group of needle and cone-bearing evergreen trees.

Cover - Vegetation used by wildlife for protection from predators or to escape the adverse effects of weather. Also described as - The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants. See also CANOPY COVER. Used to map and stratify stands of vegetation and as a measure of protection of a site or stream.

Crown Base Height - The vertical distance in feet from the ground to the base of the live crown.

Crown Class - The relative position of the tree or shrub crown with respect to competing vegetation surrounding the tree or shrub. Crown class for each tree or shrub is judged in the context of its immediate environment; that is, those trees or shrubs which are competing for sunlight with the subject tree. Crown class is essentially a classification of competition for light and is aimed at separating trees that are growing freely from those that are not. It designates trees or shrubs with crowns of similar development and occupying similar positions in the crown canopy. This is an ocular classification of trees or shrubs based on dominance in relation to adjacent trees or brush as indicated by crown development and amount of sunlight received from above and on the sides. In uneven-aged stands of tolerant species (in which the trees are not in small even-aged groups), trees in the intermediate crown position in the stand and with medium-sized crowns will be considered comparable to codominants of even-aged stands and coded as such. As a general rule, in multi-story stands crown class for each tree must be judged in the context of its immediate environment, that is, those trees affecting it or being affected by it in terms of crown competition. In cases where the overstory consists of scattered veterans standing above larger numbers of younger trees, a considerable portion of the understory trees will undoubtedly be classified as dominant or codominant.

Crown –The upper part of a tree, including the branches and foliage.

Cumulative Effect - The impact on the environment, which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor, but collectively significant, actions taking place over a period of time.

D

Decision Area - The geographic area defining the scope of this document and the alternatives proposed by it.

Decommissioned Road - Road that receives the following treatments - water bars installed, roadbed seeded, and all culverts removed. Motorized access will be discouraged with berms, boulders, fences, and signs.

Diameter at Breast Height (dbh) - The diameter of a tree measured four feet, six inches above the ground.

Dominant Tree - Trees or shrubs with crowns receiving full light from above and partly from the side; usually larger than the average trees or shrubs in the stand, with crowns that extend above the general level of the canopy and that are well developed but possibly somewhat crowded on the sides. A dominant tree is one, which generally stands head and shoulders above all other trees in its vicinity. However, there may be a young, vigorous tree nearby, but not overtopped by a dominant tree. This smaller tree may be considerably shorter than the dominant, but still be receiving full light from above and partly from the sides. In its own immediate environment, it is dominant and should be recorded as such. Only understory trees immediately adjacent to the overstory tree will be assigned subordinate crown classes.

DMR - IS BASED ON THE HAWKSWORTH SCALE. THIS IS A SIMPLE SCALE TO ASSESS DWARF MISTLETOE INFESTATION DEVELOPED BY FRANK G. HAWKSWORTH, AND HAS BECOME THE STANDARD USED BY BOTH FEDERAL AND STATE FORESTRY PROFESSIONALS. THE SCALE BREAKS A TREE CROWN INTO THREE SECTIONS: TOP, MIDDLE, AND BOTTOM. IT THEN ASSIGNS A DWARF MISTLETOE INFESTATION RATING OF 0 TO 2 TO EACH SECTION. THE SCALE MAY, THEREFORE, RANGE FROM 0 TO 6 IN TOTAL FOR A TREE.

0 = NO INFESTATION

1 = LESS THAN HALF THE BRANCHES ARE INFESTED

2 = MORE THAN HALF THE BRANCHES ARE INFESTED

Duff - An organic surface soil layer below the litter layer in which the original form of plant and animal matter cannot be identified with the unaided eye.

E

Ecosystem - Any community of organisms along with its environment, forming an **Effects (or impacts) -** Environmental consequences (the scientific and analytical basis for comparison of alternatives) as a result of a proposed action. Effects may be either direct, which are caused by the action and occur at the same time and place, indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative interacting system.

Endangered Species - As defined under section 3 of the ESA - Any species which is in danger of extinction throughout all or a significant portion of its range.

Endemic- The population of potentially injurious plants, animals or diseases that are at their normal balances level, in contrast to epidemic.

Environment - The aggregate of physical and biological factors affecting organisms in an area.

Environmental Assessment (EA) - A concise public document which serves to - a. briefly provide sufficient evidence and analysis for determining whether to prepare an EIS, or a finding of No Significant Impact; b. Aid an agency's compliance with NEPA when no EIS is necessary; c. facilitate preparation of an EIS when necessary.

Environmental Impact Statement - A detailed summary prepared by the responsible official in which a major Federal action which significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and the effects analyzed.

ESA - Endangered Species Act of 1973, as amended

Evenaged Management - The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood or seedtree harvest methods produce even-aged stands.

Evenaged Stands - Stands in which all trees are of about the same age (a spread of 10 to 20 years is generally considered one age class).

F

Fire Resiliency – The ability of an ecosystem to withstand fire without increased amounts of mortality.

Forb - An herbaceous plant that is not a graminod.

FS - USDA Forest Service

Fuel Treatment - Manipulation or reduction of natural or activity fuels (generated by a management activity such as slash left from logging) to reduce fire hazard.

Fuels - Combustible materials present in the forest which potentially contribute a significant fire hazard.

FWS - U.S. Fish and Wildlife Service

G

Ground Moraine – an extensive, fairly even layer of till having an uneven or undulating surface; a deposit of rock and mineral debris dragged along in, on, or beneath a glacier (NSSH, 1996).

Group Selection - An uneven-aged silvicultural harvest system in which all trees in a small group are removed for regeneration purposes. The size of the group is small enough in area that all subsequent regeneration will be influenced by the surrounding uncut stand. Cuts are generally 0.25 - 2.0 acres in size.

H

HABCAP - A computerized planning tool used to provide estimates of the capability of habitats to support wildlife based on the mix of vegetation covertypes and structure present in an area.

Habitat - The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Capability - The estimated ability of an area, given existing or predicted habitat conditions, to support a wildlife, fish or plant population. It is measured in terms of potential population numbers.

Habitat Effectiveness - The degree to which a physical wildlife habitat (food, water, shelter) is free from disturbances, and therefore attractive for wildlife occupancy.

Habitat Structural Stage - Two digit code used to indicate the general stem size and stem canopy closure within a geographic area (See table below). For example, a 4C stand would largely be comprised of trees 9.0 to 20.9 inches in diameter and have a canopy closure of 70 to 100 percent.

Habitat Type - An aggregation of all land areas potentially capable of producing similar plant communities at climax stage.

Hiding Cover - Vegetation capable of hiding 90 percent of a standing adult deer from the view of a human at a distance equal to or less than 61 meters (200 ft); generally, any vegetation used by elk for security or escape from danger. Vegetative hiding cover estimated using habitat structural stages 3B, 3C, 4B, 4C, and 5 stands.

High Risk - Individual or groups of trees that are live (green) but that have the physical characteristics favorable to insect infestation or disease infections. Trees in this category are subject to mortality and loss of economic value.

Hydrophobicity – a discontinuous water-repellant layer that forms under coniferous cover naturally at the mineral surface in coarse granitic soils; also, a water-repellant layer of varying depths that forms during fire, the heat from which creates a waxy residue from coniferous litter that is consumed (Huffman et al., 2001).

I

Immature Timber - Trees that have not attained full development, especially height.

Indirect Effects - Secondary effects which occur in locations other than the initial action or significantly later in time.

Individual Tree Selection - A non-unevenaged silvicultural harvest system that removes selected trees of all size classes on an individual basis.

Interdisciplinary (ID) Team - A group of professional specialists with expertise in different resources that collaborate to develop and evaluate management alternatives.

Interdisciplinary Approach - Utilization of one or more individuals representing areas of knowledge and skills focusing on the same task, problem, or subject. Team member interaction provides needed insight to all stages of the process.

Intermediate Tree – Trees or shrubs receiving little direct light from above, and none from the sides; usually with small crowns considerably crowded on the sides that are generally either below or extending into the canopy formed by codominant trees or shrubs.

Interplanting – A method of planting seedlings mixed with natural regeneration or trees that are already established.

L

Land Allocation - The assignment of a management emphasis to particular land areas with the purpose of achieving goals and objectives. Land allocation decisions are documented in environmental analysis documents such as the Idaho Panhandle National Forests' FEIS and Forest Land and Resource Management Plans.

Landsat Thematic Mapping - Process used to graphically depict vegetation types within the project area. Data are obtained from photographs taken from satellites. The satellite collects reflected and emitted energy used to discriminate between Earth surface materials (e.g. vegetation) through the development of spectral signatures.

Lateral Moraine – a ridge-like moraine carried on and deposited at the side of a valley glacier, mainly composed of rock fragments from the valley wall and/or colluvial accumulation from adjacent slopes

Lodgepole Pine - See Timber types.

Long-term Sustained Yield - The estimated timber harvest that can be maintained indefinitely over time, once all stands have been converted to a managed state under a specific management intensity consistent with multiple-use objectives.

Lop and Scatter - Fuel treatment where, following tree felling, limbs and branches are cut off and scattered in the unit.

M

Main Roads - Roads that are 1½ lanes wide or more, improved, good condition, main route of travel, and receive constant maintenance.

Management Area - Geographic areas, not necessarily contiguous, which have common management direction, consistent with the Forest Plan allocations.

Management Direction - A statement of multiple use and other goals and **Management Prescriptions -** A set of land and resource management policies that, as expressed through Standards and Guidelines, creates the Desired Future Condition over time.

Management Indicator Species (MIS) - Those species selected in the planning process to monitor the effects of planned management activities on viable populations of all wildlife and fish species, including those species that are socially or economically important.

Mature Timber - Trees that have attained full development, particularly height.

Mixed Conifer - See Timber Types

Model - A formalized expression of a theory to describe, analyze or understand a particular concept.

Monitoring and Evaluation - The evaluation, on a sample basis, of Forest Plan management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Mortality - In forestry, trees in a stand that die of natural causes.

Mountain Pine Beetle - The common name for the bark beetle (*Dendroctonous Ponderosae Hopkins*), which is one of the most destructive insect pest in the intermountain west.

Mulching - Covering the surface of the soil with natural (e.g. litter) or deliberately applied organic materials (e.g. straw, wood chips, foliage).

N

National Environmental Policy Act (NEPA) Process - An interdisciplinary process, which concentrates decisionmaking around issues, concerns, alternatives, and the effects of alternatives on the environment.

National Forest Management Act (NFMA) - Law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Regional Guides and Forest Plans, and the preparation of regulations to guide that development.

Natural Regeneration - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

No Action Alternative - The No Action Alternative is required by regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives. When a project activity is being evaluated, the No Action Alternative is defined as one where current management direction would continue unchanged.

Noxious Weed - A plant species that is highly injurious or destructive and has a great potential for economic impact. A plant species that is listed as noxious by the State of Colorado.

O

Old Growth Habitat - Habitat for certain wildlife that is characterized by mature coniferous forest stands with large snags and decaying logs.

Optimum Habitat - The amounts and arrangement of cover and forage that results

Overstory - The portion of trees in a forest which form the uppermost layer of foliage.

P

Partial Cut - Term to relate harvest units where many trees are left and forested appearance is retained. Partial cutting usually provides no long-term benefits to forest health and productivity.

Pathogen - A specific causative agent of disease, such as a virus.

Pioneer Species - A plant capable of invading a bare site (newly exposed soil surface) and persisting there until replaced by another species or community as succession progresses.

Plant Community - An assembly of plants living together.

Plastic Limit – the moisture content at which a soil changes from semisolid to plastic;

Pole Timber - Trees of at least five inches in diameter at breast height (DBH), but smaller than the minimum utilization standard for sawtimber.

Precommercial Thinning - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster.

Preferred Alternative - The alternative recommended for implementation in the EIS (40 CFR 1502.14).

Prescribed Burning - The application of fire to fuels in either a natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e. silviculture, wildlife management, reduction of fuel hazard, etc.).

Prescription - Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.

Primitive Road - A one-lane unimproved forest road in fair to poor condition that is seldom or never maintained.

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

Public Road – A road open to public travel that is under the jurisdiction of and maintained by a public authority such as States, counties and local communities.

R

Range of Alternatives - An alternative is one way of managing the National Forest, expressed as management emphasis leading to a unique set of goods and services being available to the public. A range of alternatives is several different ways of managing the Forest, offering many different levels of goods and services.

Reforestation - The natural or artificial restocking of an area with forest trees.

Regeneration - The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop itself (i.e. seedlings or saplings).

Regeneration Harvest - Used in reference to harvest methods, which remove an existing stand to prepare the site for regeneration.

Rehabilitation – A plan or treatment to return an ecosystem towards a healthy balance.

Release - Freeing trees from competition for light, water and nutrients by removing or reducing the vegetation growth that is overtopping or closely surrounding them.

Residual Stand - The trees remaining standing after some activity, such as an individual tree selection.

Riparian - Pertaining to areas of land directly influence by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas. Vegetation bordering watercourses, lakes or swamps; it requires a high water table.

Riparian - Area adjacent to rivers and streams that lie between the aquatic ecosystem and upland or terrestrial ecosystems.

Roadless Area - A National Forest-system area which is larger than 5,000 acres or, if smaller than 5,000 acres, is contiguous to a designated Wilderness or primitive area; contains no roads, and has been inventoried by the Forest Service for possible inclusion into the wilderness preservation system.

Rotation - The planned number of years required to establish (including the regeneration period) and grow timber to a specified condition or maturity for regeneration harvest. Selected management prescriptions provide the basis for the rotation age.

S

Salvage Harvest - Intermediate harvests made to remove trees that are dead or in imminent danger of being killed by injurious agents such as insects.

Sanitation Harvest - Intermediate harvests made to remove dead, damaged or susceptible trees to prevent the spread of pests or pathogens.

Sawtimber - Trees containing at least one 12 foot sawlog or two non-contiguous eight foot logs, and meeting regional specifications for freedom from defect.

Seasonal Road Closure - Road closed to motorized use during a specified time period. Closure implemented with gates.

Secondary Road - A forest road of 1½ lanes or less, somewhat improved, in good to fair condition, and is irregularly maintained.

Seedlings and Saplings - Non-commercial size young trees.

Selection Harvest - The periodic removal of trees, usually at 10-20 year intervals, individually or in small groups, from an unevenaged forest in order to realize yield and establish regeneration or irregular constitution.

Sensitive Species - Those plants and animals identified by the FS Regional Forester and BLM State Director for which population viability is a concern.

Seral - A biotic community, which is a development, transitory stage in ecological succession.

Seral Stage - A biotic community that is in a development, transitory stage in ecological succession.

Series - A group of habitat types having the same climax tree species.

Silvicultural System - A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the cuttings that remove the mature crop and provide for regeneration, and according to the typed of forest thereby produced.

Silviculture - The art and science of growing and tending forest vegetation, i.e. controlling the establishment, composition, and growth of forests, for specific management goals.

Site Preparation - A general term for a variety of activities that remove or treat competing vegetation, slash and other debris that may inhibit the establishment of regeneration.

Site Productivity - Production capability of specific areas of land.

SIZE STRUCTURE	SIZE CLASS
Grass-forb-shrub	≤ 0.9”
Shrub-tree-	1.0-4.9”
Pole-sapling (3)	5.0-8.9”
Mature (4)	9.0”-20.9”
Old tree (5)	≥ 21.0”

CANOPY STRUCTURE	CANOPY CLOSURE
Open (A)	0-29%
Moderate (B)	30-69%
Closed (C)	70-100%

Slash - The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.

Snag - A standing dead tree usually without merchantable value for timber products, but may have characteristics of benefit to some cavity nesting wildlife species.

Snag Recruitment Tree - A standing live tree designated for non-removal to allow for future snag creation.

Stand - A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from other adjacent communities.

Stand Replacing Fire - A fire that consumes an entire stand of trees. These fires are generally quite hot and can burn hundreds of acres.

Stocking - The degree to which trees occupy the land, measured by basal area and/or number of trees by size and spacing, compared with a stocking standard; that is, the basal area and/or number of trees required to fully utilize the land’s growth potential.

Succession - The progressive changes in plant communities toward climax habitat.

Successional Stage - A stage or recognizable condition of a plant community which occurs during its development from the bare ground to climax habitat.

Suitable Forest Land - Forest land (as defined in CFR 219.3, 219.14) for which technology is available that will insure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is a reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14); and for which there is management direction that indicates that timber production is an appropriate use of that area.

Suppressed Tree - Trees or shrubs with crowns receiving no direct light either from above or from the sides, and that will not respond to release. Usually crowns are entirely below the general level of the canopy.

Suppressed Trees - Trees with their crowns entirely below the general canopy level; receiving no direct light from above or sides.

System Road - Road that is officially designated as a Forest Service and BLM Road.

T

Thermal Cover - Cover used by animals to ameliorate effects of weather; for elk, a stand of coniferous trees 12 meters (40 ft) or more tall with an average crown closure of 70 percent or

more; for deer, cover may include saplings, shrubs, or trees at least 1.5 meters (5 ft) tall with 75 percent crown closure. Traditional vegetative thermal cover estimated using habitat structural stages 3C, 4C, and 5 stands.

Thinning - Cutting in even aged stands to redistribute growth potential or benefit the quality of the residual stand.

Threatened Species - As defined under section 3 of the ESA - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Timber Types - A descriptive classification of forest land based on present occupancy of an area by tree species (i.e. lodgepole, mixed conifer). More appropriately called cover types, this category is further defined by the composition of its vegetation and/or environmental factors that influence its locality.

U

Unclassified (non-system) Road – Road that is not a system road. Usually illegal, user-created roads.

Understory - Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Unevenaged Management - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover. Harvest systems that develop or maintain uneven aged stands are individual tree and group selection.

V

Vertebrates - Animals having a backbone, or a spinal column, including mammals, fishes, birds, reptiles, and amphibians.

Viable Population - A population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range within the planning area.

Viewshed - Subunits of the landscape where the scene is contained by topography similar to a watershed.

Visual Condition Class (VCC) - A measure of the level of disturbance to the visual resource, expressed in acres. The visual condition classes are used as indicators to measure the existing conditions and effects of alternatives.

Visual Quality Objective (VQO) - A system of indicating the potential expectations of the visual resource by considering the frequency an area is viewed and the type of landscape. Specific VQOs are in *Chapter 3 - Visual Quality.*

Visual Resource - The composite of landforms, water features, vegetative patterns, and cultural features which create the visual environment.

W

Water Influence Zone (WIZ) - The water influence zone (WIZ) includes 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.

Wetlands - Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Wilderness - All lands included in the National Wilderness Preservation System by public law; generally defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation.

Wildfire - Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Windrowing - Slash or debris piled in a row along the contour of the slope.

Y

Yarding - A method of bringing logs into a roadside area or landing, for truck transport. Methods may include forms of skyline cable logging systems, ground-based skidding, balloon, helicopter, etc.