United States
Department of
Agriculture

Forest Service

Pike and San Isabel National Forests, Comanche and Cimarron National Grasslands

Harris Park Fuels Management Project

Environmental Assessment

March 2005

TABLE OF CONTENTS

1.0 Purpose of and Need for Action 1-1
1.1 Description of the Project 1-1
1.2 Background 1-1
1.3 Purpose and Need 1-2
1.4 Scope of the Decision (Decision to be Made) 1-5
2.0 Proposed Action and Alternatives 2-1
2.1 Management Direction 2-1
2.1.1 Management Areas 2-1
2.1.2 Fire-Related Initiatives and Guidance 2-2
2.2 Public Involvement and Issue Identification 2-5
2.2.1 The Scoping Process 2-5
2.2.2 Development of Issues 2-5
2.2.3 Issues Eliminated from Detailed Study 2-6
2.2.4 Issues Analyzed in Detail 2-6
2.3 Alternative Development 2-9
2.3.1 Alternatives Considered but Eliminated from Detailed Study 2-9
2.3.2 Alternatives Considered in Detail 2-10
2.4 Comparison of Alternatives 2-24
3.0 Affected Environment and Environmental Consequences 3-1
3.1 Past, Present, and Reasonably Foreseeable Future Activities 3-1
3.1.1 Fuel Treatments 3-1
3.1.2 Livestock Grazing 3-2
3.1.3 Mining 3-2
3.1.4 Noxious Weeds 3-2
3.1.5 Recreation 3-2
3.1.6 Residential Use 3-2
3.1.7 Roads 3-5
3.1.8 Timber Harvest 3-5
3.1.9 Timber Stand Improvement 3-5
3.1.10 Wildfire 3-5
3.1.11 Wildlife Habitat Improvement 3-6
3.2 Vegetation 3-6
3.2.1 Cover Types 3-6
3.2.2 Habitat Structural Stages 3-9
3.2.3 Vegetation Patterns and Historical Range of Variability 3-9
3.2.4 Insects and Disease 3-10
3.2.5 Analysis of Effects 3-11
3.3 Fire and Fuels 3-15
3.3.1 Fire Regimes 3-15
3.3.2 Values at Risk 3-17
3.3.3 Fuel Models and Potential Fire Behavior 3-17
3.3.4 Fuel Loads 3-18
3.3.5 Fire Frequency and Risk Analysis 3-18
3.3.6 Fire Intensity 3-19
3.3.7 Analysis of Effects 3-19
3.4 Air Quality 3-23
3.4.1 State and Federal Requirements and Policies 3-23
3.4.2 Air Quality Standards 3-23

3.4.3 Sensitive Sites....3-24
3.4.4 Air Pollution Sources and Existing Air Quality....3-24
3.4.5 Analysis of Effects....3-25
3.5 Watersheds....3-25
3.5.1 Soil Resources....3-26
3.5.2 Water Resources....3-26
3.5.3 Watershed Conditions....3-33
3.5.4 Analysis of Effects....3-35
3.6 Management Indicator Species....3-40
3.6.1 Management Indicator Species Selection....3-40
3.6.2 Habitat Modeling....3-40
3.6.3 Species Discussion and Analysis....3-40
3.7 Special-status Species....3-54
3.7.1 Special-status Species Selection....3-54
3.7.2 Threatened, Endangered, and Proposed Species....3-54
3.7.3 Sensitive Species....3-62
3.8 Transportation....3-80
3.8.1 Analysis of Effects....3-81
3.9 Inventoried Roadless Areas....3-83
3.9.1 Analysis of Effects....3-83
3.10 Recreation....3-84
3.10.1 Analysis of Effects....3-85
3.11 Visual Resources....3-89
3.11.1 Analysis of Effects....3-89
3.12 Cultural Resources....3-91
3.12.1 Analysis of Effects....3-91
3.13 Economics....3-92
3.13.1 Local and Regional Economy....3-92
3.13.2 Population....3-93
3.13.3 Employment and Income....3-93
3.13.4 Housing....3-93
3.13.5 Community Infrastructure....3-94
3.13.6 Analysis of Effects....3-94
3.13.7 Financial Efficiency....3-97
3.14 Unavoidable Adverse Effects....3-99
3.15 Irreversible and Irretrievable Commitment of Resources....3-99
3.16 Short-term Use versus Maintenance and Enhancement of Long-term Productivity....3-100
3.17 Other Considerations....3-101
3.17.1 Effects of Alternatives on Prime Farmland, Rangeland, and Forest Land....3-101
3.17.2 Environmental Justice....3-101
3.17.3 Possible Conflicts with Other Land Use Plans, Policies, and Controls....3-101
3.17.4 Energy Requirements and Conservation Potential of Alternatives....3-101
3.17.5 Applicable Laws and Regulations....3-101
4.0 List of Acronyms, Glossary, and References....4-1
4.1 Acronyms....4-1
4.2 Glossary....4-2
4.3 References....4-10
5.0 List of Preparers....5-1

FIGURES

Figure 1-1 Project Location, Management Areas, and Inventoried Roadless Area....1-3
Figure 2-1 Alternative 1 – Proposed Action....2-13
Figure 3-1 Interagency Treatment Areas....3-3
Figure 3-2 Vegetation Cover Types....3-7
Figure 3-3 Sensitive Soils....3-27
Figure 3-4 Sixth-Level Watersheds....3-31
Figure 3-5 Lynx Habitats – Mount Evans LAU....3-59
Figure 3-6 ROS and Recreational Facilities....3-87

TABLES

Table 2-1 Summary of Treatments – Alternative 1....2-15
Table 2-2 Comparison of Effects to Substantial Issues....2-24
Table 3-1 Current HSS Distribution....3-9
Table 3-2 Existing Cover Types by Treatment Type....3-12
Table 3-3 Post-treatment Cover Type Distribution....3-12
Table 3-4 Future HSS Distribution....3-13
Table 3-5 Change in HSS Distribution and Cover Type....3-13
Table 3-6 Fuel Models – Current Condition....3-17
Table 3-7 Fuel Load by Fuel Model....3-18
Table 3-8 Fuel Models – Post-Treatment....3-20
Table 3-9 Sixth-Level Watersheds....3-29
Table 3-10 Perennial and Intermittent Streams....3-29
Table 3-11 Roads by Watershed....3-34
Table 3-12 Roads in the WIZ....3-34
Table 3-13 Roads on Sensitive Soils....3-35
Table 3-14 Lynx Habitats - Current Condition....3-58
Table 3-15 Lynx Habitats - Post-Treatment Condition....3-61
Table 3-16 Lynx Habitats - Cumulative Effects....3-63
Table 3-17 Existing Local Road Density....3-81
Table 3-18 Property Values for all Properties Within 2-Mile Buffer of Project Area....3-94
Table 3-19 Comparison of Present Net Value and Net Cost....3-98
Table 3-20 Comparison of Non-Priced Values....3-99
Table 5-1 List of Preparers....5-1

This page left intentionally blank.

1.0 PURPOSE OF AND NEED FOR ACTION

This environmental assessment (EA) was prepared to address the potential environmental effects of the Harris Park Fuels Management Project. The information in this EA will be used to decide on a course of action for the proposed project. The analysis in this EA complies with provisions of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and the National Forest Management Act (NFMA).

1.1 DESCRIPTION OF THE PROJECT

The U.S. Department of Agriculture, Forest Service (USFS), Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands (PSICC) plans to implement treatments for the Harris Park Fuels Management Project located north of Bailey and west of Pine Junction, in Park and Jefferson Counties, Colorado (**Figure 1-1**). The project would include a combination of mechanical and prescribed fire treatments to reduce wildland fire hazard and improve forest health. Mechanical treatments would include both mechanized and hand thinning. Prescribed fire treatments would include hand piling and burning, mechanical piling and burning, and broadcast burning. No new system roads would be needed, but some temporary roads may be constructed, then closed and obliterated when the project is complete. These roads would not be constructed in inventoried roadless areas (IRAs). Improvements would be made to several recreational areas. Improvement of wildlife habitats would be an important consideration for many of the proposed treatments.

The project area includes 26,302 acres in part or all of sections 1-5, 7-18, and 20-26, Township 7 South, Range 73 West; sections 1-3, 10-22, 27-29, and 32-34, Township 6 South, Range 73 West; and sections 2-15 and 17-20, Township 6 South, Range 72 West (**Figure 1-1**). Mechanical and prescribed fire treatments would be applied to 9,109 acres (34 percent of the project area), while 15,144 acres (58 percent of the project area) would not be treated. An additional 2,049 acres (8 percent of the project area) may be treated by the Colorado State Forest Service (CSFS) under a Good Neighbor Cooperative Agreement. Treatments would begin in 2005, and would be completed over the next five to seven years, depending on the availability of funding and other factors.

1.2 BACKGROUND

Forest conditions in the western U.S. are currently much different from previous centuries. The density of trees is much greater than what existed historically (pre-European settlement of the 19th century). Because of past fire management practices, ground and ladder fuels have increased to the point that surface fires can easily move into the tree canopy, fueling destructive crown fires. The higher-density, continuous fuels present in many forests allow fires to spread quickly over large distances, making control difficult and dangerous. In one day, the wind-driven 1996 Buffalo Creek fire traveled 10 miles and the 2002 Hayman fire traveled 19 miles.

The 2002 Snaking and Black Mountain fires occurred in the project area in similar fuel types (ponderosa pine and lodgepole pine, respectively) to those that would be treated by the proposed project. These two fires burned 2,500 acres, threatened 2,700 homes, and briefly closed Highway 285. The total cost for suppression of the two fires was $3.9 million.

The Buffalo Creek, Hi Meadow, Schoonover, and Hayman fires also occurred on the PSICC and indicate the potential for high-intensity fires in the project area, although these fires primarily burned in ponderosa pine and Douglas-fir forests, not in lodgepole pine or other high-elevation forests. In addition to destroying homes and property, these fires destroyed federal and state facilities, such as campgrounds and trails, and damaged municipal water systems and water holding facilities in the South Platte River watershed. Municipal water was degraded for days and has been threatened by subsequent rain events in the former burn area. Loss of vegetation and ground cover has caused increased soil erosion and loss of vegetation productivity. Fisheries and aesthetic values were also degraded. Wildlife habitat, forest products, and recreational opportunities were lost. Flash floods originating in these burned areas caused loss of human life, destroyed homes, bridges, highways, and other facilities. Air quality along the Front Range of Colorado, with its 3.5 million residents, was dangerously degraded for days at a time, adversely affecting people whose health was already at risk.

The economic effects of these fires were staggering. The Hayman Fire alone cost more than $38 million to suppress and more than $15 million for just the initial emergency rehabilitation measures. During the 2002 fire season, more than 10,000 residents were evacuated from their homes, sometimes for weeks. Tourism and other businesses lost millions of dollars because of Forest closures and other effects of these large fires.

Dense forest conditions cause trees and other vegetation to compete for limited water and nutrients, particularly during drought periods such as Colorado has experienced in recent years. Competition for water and nutrients can reduce forest health, increasing the potential for outbreaks of insects and diseases, which can kill large areas of trees and increase fuel loads, increasing the potential for uncontrollable wildland fires. Several disease and insect infestations, including dwarf mistletoe, mountain pine beetle, Ips beetle, Douglas-fir tussock moth, western gall rust, and spruce budworm have affected forests in the project area in the past. Reducing the potential for outbreaks of insects and disease by improving forest health is important to reducing the size, intensity, and hazards associated with future wildfires.

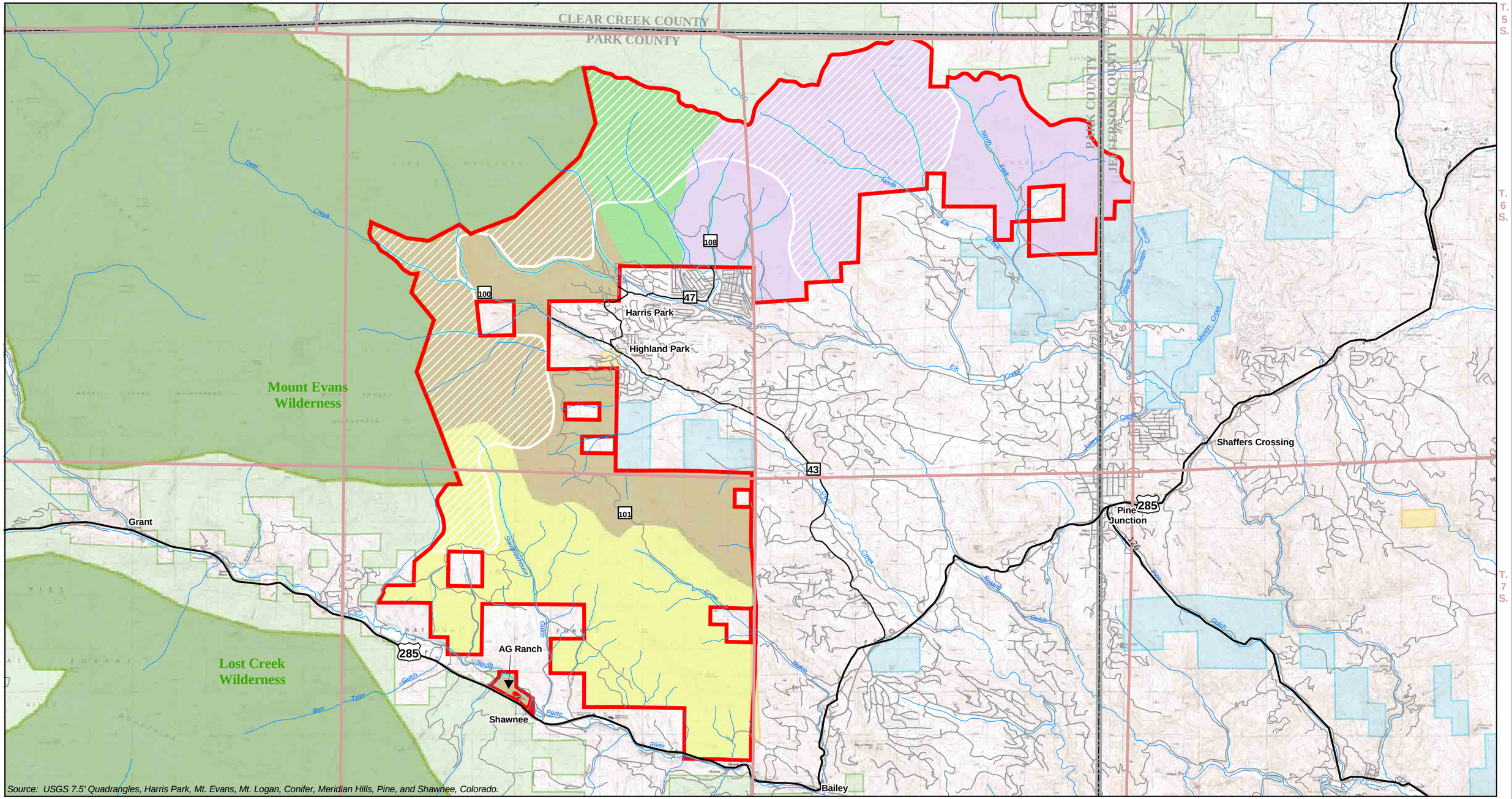
Under current conditions, the Harris Park project area is at risk for a high-intensity wildland fire. There were 1,123 fires on the South Platte Ranger District between 1974 and 2003, some of which were within the project area. Dense forests and heavy fuel loads increase the potential for lightning or human-caused fires to grow rapidly to uncontrollable size.

Development, population, and recreational use have also increased in the project area. There are hundreds of homes on private land adjacent to the project area. The project area is located primarily in Park County with a small section in Jefferson County. Park County has a population of 15,000 and Jefferson County has 529,000 residents, although only a few hundred of these live near the project area. The Denver metropolitan area, with a population of several million residents, is less than 30 miles away.

1.3 PURPOSE AND NEED

The National Fire Plan (NFP) identifies the area around Harris Park as urban interface communities at risk from catastrophic wildfire (USFS et al. 2001). In addition, the Upper South Platte River watershed, which includes the project area, provides a substantial portion of the water supply for the Denver metropolitan area. The NFP identifies two objectives that would be specifically addressed in the Harris Park project area:

- "Assign highest priority for hazardous fuels reduction to communities at risk and readily accessible municipal watersheds."



Legend

- Harris Park Project Boundary
- Wilderness Area
- Inventoried Roadless Area
- Highway
- Road
- Stream
- County Boundary

Surface Ownership

- BLM
- Forest Service
- Private
- State

Management Areas

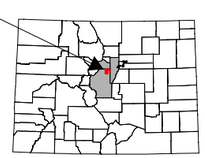
- 2A Emphasis on semi-primitive motorized recreation
- 2B Emphasis on rural and roaded-natural recreation
- 5B Emphasis on big game winter range
- 7D Emphasis on wood fiber production and utilization for products other than sawtimber.
- 9A Emphasis on riparian area management (corresponds with a 100 foot buffer around streams)

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 1-1
PROJECT LOCATION, MANAGEMENT AREAS, AND INVENTORIED ROADLESS AREA

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/PROJ_LOC1.MXD
Drawn By: MS	Layout: PROJ_LOC1 PDF

- "Restore healthy, diverse, and resilient ecological systems to minimize uncharacteristically intense fires on a priority watershed basis. Methods will include removal of excessive vegetation and dead fuels through thinning, prescribed fire, and other treatment methods."

The purpose of the Harris Park Fuels Management Project is to create sustainable forest conditions that are resilient to fire, insects, and diseases, while providing for diverse wildlife habitats, recreational opportunities, and sustainable watershed conditions. This can be accomplished by reducing forest canopy density and ground and ladder fuels across the landscape. The risk of large-scale, high-intensity wildfire with uncontrollable fire behavior, such as active crown fire, would be reduced.

The need for the proposed project is driven by forest conditions. Historic fire suppression has created forests that are more susceptible to a large-scale, high-intensity wildfire. The proposed project is needed to reduce the risk, intensity, and hazards associated with a high-intensity wildland fire near the Harris Park community; improve forest health; and enhance ecological diversity in the project area.

The proposed project is part of a larger interagency effort known as the 285 Conifer-Bailey Fuels Management Initiative, which is designed to address fire hazards across agency boundaries along the Highway 285 Corridor. Partner agencies include the PSICC, CSFS, Platte Canyon and Elk Creek Fire Protection Districts, Bureau of Land Management (BLM), and Jefferson and Park Counties.

The Harris Park Project addresses a portion of this area, and would be implemented as a collaborative effort between the CSFS, the Platte Canyon Fire Protection District, and the PSICC. It would be designed to complement similar fuels projects currently being conducted or developed on nearby private lands, at Staunton State Park, and on the Arapaho-Roosevelt National Forest. The proposed project would also contribute to the goals of the Front Range Fuels Treatment Partnership, which is designed to address fire and fuels management issues on a landscape scale across public and private land boundaries.

1.4 SCOPE OF THE DECISION (DECISION TO BE MADE)

The scope of actions to be addressed in this analysis is limited to mechanical and prescribed fire treatments in the Harris Park project area of the South Platte Ranger District on the PSICC. In addition, the scope of the proposed action includes temporary road construction and obliteration, temporary fire line construction, slash treatment, stewardship projects, and mitigation measures deemed necessary to reduce any environmental effects of the project.

This EA documents the analysis of site-specific, on-the-ground activities. It is not a general management plan for the Harris Park area. The environmental analysis documented in this EA is tiered to the Land and Resource Management Plan for the Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands (USFS 1984a) as amended (Forest Plan) and the Final Environmental Impact Statement and Record of Decision for the Forest Plan (USFS 1984b). It does not reanalyze the management area (MA) allocations already specified in the Forest Plan, nor does it seek to re-examine federal regulations or USFS policy regarding fuels management on National Forest System (NFS) lands.

This EA is not a decision document. It does not identify the alternative to be selected by the responsible official. This document discloses the environmental consequences of implementing the proposed action and alternatives to that action. The South Platte District Ranger is the responsible official who will decide which, if any, management actions for this project will be implemented. The decision will include all mitigation measures and monitoring actions that will be required in association with the selected alternative. His decision will be stated in the Decision Notice. The District Ranger will make the following decisions:

(1) Whether or not to conduct fuels treatment through mechanical thinning, prescribed burning, and other activities to meet the stated purpose and need, and;

(2) If an action alternative is selected, under what conditions and by which methods mechanical thinning, prescribed burning, and other activities will be conducted. This decision will take into account the flexibility needed to successfully meet the purpose of and need for the project.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the alternatives considered to achieve the purpose and need discussed in Chapter 1. One action alternative and a "no-action" alternative are described in detail. Discussion is also provided on public involvement and issue identification, alternatives considered but not analyzed in detail, and a comparison of the two alternatives analyzed in detail.

2.1 MANAGEMENT DIRECTION

The Forest Plan (USFS 1984a) as amended provides broad, programmatic management direction for the PSICC. Through its goals, standards and guidelines, and MA direction, the Forest Plan provides the overall guidance for management of the land within the PSICC's borders. This EA is a project-level analysis, designed in conformance with the applicable Forest Plan management direction (goals and standards/guidelines). Where appropriate, this EA tiers to the Forest Plan.

The Forest-wide standards and guidelines in the Forest Plan that apply to this project are primarily those regarding diversity (pages III-12 to III-14), cultural resources (page III-17), visual resources (pages III-18 to III-19), recreation (pages III-19 to III-24), wilderness (pages III-24 to III-27), wildlife (pages III-28 to III-35), vegetation management (pages III-40 to III-50 and III-82), water resources (pages III-50 to III-52), special uses (pages III-68 to III-69), soil resources pages III-72 to III-74), transportation (pages III-74 to III-80), fire and fuels (pages III-81 to III-82), and air quality (page III-82) and are hereby incorporated by reference. This project was also designed in conformance with Forest Plan direction that applies to specific MAs. Section 2.1.1 provides the general guidance for each MA in the Harris Park project area. Section 2.1.2 discusses other guidance relevant to the proposed project.

2.1.1 Management Areas

The Forest Plan divides the PSICC into individual MAs. The emphasis of each MA is described below. The Forest Plan designates specific direction, goals, standards, and guidelines to be used in the management of these areas to meet the MA emphasis more completely. These are referred to as management area prescriptions. There are five MAs in the project area (**Figure 1-1**).

Management Area 2A (Emphasis on semi-primitive motorized recreation opportunities)

This MA covers 2,332 acres (9 percent) of the project area. Semi-primitive motorized recreation opportunities, such as snowmobiling, four-wheel driving, and motorcycling, are emphasized both on and off roads and trails. Motorized travel may be restricted to protect physical and biological resources. Visual resources are managed such that management activities are not evident or remain visually subordinate. Standards and guidelines for MA 2A are found in the Forest Plan on pages III-107 to III-115.

Management Area 2B (Emphasis on rural and roaded-natural recreation opportunities)

This MA covers 7,319 acres (28 percent) of the project area. Motorized and non-motorized recreational activities are possible. Motorized travel may be restricted to protect physical and biological resources. Visual resources are managed such that management activities maintain or improve the quality of recreation opportunities. Standards and guidelines for MA 2B are found in the Forest Plan on pages III-116 to III-124.

Management Area 5B (Emphasis on big game winter range)

This MA covers 7,336 acres (28 percent) of the project area. Forage and cover on winter range habitats is emphasized for deer, elk, bighorn sheep, and mountain goats. Treatment options that increase forage production or create and maintain thermal and hiding cover for big game are available. New roads are limited to short-term, temporary roads that are obliterated soon after project activities are complete. Standards and guidelines for MA 5B are found in the Forest Plan on pages III-149 to III-160.

Management Area 7D (Emphasis on wood fiber production and utilization for products other than saw timber)

This MA covers 8,689 acres (33 percent) of the project area. Production and utilization of small round wood used for fuelwood, posts, poles, or props is emphasized. Standards and guidelines for MA 7D are found in the Forest Plan on pages III-179 to III-188.

Management Area 9A (Emphasis on riparian area management)

This MA covers 626 acres (2 percent) of the project area. The management of all component ecosystems of riparian areas is emphasized. These components include the aquatic ecosystem, the riparian ecosystem, and adjacent ecosystems within 100 feet of perennial streams, lakes, and other water bodies. Each of these components is managed together as an integrated riparian area. Standards and guidelines for MA 9A are found in the Forest Plan on pages III-204 to III-215.

2.1.2 Fire-Related Initiatives and Guidance

Several fire-related plans, initiatives, and legislative acts drive or would affect implementation of the proposed project. These include the NFP, Healthy Forests Initiative (HFI), Healthy Forests Restoration Act (HFRA), Stewardship Contracting, Front Range Fuels Treatment Partnership (FRFTP), and Good Neighbor Cooperative Agreements. Each of these initiatives is discussed briefly below.

National Fire Plan

The NFP was developed in August 2000 with the intent of actively responding to severe wildland fires and their effects on communities while ensuring sufficient firefighting capacity for the future. The NFP addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

The NFP provides technical, financial, and resource guidance and support for wildland fire management. The USFS and the Department of the Interior (DOI) are working to implement the key points outlined in the NFP by taking the following steps:

- Assuring that necessary firefighting resources and personnel are available to respond to wildland fires that threaten lives and property,
- Conducting emergency stabilization and rehabilitation activities on landscapes and communities affected by wildland fire,
- Reducing hazardous fuels (dry brush and trees that have accumulated and increase the likelihood of unusually large fires) in the country's forests and rangelands, and

- Providing assistance to communities that have been or may be threatened by wildland fire.

In 2001, participating agencies prepared a list of communities at high risk from wildland fire near public lands (USFS et al. 2001). The Harris Park community was identified on this list and prioritized for fuels reduction, which led directly to the development of this project. Other nearby communities that could be affected by the proposed project, such as Bailey, Brook Forest, Elk Falls, Grant, and Pine Junction, are also identified on this list.

In 2003, the USFS and DOI formed the Interagency Wildland Fire Leadership Council to further implement the NFP and to combat wildland fires more effectively. The council provides a coordinated, seamless management structure to all aspects of wildland fire policy and integrates federal fire activities with those of states, tribes, and local governments, including land restoration and rehabilitation.

Healthy Forests Initiative

In August 2002, the Administration launched the HFI to reduce the risk of catastrophic fire by reducing administrative barriers to hazardous fuel removal. The HFI expedites administrative procedures for hazardous fuel reduction and ecosystem restoration projects on federal land. The administrative actions undertaken through the HFI include:

- NEPA categorical exclusions: New categorical exclusion categories allow certain fuel treatment projects, such as mechanical thinning and prescribed fires, and rehabilitation projects after fire, such as reseeding and tree planting, to proceed with a lower level of documentation.

- New guidance for EAs of forest health projects: The CEQ provided new guidance for EAs on fuel reduction projects.

- Amended rules for appeals: The USFS amended the rules for project appeals to hasten the review of forest health projects.

- New Endangered Species Act (ESA) procedures: The new process provides an alternative to informal consultation with the U.S. Fish and Wildlife Service (USFWS) on actions determined "not likely to adversely affect" listed species or designated critical habitat for projects within the scope of the NFP.

- Stewardship contracting: The new stewardship contracting authority allows forest products to be exchanged for ecological restoration services. Stewardship contracting is discussed in more detail below.

Healthy Forest Restoration Act

The HFRA, House Resolution 1904, was passed in response to the HFI. It contains a variety of provisions designed to expedite hazardous fuel reduction and forest restoration projects on lands that are at risk of wildland fire or insect and disease epidemics. These include:

- Expedited environmental analysis of HFRA projects.

- Collaboration between federal agencies and local communities, particularly when Community Wildfire Protection Plans are prepared.

- At least 50 percent of the funds allocated to HFRA projects must be used to protect communities at risk of wildland fire.
- Performance should be monitored when agencies conduct hazardous fuel reduction projects. Encourages multiparty monitoring that includes communities and other diverse stakeholders, including interested citizens.
- Encourages courts to expedite judicial review of legal challenges to HFRA projects.
- Directs courts that consider a request for an injunction on an HFRA-authorized project to balance the short- and long-term environmental effects of undertaking the project against the effects of taking no action.

Stewardship Contracting

Under the HFI and Public Law 108-7, the USFS has approved stewardship contracts through Interim Directive 2409.19-2004-1 (USFS 2004a). These contracts allow the USFS to enter into long-term (up to 10 years) contracts to reduce wildland fire hazard and improve forest health while meeting community needs.

Stewardship contracts may be used for treatments to improve, maintain, or restore forest or rangeland health; restore or maintain water quality; improve fish and wildlife habitat; and reduce hazardous fuels that pose risks to communities and ecosystem values. The new authority allows contractors, community groups, and others to keep the wood material removed as full or partial payment for their service, depending on the value of the wood and services performed. Without further appropriation, the USFS may then apply that credit at the project site or another stewardship project site. These long-term contracts foster a public and private partnership and provide contractors with an incentive to invest in the equipment and facilities needed to conduct projects on National Forest System lands.

Front Range Fuels Treatment Partnership

The CSFS, USFS, USFS-Rocky Mountain Research Station, and the National Park Service created the FRFTP. The primary goal of the FRFTP is to enhance community sustainability and restore fire-adapted ecosystems through identification, prioritization, and rapid implementation of hazardous fuels treatment projects along the Front Range.

A key to the success of this strategy is extensive participation from local governments and public involvement. The proposed project is part of the larger 285 Conifer – Bailey Fuels Treatment Initiative, a multi-agency review of fuels treatment priorities along the 285 corridor. This effort was discussed in **Section 1.4** above. As part of this planning effort, the Platte Canyon Fire Protection District has prepared a Community Wildfire Protection Plan (CWPP), as defined by the HFRA, that includes much of the project area.

Good Neighbor Cooperative Agreements

The State of Colorado has developed Good Neighbor Cooperative Agreements, an innovative approach to addressing wildland fire hazards across USFS and state or private land boundaries. Legislation passed in 2001 allows the CSFS to act as an agent for the USFS on NFS lands that abut state or private land. The agreement gives the CSFS the legal authority to conduct treatments on public lands. The USFS pays the

CSFS, who then pays the contractor. CSFS prioritizes areas for work through Good Neighbor Cooperative Agreements where private property owners are thinning on their own land. CSFS then conducts the thinning on federal lands to create a fuel break across both public and private land.

2.2 PUBLIC INVOLVEMENT AND ISSUE IDENTIFICATION

The first step in environmental analysis is to determine what needs to be analyzed. Accordingly, scoping was conducted to determine the potential issues associated with a proposed action and further identify those issues that are substantial and relevant to the decision. First, comments were obtained from the public; federal, state and local government agencies; and affected Indian tribes to develop potential issues that should be considered. These comments were reviewed by the interdisciplinary (ID) team to determine the substantial issues to be analyzed in detail and the issues that are not substantial or that have been covered by prior environmental review and should be eliminated from detailed analysis.

Public involvement is a process that continues throughout the development and refinement of an EA. However, there are two specific periods when public and agency comments are solicited—before the environmental analyses are conducted to define the scope of the studies (scoping) and following publication of the EA.

2.2.1 The Scoping Process

The public scoping process was initiated with the publication of a Legal Notice on September 2, 2004 in the Douglas County News-Press, the South Platte Ranger District newspaper of record. Comments were accepted on the proposed project for a 30-day period ending October 4, 2004. At the same time, a scoping letter was mailed to interested parties that had previously requested notification of upcoming projects on the PSICC. The letter described: 1) a brief background for the project, 2) potential actions, 3) the purpose of and need for the proposed project, and 4) opportunities to provide comments. A bulk mailing with identical information was distributed to more than 3,000 individuals along mailing routes within one mile of the project area on September 2, 2004. Notices of the public meetings were also posted on the PSICC's web site, two community web sites, two local newspapers, and local community bulletin boards. Public open houses were held on September 8 and 11, 2004 at Platte Canyon Fire Protection District Station #2 to explain the project and solicit public input. The meetings were held in an open-house format that allowed local residents and other interested parties to review displays and maps and have one-on-one discussions with ID team members. Those attending the meetings were asked to complete feedback sheets that requested input—questions, concerns, and suggestions—as to what individuals thought about the project. Fifty-four people attended these meetings.

2.2.2 Development of Issues

Forty responses were received from individuals, groups, and governmental agencies during the scoping period, 18 from the open houses and 22 in letters, email, faxes, and documented phone calls. These responses were reviewed and discussed by the ID team, and then used in the issue development process. Each issue identified during scoping was evaluated to determine its relevance to the decision and then placed in one of the following categories: 1) dismissed as not relevant to the decision or beyond the scope of the project; 2) eliminated from detailed study because of known minimal or no effects, or effective mitigation; 3) listed as a substantial issue to be analyzed in detail, but not a key issue for alternative development; or 4) listed as a substantial issue to be analyzed in detail, and a key issue for alternative development.

Seventeen preliminary issues were identified for consideration based on public comments received during scoping. Internal discussion during comment analysis led to the identification of one additional issue, bringing the total number of identified issues to 18. Of these 18 issues, four were related to the EA process itself, while 14 were related to specific resources. Three of the process issues are not discussed further in this EA because they were determined to be not relevant to the decision or beyond the scope of the project. The fourth process issue relates to development of the proposed action. The ID team considered all comments related to development of the proposed action in formulating the proposed action discussed later in this section. The remaining 14 resource issues are discussed in the next two sections.

2.2.3 Issues Eliminated from Detailed Study

Two issues were eliminated from detailed study because it is known that the proposed project would have minimal or no effects on these resources or because standard resource protection and mitigation measures included in the proposed action would reduce the potential for effects to the extent that these resources would be essentially unaffected. Each of these issues is discussed below.

Issue 1. Public Health and Safety

The concern with public health and safety is primarily related to the risk of prescribed burning on adjacent private lands (including inholdings). The effects of smoke produced by prescribed burning on public health are discussed in detail in the air quality section. Project design standards and mitigation measures would be used to minimize risks to public health and safety. All prescribed burning would be conducted under an approved burn plan, which would minimize risk to public health and safety from prescribed burning.

Issue 2. Wilderness

Concern was raised regarding the effects of treatments on the adjacent Mount Evans Wilderness. No treatments would take place in the wilderness or within ½ mile of the wilderness boundary. Adjacent treatments could help protect wilderness from high-intensity crown fires by creating fuel breaks that would reduce fire intensity. Once a fire has entered the wilderness, suppression is often limited to primitive methods. The Mount Evans Wilderness is a Class 2 airshed. Prescribed burns could have a short-term effect on air quality in the wilderness. The project would comply with all applicable Forest Plan standards that relate to wilderness.

2.2.4 Issues Analyzed in Detail

The following 12 issues are considered important factors in the decision to be made. They are discussed in detail because: 1) they are potential factors in deciding among alternatives; 2) they are topics of high public interest; or 3) another law, regulation, or policy requires their analysis such that detailed analysis was determined to be appropriate. Each of these issues is summarized below and is discussed in detail in Chapter 3 of this EA. No issues were identified during scoping that were key to development of the alternatives analyzed in detail.

Issue 1. Vegetation

Forested stands in the project area tend to be dense and lack a diversity of age classes of trees. They are therefore more susceptible to crown fire, insects, and disease. One purpose of the proposed action is to create forest conditions that are resilient to fire, insects, and diseases. The proposed action may

substantially alter the existing vegetation in the project area from its present condition in order to meet this purpose. Ground-disturbing activities associated with the proposed action may also increase the susceptibility of the project area to invasion and spread of noxious weeds.

Issue 2. Fire and Fuels

One of the primary purposes of the proposed action is to reduce fuel loads so that, in the event of a wildland fire, suppression opportunities are improved, public and firefighter safety are improved, the risk to public and private property is reduced, and the extent of stands susceptible to crown fire is reduced. Proposed treatments would be directly focused on reducing fuel loads and altering potential fire behavior. Where the natural fire regime is low- or mixed-severity fire, treatments would move stands towards a more natural fire regime and condition class in addition to reducing fuels and altering potential fire behavior. Where the natural fire regime is stand replacement fire, treatments would not attempt to alter fire regime or condition class, but would focus solely on reducing fuels and altering potential fire behavior.

Issue 3. Air Quality

Air quality may be adversely affected by smoke from prescribed fire treatments. Some residents may have health conditions that could be exacerbated by smoke. All burning would comply with State of Colorado air quality guidelines; however, there is a concern that smoke from prescribed burning may have substantial effects on local residents and recreationists. Prescribed burns may also have a short-term effect on air quality in the Mount Evans Wilderness, a Class 2 airshed.

Issue 4. Watersheds

Each of the activities associated with the proposed action may cause increased water production because of the decrease in trees, decreased surface water quality, contribute to soil erosion, and otherwise affect watersheds. There are small numbers of wetlands in the project area. Effects to or conversion of wetlands is a federally regulated activity under section 404 of the Clean Water Act (CWA).

Issue 5. Management Indicator Species

NFMA establishes the use of Management Indicator Species (MIS) for planning and monitoring implementation of land and resource management plans. MIS include species whose response to management activities may help to predict the likely response of a wide range of species with similar habitat requirements to management activities. The Forest Plan (page III-28) identified 20 potential MIS for the Pike and San Isabel National Forests (USFS 1984a). From this list, nine species were selected for detailed evaluation because they are most likely to be affected by the proposed project.

Issue 6. Special-status Species

The ESA and USFS policy require the assessment of potential effects of proposed agency actions on species that are listed as threatened, endangered, or proposed under the ESA, or as Sensitive by the Regional Forester (USFS 2003a). The potential effects of the alternatives were evaluated in detail for 3 threatened species and 25 sensitive species that may occur in the project area. A Biological Assessment (BA) and Biological Evaluation (BE) have been prepared.

Issue 7. Transportation

A limited number of roads access the project area; however, these roads are generally sufficient to allow access for treatments associated with the proposed action. Traffic from logging trucks could affect local residents on county roads. No new system roads would be constructed. Reconstruction of existing roads may be necessary to access some areas. Reconstruction would generally have a positive effect on other resources by fixing problem areas that are currently causing resource damage. Temporary roads may be needed to access some areas.

Issue 8. Inventoried Roadless Areas

Thirty-nine percent of the project area (10,278 acres) is in an IRA (**Figure 1-1**). IRAs are currently managed according to Forest Service Handbook (FSH) Interim Directive 1920-2004-1 (USFS 2004b) because of the continued legal uncertainty of implementing the Roadless Area Conservation Final Rule (USFS 2001a). This rule restricts most road construction in IRAs, but does allow for vegetation management under certain circumstances. Some treatment units for the proposed project are located in an IRA.

Issue 9. Recreation

The project area receives extensive year-round recreational use, including camping, hiking, hunting, off-road vehicle (ORV) use, fishing, and sightseeing. The area is popular for day visitation by anglers and hikers from regional population centers, as well as seasonal hunters from across the country. The project area contains several access points for the adjacent Mount Evans Wilderness. Fuel management activities may, at times, interfere with visitor traffic, hunting, and other recreational uses in the area.

Issue 10. Visual Resources

Part or all of some proposed treatment units could be viewed from U.S. Highway 285, the Harris Park and Highland Park communities, and several NFS Roads (NFSRs). Some treatment units for the proposed project are located in MA 2A, which requires that visual resources be managed so that treatment activities are not evident or remain visually subordinate. Other units occur in MA 2B, which requires that visual resources be managed to maintain or improve the quality of recreational opportunities. Treatment units are also located in MAs 5B and 7D, which allow management activities to visually dominate the foreground and middle-ground, provided that they harmonize and blend with the natural setting. The proposed action may affect the visual landscape by altering forest canopy structure and increasing contrast between treated and non-treated areas.

Issue 11. Cultural Resources

Federal mandates for heritage resource surveys include the Antiquities Act of 1906, the Historical Sites Preservation Act of 1935, the National Historic Preservation Act of 1966, NEPA, the Archeological and Historic Preservation Act of 1974, the Archeological Resources Protection Act of 1979, and Executive Order 11593. In addition, USFS policy requires the completion of cultural resource inventories before all ground-disturbing activities.

Issue 12. Economics

The proposed action may affect many economic factors. Implementing the proposed action may not produce a net benefit to the government in terms of cost/benefit ratio. However, intangible benefits to

natural resources (lowered risk of wildfire, increased resistance to insects and disease, reduced costs for future firefighting) and public and private property may be more important than the direct monetary cost. The cost may also be justified because the wildfire hazard to private property that is adjacent to the project area would be reduced. Timber production would not be emphasized by the proposed project; however, commercial timber products may be sold to help offset the costs of the project. The proposed project may also benefit the local community by providing work in the form of service contracts for project activities and as a source of low-cost fuelwood.

2.3 ALTERNATIVE DEVELOPMENT

Following completion of scoping and issue analysis, the ID team met to discuss the array of substantial issues and to develop a range of alternatives. An alternative was considered reasonable if it was feasible and would achieve the purpose and need. Alternatives considered but eliminated from further analysis included those that were beyond the scope of the proposed action, failed to meet the purpose and need, were poorly defined, or were unlikely to be implemented. Six alternatives were developed and considered. Two of these (the proposed action and no action alternatives) were identified for detailed study based on the substantial issues. The other four alternatives were considered but eliminated from detailed study because they did not sufficiently address the relevant issues or meet the purpose of and need for the proposed action.

2.3.1 Alternatives Considered but Eliminated from Detailed Study

This section describes the alternatives that were considered but eliminated from further analysis in the EA.

Alternative A – No Prescribed Fire Use

This alternative would include all mechanical vegetation treatments and other activities that are part of the proposed action, but would not use prescribed fire. All natural and activity fuels would be treated using mechanical methods. The use of prescribed fire is an important component of accomplishing the purpose and need of the project. Prescribed fire, when combined with mechanical treatments, removes ladder and ground fuels, prepares seedbeds, and promotes natural regeneration. While mechanical treatments would accomplish similar objectives, prescribed fire can be the most efficient method of reducing fuels and modifying vegetation while minimizing effects to other resources. For example, mechanical means cannot remove accumulations of smaller slash and fine fuels without causing substantial soil disturbance. Removing slash using mechanical treatments without the use of prescribed fire would also be prohibitively expensive. This alternative was eliminated from detailed study because it does not meet the purpose of and need for the project.

Alternative B – Add Project Area to Mount Evans Wilderness Area

This alternative would not involve any vegetation treatments. The project area would be added to the Mount Evans Wilderness, closed to all vehicle access, and open fires would be banned. This alternative was eliminated from detailed study because designating the project area as Wilderness, closing it to vehicle access, and banning open fires is outside the scope of this project. Congress designates wilderness areas, and there is no opportunity for adding the project area to the Mount Evans Wilderness within the scope of this project. In addition, banning open fires does not address the potential for a wildland fire ignition. Seventy percent (789 fires) of the fires that started on the South Platte Ranger District between 1974 and 2003 were ignited by lightning. Reducing the risk of human-cause fires does not eliminate the potential for a wildland fire starting in or moving through the project area. To address the purpose and

need, an alternative must reduce fuel loads and potential fire behavior in the project area in the event of a wildland fire.

Alternative C – No Treatments in Inventoried Roadless Areas

This alternative would include all vegetation treatments and other activities that are part of the proposed project except those located in IRAs. Thirty-nine percent of the project area (10,278 acres) is located in IRAs. The proposed action includes 1,480 acres of treatments (13 percent of treatments) in IRAs. This alternative was eliminated from detailed study because it does not meet the purpose of and need for the project. Under this alternative, 739 acres of the proposed treatments that would be eliminated are within 1,000 feet of private lands where fuel treatments are needed to protect private property. Other treatments are part of strategic fuel breaks that are designed to slow fire spread and reduce extreme fire behavior in the event of a wildfire. Avoiding treatments in IRAs would reduce or eliminate the effectiveness of these fuel breaks, and would fail to meet the purpose of and need for the project.

Alternative D – Locate All Treatments Adjacent to Private Land

This alternative would include all vegetation treatments and other activities within 1,000 feet of private lands that are part of the proposed action, but eliminate all vegetation treatments and other activities farther than 1,000 feet from private lands. This alternative was eliminated from detailed study because it does not meet the purpose of and need for the project. Although conducting treatments adjacent to private land would reduce fuel loads and potential fire behavior near homes, additional treatments are needed farther from homes to reduce the risk of large-scale fire. The wind-driven Hayman fire traveled 19 miles in one day through continuous fuels. A running crown fire of this type can cause spot fires at a much greater distance than 1,000 feet, spreading fire throughout the Harris Park community despite a 1,000-foot treated buffer. For example, spotting was observed of up to ½ mile on the Snaking Fire and ¾ mile on the Hayman Fire. For this reason, a landscape-level approach to fuels treatment is needed to create strategic fuel breaks to slow or stop the spread of a large-scale, wind-driven fire. This alternative would also eliminate connections between treatments across jurisdictional boundaries that could protect larger communities.

2.3.2 Alternatives Considered in Detail

This section describes the features of the two alternatives that were considered in detail. For Alternative 1, the general concept of the alternative is explained, and then the components of the proposed mechanical and prescribed fire treatments are explained. The next section describes each of the specific treatment types, followed by a description of the proposed transportation system and stewardship projects. The description of this alternative concludes with lists of the project design standards, mitigation measures, and monitoring that would be used for this alternative. Alternative 2, the No Action alternative, is then described.

Alternative 1 – Proposed Action

This alternative is the proposed action described in Chapter 1. It is the initial proposal developed to meet the purpose of and need for the project. Treatments are expected to begin in 2005 and take at least five years to implement, depending on the availability of funding and other factors. Commercial sales, non-commercial mechanical treatments, service or stewardship contracts, and public fuelwood areas would be offered for an approximate five-year period beginning in 2005. Prescribed burning would also begin in 2005 and continue for an approximate five-year period, again depending on availability of funding. Alternative 1 is designed to reduce the risk of large-scale wildland fire in the project area by changing

forest conditions to enhance the mosaic of vegetation species, ages, and health. This alternative would move treated stands towards a pre-fire suppression condition, while reducing the potential for unacceptable tree mortality from uncontrollable crown fires. By altering forest stand characteristics, the stands would be more resilient to insect and disease infestations, encroachment by shade-tolerant tree species, and fire mortality. Throughout the project area, the potential for negative effects from fire would be reduced, health and vigor of stands would be improved, resistance to insect and diseases would be increased, and habitats for wildlife would be improved.

The overall outcome of this alternative would be to create a forested area that is less prone to large-scale fire while increasing opportunities to control wildland fires before they burn from NFS lands onto private property or from private property to NFS lands. The project is designed to reduce wildland fire hazard on a landscape scale by identifying fuel breaks that connect with other agencies' planned treatments. Treatment areas are also located near private land to allow for Good Neighbor Cooperative Agreements with the CSFS.

Alternative 1 includes two primary components, mechanical treatments and prescribed fire treatments, described below. The specific application of treatments is discussed below because both primary treatments would apply to several different vegetation cover types. Potential changes to the transportation system and stewardship projects that are part of this alternative are also discussed below. Treatment units, the transportation system, and other project activities are shown in **Figure 2-1**.

Mechanical Treatments

Approximately 11,158 acres of forested stands (42 percent of the project area) would be mechanically thinned or thinned by hand to reduce stem density, basal area, canopy continuity, and ladder fuels. The remaining 15,144 acres (58 percent) of the project area would not be treated. The removal of smaller, suppressed, and intermediate trees would be a priority, while the oldest and largest trees in the stand would generally be retained. Some co-dominant trees may be removed to reduce canopy density. Some smaller trees with good crowns would be retained to provide for a diversity of age and size class distributions in the remaining stands and to provide cover for lynx, snowshoe hare, and other lynx prey.

A combination of commercial and non-commercial methods would be used to dispose of cut trees and slash in thinned areas. In some areas, logs of commercial size would be produced, although production of commercial products is not the purpose of this project. Commercial removal of material would only be done to reduce treatment costs where, or if, feasible. Tractor or other ground-based yarding systems would be used to move logs to landings. No helicopter or cable yarding is anticipated.

Commercial and personal-use fuelwood sales would also be used to accomplish thinning and to remove material. Fuelwood areas would be concentrated near existing roads to allow access for fuelwood cutters. Fuelwood cutting would involve a permit system that would specify cutting locations, species and size classes allowed for cutting, slash treatment requirements, and other measures needed to effectively thin stands, reduce fuel loads, and minimize environmental effects.

A number of regeneration harvests have occurred in the past in the project area. Activities in these stands would include timber stand improvement, weed and release, and removal of insect- and disease-infested trees. In addition, the edges of the past treatment areas would be modified to improve the visual aspects of the treatment units, increase the size and effectiveness of openings as fuel breaks, favor fire-resistant tree species, and favor expansion of aspen clones.

Slash from all thinning units would be treated by lopping and scattering, crushing, piling and burning, broadcast burning, chipping, or other methods. Piling may be done by tractors where feasible and by hand on steeper slopes and other areas that are not accessible to tractors. Slash may also be piled at landings for later disposal. Where slash is chipped, chips may be spread across the treatment unit or removed from the area.

Where possible, small trees that are of Christmas tree size and character, as well as seedlings and saplings that may grow into Christmas trees, would be left in some treatment units. Future Christmas tree removal would be promoted. During implementation of the project, any opportunities that arise for product removal would be examined for their potential to reduce fuels. These may include, but are not limited to, commercial and personal-use Christmas tree sales, sale of mulch, and free use permits.

Prescribed Fire Treatments

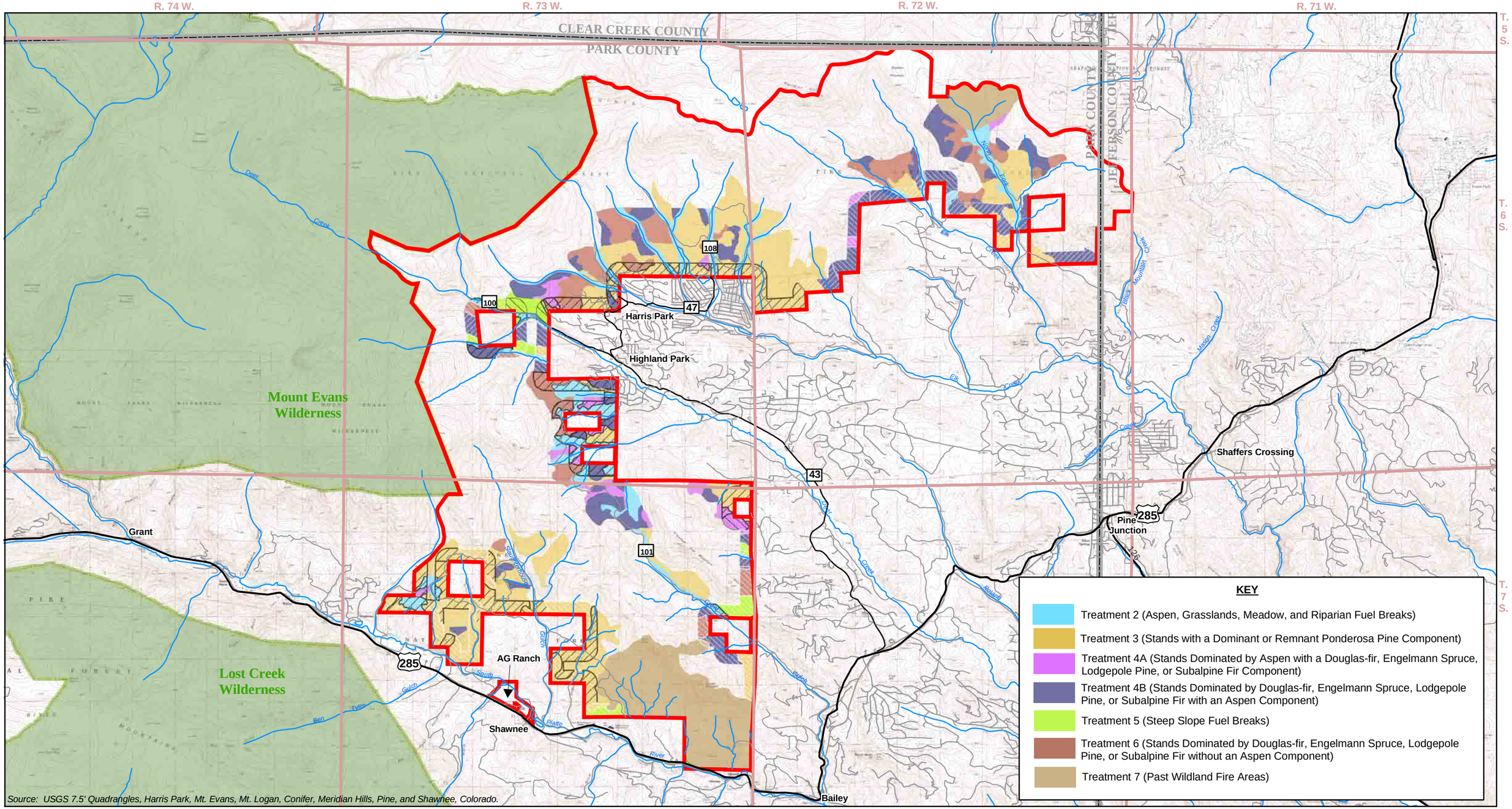
Prescribed fire would be used on up to 11,158 acres (42 percent of the project area), including most areas that have been treated mechanically or by hand, to reduce litter and duff layers, slash produced by treatments, surface fuels, regeneration, and ladder fuels. It would also be used to create small openings. The exact treatments to be used and their locations would be determined after treatments are completed, depending on the level of natural and activity fuels in each stand. Before any prescribed burning takes place, detailed burn plans that address site-specific details would be completed and approved.

Prescribed fire treatments would include hand piling and burning, mechanical piling and burning, and broadcast burning. In some areas, a combination of different treatments would be used, depending on fuel loads, accessibility, and concerns for protecting private property. For example, in areas where little slash is created or existing ground fuels are not heavy, slash generated by thinning may be lopped and scattered, then broadcast burning would be used to reduce fuels. In areas of heavy ground fuels or heavy slash creation, slash may be piled mechanically and the piles burned, except on steep slopes where hand piling would be used instead of mechanical piling. Burning would not generally be conducted in mechanical treatment areas until after the completion of non-commercial thinning, commercial sales, service contracts, and public fuelwood use.

Broadcast burning would generally not be used in units directly adjacent to private property or other improvements, especially where private lands could be at risk. Pile burning alone would be used in areas of fuel accumulation where broadcast burning is not appropriate. A combination of pile and broadcast burning would be used where necessary to maintain control. Broadcast burning may be used in areas that are not treated mechanically but where some fuel reduction is desired, such as along meadow edges to reduce conifer encroachment.

Specific Stand-type Treatments

Beyond the general mechanical and hand thinning and prescribed fire treatments described above, specific treatments would be applied to stands depending on the mix of dominant and other tree species that are present. These treatment descriptions correspond to the treatment areas shown in **Figure 2-1** and are summarized in **Table 2-1**. Each specific treatment would use a combination of the mechanical, hand, and prescribed fire methods discussed above, as appropriate. Natural variation exists in each stand; therefore, the exact prescription for each stand would be developed during project implementation. Adaptive management would be used to develop stand prescriptions during implementation based on actual site conditions. All stand prescriptions would remain within the general project design standards listed later in this chapter. Stand conditions created by these treatments may be maintained by the use of prescribed fire, thinning, or other mechanical treatments every 10 to 30 years, as needed. Prescribed burning for maintenance would be focused on created openings and ponderosa pine stands to replicate a more natural



Legend

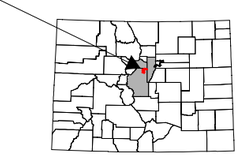
- Harris Park Project Boundary
- Wilderness Area
- Highway
- Road
- Stream
- County Boundary
- Treatment 1A (1,000-foot Buffer from Private Lands, USFS Treatment, <40% slopes)
- Treatment 1B (1,000-foot Buffer from Private Lands, USFS Treatment, >40% slopes)
- Treatment 1C (1,000-foot Buffer from Private Lands, "Good Neighbor" Treatment, <40% slopes)
- Treatment 1D (1,000-foot Buffer from Private Lands, "Good Neighbor" Treatment, >40% slopes)

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 2-1
ALTERNATIVE 1 - PROPOSED ACTION

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/TREATMENTS.MXD
Drawn By: MS	Layout: TREATMENTS PDF

fire regime, but may also be used in other situations. Specific treatments that would apply to each stand type are described below.

TABLE 2-1 SUMMARY OF TREATMENTS – ALTERNATIVE 1

Treatment Type	Extent (acres)	Proportion of Project Area (percent)
Treatments 1A and 1B (1,000-foot Buffer from Private Lands)	2,219	8
Treatments 1C and 1D (1,000-foot Buffer from Private Lands)	2,049	8
Treatment 2 (Aspen, Grasslands, Meadow, and Riparian Fuel Breaks)	1,181	4
Treatment 3 (Stands with a Dominant or Remnant Ponderosa Pine Component)	4,244	16
Treatment 4A (Stands Dominated by Aspen with a Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir Component)	383	1
Treatment 4B (Stands Dominated by Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir with an Aspen Component)	1,849	7
Treatment 5 (Steep Slope Fuel Breaks)	331	1
Treatment 6 (Stands Dominated by Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir without an Aspen Component)	1,243	5
Treatment 7 (Past Wildland Fire Areas)	1,928	7
Treatment Total*	11,158	42
No Treatment	15,144	58

* Treatments 1A, 1B, 1C, and 1D are not included in project totals because they overlap with treatments 2 through 7.

Treatments 1A, 1B, 1C, and 1D (1,000-foot Buffer from Private Lands)

The goal for these treatments is to provide a buffer area near private lands where fuel loads and the potential for passive or active crown fires are substantially reduced. This buffer would allow fire suppression activities to be effective in slowing or stopping an actively spreading wildland fire before it reached private or public lands.

Stands in the buffer area would be treated using Treatments 2 through 7 as described below. In addition, portions of this buffer that would not otherwise be treated, such as steep slopes, may be treated because of the need to protect private lands.

Treatments 1A and 1B would generally be conducted by USFS personnel or through service or stewardship contracts as part of this project. The USFS has placed a high priority on treating the buffer areas because of immediate concerns for protecting residences and other improvements on nearby private lands. Treatment 1A would include mechanical and hand thinning and all available methods of slash disposal, while Treatment 1B would include hand thinning and limited slash disposal (similar to Treatment 5 described below) because of steep slope concerns. These areas would also be eligible for Good Neighbor Cooperative Agreements between the USFS and the CSFS.

Treatments 1C and 1D would be conducted through Good Neighbor Cooperative Agreements between the USFS and CSFS. These areas are not immediately adjacent to residences and other improvements on private lands. In addition, access across USFS lands for treatment is not available. The USFS recognizes the need to treat these areas, but has given these areas a lower priority because of the lack of access across public lands and lower risk to residences and other improvements on private lands. The USFS is committed to working with the CSFS, other agencies, and private landowners to treat these areas within the time frame for this project. Treatment 1C would include mechanical and hand thinning and all available methods of slash disposal, while Treatment 1D would include hand thinning and limited slash disposal (similar to Treatment 5 described below) because of steep slope concerns.

Treatment 2 (Aspen, Grasslands, Meadow, and Riparian Fuel Breaks)

The goal for this treatment is to enhance existing vegetation fuel breaks. Treatments are designed to promote a diversity of vegetation types that would serve as fuel breaks in the event of a wildland fire, while maintaining high scenic, recreational, and wildlife habitat values. Areas of this treatment would be designated at existing natural locations (such as aspen stands, grasslands, meadows, or riparian areas) across the project area to break up continuous conifer stands and create barriers to active crown fire.

Natural openings, such as meadows and grasslands, would be maintained and expanded where possible. Where conditions permit, additional openings would be created using vegetation treatments and prescribed fire. For example, where drainages are a combination of aspen stands, willow patches, and open meadows, invading conifers would be removed to promote aspen. Promotion of aspen would consist of removing conifers from aspen clones to reduce competition, removing conifers surrounding the aspen clones to promote expansion, and using prescribed fire to stimulate root suckering. In this way, continuous fuel breaks would be created in locations where fire suppression could be effective at slowing or stopping an actively spreading wildland fire.

Treatments in riparian areas would be limited to those that would benefit fish and wildlife while providing a connection between the natural riparian fuel break and other fuel treatments. Streams and their associated riparian areas would be protected from adverse effects in accordance with MA 9A direction in the Forest Plan.

Treatment 3 (Stands with a Dominant or Remnant Ponderosa Pine Component)

The goal of this treatment is to manage stands to promote survival and re-establishment of ponderosa pine using mechanical and hand treatments and prescribed fire. This treatment would be used in areas where ponderosa pine is currently dominant or where a remnant ponderosa pine component exists in stands dominated by other conifer species, such as Douglas-fir and lodgepole pine. Stands dominated by ponderosa pine would be maintained using mechanical treatments and prescribed fire. Over-stocked stands would be managed to reduce stocking levels and improve the health and vigor of the residual trees. Once an acceptable level of stocking is reached, the stands may be under-burned to re-introduce fire, remove remaining fuels, prepare seedbeds, and promote natural regeneration.

The proposed silvicultural treatment is to thin from below by removing suppressed and intermediate trees first, followed by co-dominant and dominant trees as necessary to meet the desired canopy cover. Small, young trees with good crowns would be left to improve size and age class distribution in the remaining stand. Blue spruce, bristlecone pine, and limber pine would generally be retained unless their removal is necessary to meet the objectives of this treatment. Aspen and ponderosa pine would also be favored for retention. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be targeted for removal. Trees would be thinned in a manner that creates clumps of trees intermingled with small, irregular openings or areas of lower tree density. The proposed openings are not intended to optimize timber production but rather to create a mosaic of different stand characteristics across the landscape. This

mosaic forest structure would provide fuel breaks and diverse wildlife habitats. The openings would generally be located on south and west exposures where openings historically would have persisted for decades under natural fire regimes.

Treatment 4A (Stands Dominated by Aspen with a Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir Component)

The goal of this treatment is to enhance the health of aspen-dominated stands by removing encroaching conifers. Removing encroaching conifers would maintain habitat values for wildlife that use aspen stands, allow the stands to act as natural fuel breaks, and provide firefighters with additional areas for successful control of wildland fires.

Maintaining aspen dominance would consist of removing conifers from aspen clones to reduce competition, removing conifers around aspen clones to promote expansion of the clones, and using prescribed fire to stimulate root suckering. Blue spruce, bristlecone pine, and limber pine would generally be retained unless their removal is necessary to meet the objectives of this treatment. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be targeted for removal. Prescribed burning would be applied in areas with lodgepole pine using methods that would reduce the potential for regeneration of this species. These treatments would produce a diversity of different-aged aspen stands. Where possible, treatments would connect aspen clones with other fire-resistant vegetation (such as riparian areas) to create continuous fuel breaks.

Treatment 4B (Stands Dominated by Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir with an Aspen Component)

The goal of this treatment is to increase the proportion of aspen and decrease the proportion of conifers in stands that are dominated by conifers, but have an aspen component. Increasing aspen in these stands would increase vegetative diversity and reduce the potential for a crown fire running through a continuous conifer canopy.

Increasing aspen would involve removing conifers from aspen clones to reduce competition and removing conifers around aspen clones to promote expansion of the clones. Blue spruce, bristlecone pine, and limber pine would generally be retained unless their removal is necessary to meet the objectives of this treatment. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be targeted for removal. Prescribed burning would be applied in areas with lodgepole pine using methods that would reduce the potential for regeneration of this species. These treatments would produce a diversity of different-aged aspen stands. Where possible, treatments would connect aspen clones with other fire-resistant vegetation (such as riparian areas) to create continuous fuel breaks.

In addition to conifer removal around aspen clones, thinning and patch cutting would be used to break up the canopy and continuity of conifer stands to create a diversity of age classes and structural stages. Many conifer stands contain a few scattered, remnant aspens that would be retained during thinning and patch cutting. Following treatment, these aspens are expected to sprout, expanding the presence of aspen in treated areas. If remnant aspen do not regenerate, they may be treated to promote sprouting.

Treatment 5 (Steep Slope Fuel Breaks)

The goal of this treatment is to connect areas of steep slopes with other treated areas where slopes are not as steep. This treatment would develop or enhance strategic fuel breaks in locations where fire suppression could be effective at slowing or stopping an actively spreading wildland fire.

This treatment is located primarily on steep, south-facing slopes adjacent to riparian areas, meadows, aspen stands, or other natural fuel breaks. Hand thinning would be favored because slopes are generally too steep for mechanical thinning methods. Blue spruce, bristlecone pine, and limber pine would generally be retained unless their removal is necessary to meet the objectives of this treatment. Aspen and ponderosa pine would also be favored for retention. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be targeted for removal. Areas selected for this treatment generally have low tree density and canopy closure so that the amount of thinning and the amount of slash created would be lower than in many stands. Cut trees and slash would be treated by lopping and scattering, piling and burning, broadcast burning, or may be removed from the treatment unit where access for equipment is good.

Treatment 6 (Stands Dominated by Douglas-fir, Engelmann Spruce, Lodgepole Pine, or Subalpine Fir without an Aspen Component)

The goal of this treatment is to increase the diversity of age classes and structural stages of conifer stands to create a forest more resilient to insects and diseases and reduce the potential for a crown fire running through a continuous conifer canopy.

Crown continuity would be modified with the creation of shaded fuel breaks and small patch cuts. These activities would create stands of differing age and structural stage classes. Blue spruce, bristlecone pine, and limber pine would generally be retained unless their removal is necessary to meet the objectives of this treatment. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be targeted for removal. Prescribed burning would be applied in areas with lodgepole pine using methods that would reduce the potential for regeneration of this species. Although it is not possible or desirable to treat all stands, the mosaic of treated stands would work in conjunction with the other treatments to create a landscape where fuel loads and conditions would not support a large-scale crown fire.

Treatment 7 (Past Wildland Fire Areas)

One goal of this treatment is to maintain the positive aspects of past wildland fire areas, such as lower fuel loads, aspen regeneration, and the creation of open areas for wildlife habitat. This treatment is also designed to minimize the negative aspects of future fires, such as the potential for loss of remnant trees, invasion of noxious weeds, or regeneration of less desirable species and cover types. Although past fires were not planned, nor necessarily desirable, they provide an opportunity to manage portions of the project area for cover and habitat types that are not common in the surrounding landscape.

In the areas burned by the Snaking and Black Mountain Fires in 2002, surviving conifers would be protected by the modification of adjacent fuels. Fuel loads around green trees would be reduced to prevent future fires from killing the remaining trees. Regeneration of a desired cover type, such as aspen or ponderosa pine, would be promoted through mechanical and prescribed fire treatments. Ponderosa pine seedlings may be planted in areas with adequate soil and growing conditions. Infestations of noxious weeds would be treated using appropriate methods.

Transportation System

Existing NFSRs would provide the primary access to the project area. There are 31 miles of NFSRs within the project area (**Figure 2-1**). No new NFSRs would be constructed. NFSRs used for the project would be maintained or reconstructed as needed to accommodate safety or environmental considerations.

Up to 30 miles of new temporary roads would be needed to access treatment units. Temporary roads would be constructed to the minimum standard needed for safe and efficient use by project equipment, which may include vegetation clearing and minor earth movement. No temporary roads would be constructed in IRAs. Temporary roads would be constructed immediately before access is needed for a

particular treatment area, and then closed and obliterated as soon as possible after treatment is complete. Public use of these roads would be restricted. Temporary road construction and obliteration would be phased throughout the life of the project to minimize the extent of open temporary roads. No more than 10 miles of temporary roads would be open at any time during project implementation. Closed roads would be thoroughly obliterated using physical barriers to prevent future use by motorized vehicles.

Access for proposed treatments in several portions of the project area would be across private lands where there is no current right-of-way. Treatment in these areas would depend on successful negotiation of access between the USFS and willing private landowners. If access agreements cannot be developed with private landowners, some areas would not be treated.

Stewardship Projects

Public Law 108-7 provides the USFS with the opportunity to enter into stewardship contracts to achieve agency land management objectives and meet community needs. Guidance for stewardship projects is discussed in **Section 2.1.2**. It is anticipated that stewardship contracts would be used to implement a substantial portion of the mechanical and hand fuel treatments, as well as slash treatment, changes to the transportation system, recreational area improvements, wildlife habitat improvements, and other projects.

Appropriate stewardship work in the project area may include:

- Road and trail maintenance or obliteration to restore or maintain water quality;
- Improving soil productivity, habitat for wildlife and fisheries, or other resource values; and
- Removing vegetation or other activities to promote healthy forest stands, reduce fire hazards, or achieve other land management objectives.

Project Design Standards

This section describes project design features and activities, mitigation measures, and monitoring activities that would be used under Alternative 1.

Riparian Areas, Wetlands, and Floodplains

- All treatments near riparian areas would follow FSH 2509.25, Watershed Conservation Practices Handbook – R2 Amendment 2509.25-96-1 (WCPH) (USFS 2001b) to minimize effects to riparian habitats.

Small Mammals

- Project design and implementation would follow Forest Plan standard 6022 (page III-13), which relates to retention of coarse woody debris.

Snag Dependent Species

- Project design and implementation would follow Forest Plan standards that relate to snag dependent species, specifically 6010PI (page III-12), 0405 (page III-12), and 6011PI (page III-13).

Treatment Operations

- Defensible space would be created around the Camp Rosalie facilities according to CSFS guidelines. In surrounding stands that are part of Treatment 6, as described above, lodgepole pine would be thinned from below, leaving dominant and co-dominant lodgepole and favoring aspen regeneration.

- Treatments would retain larger trees to the extent possible. Specifically, old growth stands would only be treated in a manner that maintains or restores pre-fire suppression old growth stand characteristics. Trees with old growth characteristics would be protected during burning and thinning operations except when severely infected with insects or diseases, or when retention would compromise the effectiveness of the proposed treatments.

- In general, blue spruce, bristlecone pine, and limber pine would not be cut, except where their removal would be needed to meet the objectives of a particular treatment. Aspen and ponderosa pine would be favored for retention. Douglas-fir, Engelmann spruce, lodgepole pine, and subalpine fir would be favored for removal.

- South and west slopes would be favored for openings to increase the amount of shrublands. Openings would also be created near private lands and other fire strategic locations to increase areas of aspen or shrublands and to remove pockets of disease- or insect-infected trees. Typically, openings would not exceed one acre, and no openings greater than 10 acres would be created.

- Treatments would only remove hazard trees that actually pose a safety hazard, especially on roads that would be open (seasonally or year-long) to the public and in treatment units. Treatments would maintain dead and dying trees adjacent to roads that are closed to vehicular access.

- Where slash is treated by chipping and chips are not removed from the unit, chips would be spread over no more than 25 percent of the unit to an average depth of no more than two inches.

- Temporary roads would not be constructed in IRAs.

- Roads constructed for temporary access into a treatment unit would be guided by the principles of temporary road construction. In general, these roads are short and used where the topography and drainage requirements are minimal and the potential effects to other resources are low. Public use of temporary roads would be restricted. They serve no long-term need as roads; therefore, they would be closed and obliterated by the purchaser, contractor, or USFS after use.

- Temporary roads would only be constructed as they are needed to access particular treatment units. Temporary roads would be closed and obliterated as soon as possible once treatments are complete. No more than 10 miles of temporary roads would be open in the project area at any time during project implementation.

- Unless waived in writing by the USFS, operational restrictions would include the following:

    - No cutting or chipping activities would be allowed on weekends from 5 PM on Friday until midnight on Sunday or 5 PM preceding a state or federal holiday to midnight of the actual holiday.

    - No hauling of logs from the project area would be allowed on weekends from 5 PM on Friday until midnight on Sunday or 5 PM preceding a state or federal holiday to midnight of the actual holiday.

- Treatments directly within or closely adjacent to designated campgrounds, summer camps, trails, trailheads, and summer home groups would not occur between Memorial Day and Labor Day.

- The Fuels Management Specialist would coordinate with the Recreation Specialist as to the timing of activities adjacent to campgrounds, trails, and trailheads.

Wildlife

- Project design and implementation would follow Forest Plan standards and guidelines that relate to wildlife, specifically 6003PI (page III-29), 6004PI (page III-29); 6188 and 6289 (page III-32); 6312 and 6660 (page III-33); 6183 (page III-110); 6186 (page III-119); 6261, 6117, 6168, and 6179 (page III-152); and 6191, 6334, 6171, and 6261 (page III-153).

Mitigation

The following mitigation measures are integral to the proposed action and have been identified as necessary to ensure that it complies with the Forest Plan and to reduce environmental effects. These measures would be incorporated into the project design, timber sale contracts, service contracts, burn plans, and project plans.

Air Quality

- All prescribed burning would be conducted in a manner that complies with State of Colorado's permit process for burns.

Cultural Resources

- If any cultural resource sites are found during implementation, project activities would stop and the archeologist would be contacted immediately. The archeologist would evaluate the site and determine future actions.

Noxious Weeds

- Any infestations of weeds would be treated by the USFS following project completion. Chemical, biological, cultural, and mechanical techniques would be used as appropriate to control populations of noxious weeds as described in the PSICC Noxious Weed Management Plan Programmatic EA and Decision Notice. All treatments of noxious weeds would follow state and federal regulations.

- Disturbed areas, such as roads, landings, and skid trails, would be revegetated using the South Platte Ranger District seed mixes for the elevation zones in the project area. If commercially available, native species would be used in all seed mixes.

- The contractor/purchaser would be required to clean all equipment that operates off road before the first entry into the project area.

Public Safety

- Project travel routes open to public use would be signed to warn the public of project traffic or other potential hazards (such as prescribed fire). Where public safety cannot be reasonably ensured, roads may be temporarily closed to public use.

- The public would be notified in accordance with state air quality regulations before prescribed burning activities.

- Treatments would not be implemented within 200 yards of campgrounds and summer camps when the public is present.

- Prescribed fire treatments, including pile burning and broadcast burning, would not be implemented within less than one mile of Camp Rosalie when children are present, In addition, prescribed fire treatments would not be implemented when smoke would substantially affect Camp Rosalie if children are present.

Sensitive Species

- Sensitive species located in or near treatment areas, before or during project implementation, should be appropriately managed by active coordination among permittee, contractor or purchaser, Forest Service line officer, project administrator, and biologist. Project implementation would be modified as necessary to minimize or avoid effects to sensitive species discovered in the project area.

Watersheds

- All crossings of the Water Influence Zone (WIZ), as defined in the WCPH (USFS 2001b), would take place at designated locations. The number of designated crossings and the extent of disturbance in the WIZ from these crossings would be minimized.

- Ash piles at landings where large slash piles are burned would be ripped or otherwise scarified and seeded.

Wildlife

- A goshawk nest survey would be conducted in potential goshawk habitats before ground-disturbing activities are conducted.

- A 30-acre buffer surrounding active and historic nest sites would be created for all northern goshawk nests located in the project area.

- From March 1 to September 30, additional human-caused noise and disruption beyond that occurring at the time of nest initiation (for example, road traffic, timber harvests, and construction activities) would be minimized in an approximate 420-acre area around any active northern goshawk nest in order to reduce potential effects on nesting and fledgling success.

- Management at northern goshawk nest sites would be designed to conserve or enhance site conditions (for example, thin regeneration).

- Silvicultural prescriptions and management activities would be designed to enhance prey species habitat by maintaining vegetative diversity and striving for a balance of structural stages, from stand initiation to late successional, in northern goshawk post-fledging habitat.

- Buffers and timing restrictions would be applied as necessary to minimize disturbance of raptors nesting in or near treatment areas.

- To minimize adverse effects to Abert's squirrels in MA 2A, site-specific surveys would be conducted in mature (habitat structural stage [HSS] 4B) ponderosa pine stands before project implementation. Treatments would be modified as necessary to minimize the potential for the project to cause a declining trend in the local population.

- Wetlands that provide potential habitat for boreal toads would be avoided by all mechanical treatments and prescribed burning. No roads or other designated crossings of the WIZ would be located in these wetlands.

Monitoring

Monitoring occurs at the programmatic or Forest Plan level (USFS 1984a) and the project-specific level. Following are several monitoring activities that apply specifically to this project.

Noxious Weeds

- Treated areas and access roads would be monitored for noxious weeds for at least two years after project completion.

Roads

- Treatment units, and especially closed temporary toads in treatment units, would be monitored for ORV use. Additional measures would be developed or used to restrict ORV use and prevent resource damage if high ORV use or resource damage caused by ORVs is observed.

Vegetation/Fuels

- Post-treatment stand characteristics, such as overstory density, regeneration density, crown base height HSS distribution, and fuel loads, would be monitored to ensure that the stand prescriptions and the purpose and need for the project have been met.

Watersheds

- All roads used for project activities, including existing system roads and temporary roads, would be monitored to ensure that no adverse soil erosion or other watershed effects are occurring.

Alternative 2 – No Action

The no action alternative provides a baseline for comparison to aid in determining the relevance of issues and effects of the proposed action. Under Alternative 2, the proposed mechanical treatments, prescribed fire treatments, transportation system changes, and stewardship projects would not occur. Current management activities, such as maintenance of recreation facilities and fire suppression, would continue, but no action would be taken to meet the purpose of and need for the proposed project. Existing fuel accumulations and the risk of large-scale crown fire would not be reduced. Potential fire behavior would not be altered, and the risk to firefighters, the public, and private property in the event of a wildland fire would not be reduced.

Implementation of this alternative would cause no additional incremental effects relative to the issues previously described. For example, there would be no project-induced effects to water quality, special-status species, or visual resources. Ongoing ecological processes, such as insect and disease infestations, would continue unchecked. The potential for large-scale, difficult-to-control wildland fires would remain at current levels in the short-term, but would likely increase in the long-term as stands age and fuels accumulate.

2.4 COMPARISON OF ALTERNATIVES

Table 2-2 briefly compares the two alternatives studied in detail as they relate to the project components, objectives (purpose and need), and issues. **Chapter 3** discusses the environmental consequences of each alternative in more depth.

TABLE 2-2 COMPARISON OF EFFECTS TO SUBSTANTIAL ISSUES

Issue and Indicator		Alternative 1	Alternative 2
Vegetation			
Mechanical Thinning* and Prescribed Fire* (acres)		11,158	0
Total Area Not Treated (acres)		15,144	26,302
Post-Project Distribution of Cover Types* (acres)	Grassland	676	676
	Tufted Hairgrass-Sedge	17	17
	Mountain Shrub	225	225
	Willow	96	96
	Ponderosa Pine	4,450	3,035
	Douglas-fir	576	779
	Aspen	4,938	4,938
	Lodgepole Pine	10,888	12,091
	Spruce/Fir	2,074	2,081
	Blue Spruce	26	26
	Bristlecone Pine	1,595	1,595
	Limber Pine	535	535
	Bare Soil/Rock	208	208
Post-Project Distribution of HSSs* (acres)	HSS 1	693	693
	HSS 2	321	321
	HSS 3A	3,267	926
	HSS 3B	10,973	12,877
	HSS 3C	2,693	3,132
	HSS 4A	3,656	1,133
	HSS 4B	4,314	6,820
	HSS 4C	177	192
	HSS 5	0	0
Vegetation Patterns		The proposed treatments would promote an open mosaic of trees and fuel types similar to pre-settlement conditions.	Dense, homogenous forests, which are substantially different from pre-settlement forest conditions, would be maintained.
Insect and Disease Risk		Reduced compared to the current condition for the short and long term.	Same as current condition in the short term, likely to increase in the long term.
Fire and Fuels			

TABLE 2-2 COMPARISON OF EFFECTS TO SUBSTANTIAL ISSUES

Issue and Indicator	Alternative 1	Alternative 2
Fire Regimes*	The potential for large-scale stand-replacing fires* would be reduced. Some treatments would mimic low-intensity* ground fires that were part of the historical mixed-severity fire regime*. Treatments would move stands back towards pre-settlement fire regimes*. Treated stands would be in condition classes* 1 and 2.	Stands would remain similar to conditions under a stand-replacement fire regime* rather than the mixed-severity fire regime* that was historically present in some cover types*. Stands would remain in condition classes* 1, 2, and 3.
Fuel Models*	Treatments would increase the acreage of fuel models* 2 and 9 while decreasing the acreage of fuel models* 8 and 10.	The extent of fuel models* would not change in the short term, but fuel model* 10 may increase in the long term.
Potential Fire Behavior*	The potential for passive* and active crown fire* would be reduced. Treated areas would serve as fuel breaks* to slow or stop large-scale wildfire. Firefighting efforts would be safer, more efficient, and more effective than under current conditions.	The potential for crown fire* would not be reduced. Few fuel breaks* exist to slow or stop a large-scale wildfire. Firefighter safety and the efficiency and effectiveness of firefighting efforts would be a concern.
Fuel loads*	Treatments would decrease fuel loads* on 42 percent of the project area. Fuel loads* would increase on the 58 percent of the project area that is not treated.	Fuel loads* would increase on 100 percent of the project area.
Predicted wildland fire burn area between the years 2004 and 2024 (acres).	1,414	2,068
Change in predicted wildland fire burn area from current condition (percent).	-32	0
Predicted extent of moderate- and high-intensity wildfires in the project area between the years 2004 and 2024 (acres).	868	1,595
Change in predicted extent of moderate- and high-intensity wildfires from current condition (percent).	-46	0
Air Quality		
Potential effects to air quality	Prescribed burning* would produce smoke. Emissions from project equipment and dust production on project roads would be minimal and would not affect air quality. The potential for extensive smoke emissions from a future wildland fire would be reduced.	No prescribed burning* would be conducted. The potential for extensive smoke emissions from a future wildland fire would not be reduced.
Watersheds		
Soils	Soil disturbance and compaction* would be limited to less than 15 percent of each treatment unit. Bare soil would not increase. A minimal increase in soil erosion is expected.	There would be no changes to current levels of soil disturbance and compaction*.
Water Quality	Minimal changes to water quality are predicted.	Current water quality would be maintained.

TABLE 2-2 COMPARISON OF EFFECTS TO SUBSTANTIAL ISSUES

Issue and Indicator		Alternative 1	Alternative 2
Water Yield		No changes to water yield are predicted.	Current water yield would be maintained.
Riparian Areas*, Wetlands*, and Floodplains*		Minimal effects to riparian areas*, wetlands*, and floodplains* are predicted.	Current conditions in riparian areas*, wetlands*, and floodplains* would be maintained.
Watershed* Conditions		Minimal effects to watershed* conditions from treatment activities, including temporary roads*, are predicted. This alternative would reduce the predicted extent of areas burned by wildland fires in the project area by 32 percent and the potential for adverse watershed* effects (primarily increased erosion and sediment yield) by 46 percent.	Current watershed* conditions would be maintained. This alternative would not reduce the predicted extent of areas burned by wildland fires in the project area or the potential for adverse watershed* effects (primarily increased erosion and sediment yield).
Water Erosion Prediction Project* (WEPP) Modeling		Sediment production would be 815 tons with a 7 percent probability of sediment delivery to streams.	Sediment production would be 578 tons with a 3 percent probability of sediment delivery to streams.
Management Indicator Species*			
Habitat Trend	Mule Deer	Increase	Stable[1]
	Elk	Increase	Stable[1]
	Abert's Squirrel	Stable	Stable[2]
	Mountain Bluebird	Increase	Stable[2]
	Red-naped Sapsucker	Slight decrease[3]	Stable[2]
	Lewis' Woodpecker	Slight increase[1]	Stable[2]
	American Three-toed Woodpecker	Slight decrease[1]	Stable[1]
	Wilson's Warbler	Increase	Stable
	Brook Trout	Stable	Stable
Population Trend	Mule Deer	Increase	Stable[1]
	Elk	Increase	Stable[1]
	Abert's Squirrel	Stable	Stable[2]
	Mountain Bluebird	Increase	Stable[2]
	Red-naped Sapsucker	Slight decrease[3]	Stable[2]
	Lewis' Woodpecker	Slight increase[1]	Stable[2]
	American Three-toed Woodpecker	Slight increase[1]	Stable[1]
	Wilson's Warbler	Slight increase	Stable
	Brook Trout	Stable	Stable
Special-status Species			
Threatened and Endangered Species Determinations		"Not likely to adversely affect" for bald eagle, Mexican spotted owl, and Canada lynx.	"No effect" for bald eagle, Mexican spotted owl, and Canada lynx.
Change in Lynx Habitats (percent)	Denning	-4.4	0
	Winter Foraging	-0.5	0
	Other	-1.3	0
	Total Suitable	-2.3	0
	Unsuitable	+189.3	0

TABLE 2-2 COMPARISON OF EFFECTS TO SUBSTANTIAL ISSUES

Issue and Indicator		Alternative 1	Alternative 2
	Total Habitat	0	0
	Non-Habitat	0	0
	Lynx Analysis Unit (LAU) Total	0	0
Sensitive species determinations		"May adversely impact individuals, but is not likely to result in a loss of viability on the planning area, or cause a trend toward federal listing or a loss of species viability rangewide" for Townsend's big-eared bat, American marten, pygmy shrew, northern goshawk, boreal owl, olive-sided flycatcher, Lewis' woodpecker, flammulated owl, American three-toed woodpecker, and yellow lady's slipper. "No impact" for Gunnison's prairie dog, peregrine falcon, white-tailed ptarmigan, boreal toad, northern leopard frog, Hudsonian emerald, narrow-leaf moonwort, slender cotton grass, Colorado tansy-aster, white adder's mouth, Weber monkey flower, Kotzebue grass-of-parnassus, Rocky Mountain cinquefoil, nagoonberry, and Selkirk violet.	"No impact" for Townsend's big-eared bat, Gunnison's prairie dog, American marten, pygmy shrew, northern goshawk, boreal owl, olive-sided flycatcher, peregrine falcon, white-tailed ptarmigan, Lewis' woodpecker, flammulated owl, American three-toed woodpecker, boreal toad, northern leopard frog, Hudsonian emerald, narrow-leaf moonwort, yellow lady's slipper, slender cotton grass, Colorado tansy-aster, white adder's mouth, Weber monkey flower, Kotzebue grass-of-parnassus, Rocky Mountain cinquefoil, nagoonberry, and Selkirk violet.
Transportation			
Daily vehicle (truck and passenger car) round trips added to County Road (CR) 43 (maximum)		23	0
Road system length (miles)	Proposed temporary	30 (10 miles open at any given time during project)	0
	Total during project life	41 (maximum of 10 miles of temporary road)	31
	Obliterated at end of project	30 (obliteration would occur over the course of the project)	0
	Total after project completion	31	31
Road density (miles per square mile)	Proposed temporary	0.2 (10 miles open at any given time during project)	0.0
	Total during project life	1.0 (maximum of 10 miles of temporary road)	0.8
	Obliterated at end of project	0.2 (obliteration would occur over the course of the project)	0
	Total after project completion	0.8	0.8
Inventoried Roadless Areas*			
Treatments in IRA (acres)		1,480	0
Roads (including temporary) constructed in IRA (miles)		0	0
Recreation			

TABLE 2-2 COMPARISON OF EFFECTS TO SUBSTANTIAL ISSUES

Issue and Indicator		Alternative 1	Alternative 2
Quality of recreational experience		Temporary disruption of activities adjacent to treatment areas. Potential improvements to facilities from stewardship contracting.	Existing condition unchanged, but higher potential for negative effects to recreational use from large, high-intensity wildfires. No potential for improvements from stewardship contracting.
Visual Resources			
Visual quality		Short-term degradation of foreground views adjacent to treatment units. Forest Plan Visual Quality Objectives* (VQOs) would be met for all MAs.	Existing condition unchanged, but higher potential for negative effects to visual quality from large, high-intensity wildfires.
Cultural Resources			
Effects to cultural resources		Minimal potential for project effects to undiscovered sites because inventories would be conducted before project implementation.	Minimal potential for effects to sites from large, high-intensity wildfires.
Economics			
Present net value* ($)	USFS	-$4,744,646	-$1,008,383
	All Partners	-$38,670,293	-$77,475,818
Net cost/savings ($)	USFS	-$3,736,263	NA[4]
	All Partners	$38,805,525	NA
Non-price values	Forest health	Forest conditions would be improved on 11,158 acres, creating a more heterogeneous natural landscape with diverse habitats.	No benefit, tree stands would remain unnaturally dense and vulnerable to large-scale losses from fire, insects, or disease.
	Wildlife habitats	Creating more open forest conditions would improve habitat for some MIS* and special status species, but cause small-scale habitat loss for others. The hazard of large-scale habitat loss to fire, insects, or disease would be reduced.	Habitats would be maintained in the short term. Habitat conditions for some MIS* and special status species would be degraded as the forest grows less open and large fires threaten to cause long-term habitat loss. Species that depend on snags and open habitats may benefit from poor forest health or large-scale wildland fire.
	Recreational opportunities	The risk of large-scale events would be reduced. Existing recreational opportunities would be maintained and may be enhanced by stewardship projects.	No benefit. The current risk of large-scale fire may worsen over time. Such an event could dramatically reduce recreational use. Stewardship projects would not be used to enhance recreational opportunities.

*This term is defined in the glossary (**Section 4.2**).
[1] Substantial long-term increases in habitat and population may be caused by wildfire, but the potential for such an event is low.
[2] Substantial long-term declines in habitat and population may be caused by insect outbreak or wildfire, but the potential for such an event is low.
[3] A slight increase in habitat and population caused by increased density of aspen is anticipated in the long term.
[4] NA = Not applicable.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

There are several activities that have already occurred, are occurring, or that are likely to occur in the future in or near the Harris Park Fuels Management project area. Past activities have contributed to the current condition of resources as described in this chapter. The structure, composition, and pattern of vegetation in the project area and surrounding landscape have been altered from pre-European conditions by the cumulative effects of human activities. These activities include livestock grazing, human use of fire, extensive logging between 1870 and 1900, fire suppression since the early 1900s, and the introduction of exotic plant species (Foster Wheeler 1999). Cumulatively, these activities have altered the disturbance processes that shaped the landscape before European settlement.

Ongoing and future activities could affect resources that may also be affected by the proposed project. The need to include these activities in the cumulative effects section of each individual resource analysis depends on the extent of the cumulative effects analysis area and the duration of effects on each resource. Future activities on NFS lands described in this section are not part of the decision to be made for this EA. Ongoing activities in and near the project area are similar to past activities, with the exception of increased focus on mechanical and prescribed fire fuel treatments, as well as increased recreational activity, on federal lands and an increase in the number of primary residences on nearby private lands. Future activities are also likely to be similar, again with an increased emphasis on fuel treatment and recreational activities on federal lands and increased residential use on private lands. The extent of each type of activity is detailed below.

3.1.1 Fuel Treatments

Relatively little fuel treatment has been conducted in the past. Any fuel treatment activities in the past were completed in conjunction with timber harvest or wildlife habitat improvement projects.

There are several current and future fuel treatment projects near the project area, including projects at Staunton State Park, on the Arapaho/Roosevelt National Forest, on BLM lands, and on private lands (**Figure 3-1**). Each of these treatments is part of the larger 285 Conifer – Bailey Fuels Treatment Initiative, which is described in **Section 1.4**. Each of these fuel treatment projects would work to create a landscape where the potential for extreme fire behavior, the threat of a large-scale wildfire, and the fire hazard to surrounding private lands would be substantially reduced.

The CSFS is carrying out mechanical and prescribed fire fuel treatments in Staunton State Park, near the eastern edge of the Harris Park project area (**Figure 3-1**). When completed, 1,050 acres will have been treated at Staunton State Park. The Arapaho/Roosevelt National Forest's Evergreen Project, which is currently in the planning phase, would treat up to 1,157 acres to the northeast of the Harris Park project area (**Figure 3-1**) using a combination of prescribed fire and mechanical methods. Several communities covering 18,851 acres near the project area have been prioritized for treatment by local and state agencies (**Figure 3-1**). The actual timing and extent of treatments in these areas has not yet been determined and would be based primarily on interest from individual landowners in the identified areas.

3.1.2 Livestock Grazing

Federal lands in the project area include several livestock grazing allotments. Management plans for these allotments are currently being revised. A decision about future management of these areas is expected in 2005. Livestock grazing was much more extensive in the past in the project area and on surrounding lands. In general, livestock numbers in this area have declined in recent years, as the area has been extensively subdivided and traditional land uses, such as livestock grazing and timber harvest, have been replaced with residential development. The Elk Creek allotment north of Harris Park has been inactive since 1996. The Geneva allotment, in the southern and western portions of the project area, has had fewer than 100 cow/calf pairs turned out in recent years. Larger nearby parcels of private land are grazed, as are some smaller ranchettes and horse properties in the Harris Park area. Similar or reduced levels of livestock grazing are expected in the future on federal lands. Levels of livestock grazing on private lands may stay similar into the future or may decrease gradually as larger parcels are divided for residential use.

3.1.3 Mining

There has been no mining in the project area, nor is any expected in the future. However, there is some limited gem collecting and prospecting north of Harris Park. Prospecting pits dot the landscape. Scattered, small mining areas are located on nearby lands, especially along Highway 285 between Bailey and Grant. There are also several small gravel pits on private lands near the project area. No new mining activity is expected on private lands, other than occasional operation of some small gravel pits.

3.1.4 Noxious Weeds

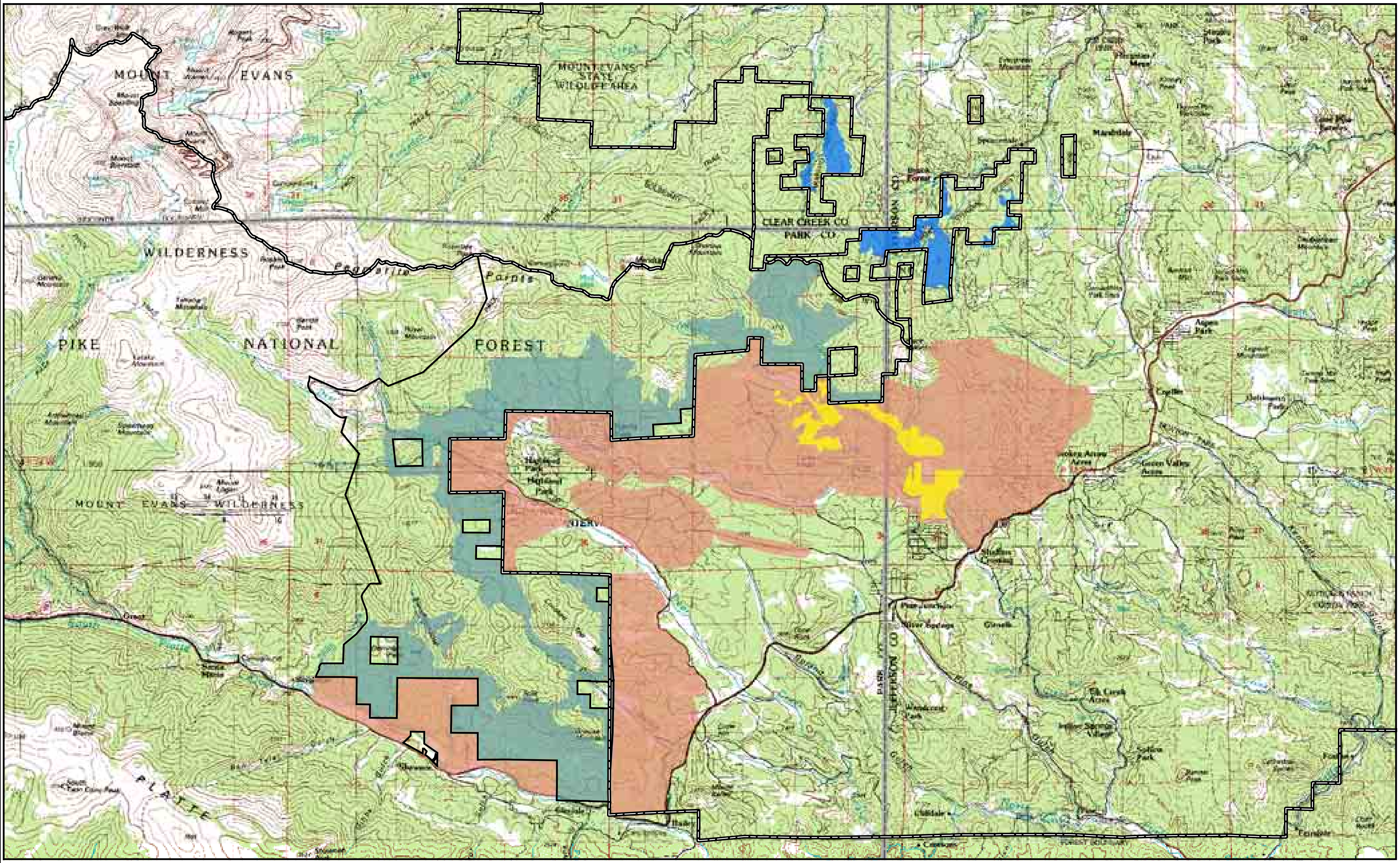
Herbicides have been applied to existing noxious weed infestations throughout the PSICC. Continued treatment of known infestations and continued survey for new infestations of noxious weeds will continue. Noxious weeds in the project area are not a widespread problem like in other areas of the PSICC.

3.1.5 Recreation

The project area has been and is currently used for camping, hiking, horseback riding, hunting, ORV use, fishing, shooting, and sightseeing. The project area also contains several access points for the adjacent Mount Evans Wilderness. The area is popular for day visitation by anglers, hikers, and other recreationists from regional population centers. Ongoing activities, such as facility maintenance and closure of informal ORV routes, are expected to continue. Future recreational uses are expected to be similar to current uses, with increasing numbers of people participating in these activities. No specific changes to federal recreational facilities are expected other than those that may be accomplished through stewardship contracting as part of this project (see **Section 2.3.2**). At some time in the future, Staunton State Park will be opened to the public. Trail connections between the state park and federal lands may be developed; however, no specific plans, locations, or schedules have been identified.

3.1.6 Residential Use

Residential use of private lands near the project area began more than 100 years ago and has slowly increased ever since. Over the last 10 to 20 years however, this use increased substantially as more people who commute to the Denver metropolitan area began to live here. Continued development of primary residences on nearby private lands at an accelerated pace is expected in the future.



Source: USGS 100k Quadrangles, Bailey and Denver West, Colorado.

Legend

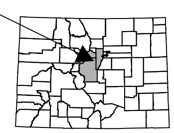
- Staunton State Park Treatment Units
- Arapaho/Roosevelt National Forest Evergreen Project Treatment Units
- Pike National Forest Harris Park Fuels Management Project Treatment Units
- Treatments on Private Land/Communities
- Harris Park Project Boundary
- National Forest Boundary
- County Boundary

N
W E
S

0 0.5 1 2 3 4 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-1
INTERAGENCY TREATMENT AREAS

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/ALL_TREATS.MXD
Drawn By: MS	Layout: ALL_TREATS PDF

3.1.7 Roads

Many of the main access routes in and around the project area are quite old. In the recent past, there has been little change to the road system, except on private lands in areas of residential development, where local roads have been built to access new subdivisions and individual homes. Improvements to Highway 285 between Foxton Road and Bailey are currently in the planning phase, with a decision expected in 2005. Some future expansion of residential roads on private lands is also expected, but specific plans are not available.

3.1.8 Timber Harvest

Timber harvest probably occurred in the project area and on surrounding lands between 1870 and 1900 (Foster Wheeler 1999), as the surrounding area was developed and wood products were needed in Denver and other developing communities. There are no specific records, but many of the existing timber stands in the project area are likely composed of trees that regenerated after these harvests.

There were several timber sales in the project area in the 1970s and 1980s. Most of the treatments consisted of clear-cuts in mature lodgepole pine. Together, these projects affected approximately 500 acres and account for most of the younger lodgepole pine stands in the project area. Some ponderosa pine stands were cut using a shelterwood prescription and Douglas-fir trees killed by a spruce budworm outbreak were salvaged. Timber harvest has probably also occurred on larger private land parcels, but no specific records are available. No future timber harvests are currently planned on NFS lands or known on private lands. Any future removal of commercial timber would likely be secondary to fuel treatments projects, as is the case with the proposed project.

3.1.9 Timber Stand Improvement

Some precommercial thinning has likely taken place in the project area. Evidence of precommercial thinning, in the form of smaller stumps and remnant slash, can be seen in several locations. However, no specific information on dates or locations is available. Future precommercial thinning is not anticipated. The proposed fuel treatments would thin many stands, favoring future growth of residual trees. However, the purpose of these treatments is fuel reduction, not development of commercial timber stands.

3.1.10 Wildfire

Several large wildfires have burned in and near the project area in recent years, including the Snaking and Black Mountain Fires. Other smaller wildfires have also occurred in the project area in the past. The Snaking Fire burned in April 2002 and the Black Mountain Fire burned in May 2002. Both fires were human-caused, and together burned 1,923 acres in the project area and 589 acres outside the project area.

The Snaking Fire burned primarily ponderosa pine stands, with smaller amounts of Douglas-fir, lodgepole pine, and spruce/fir. Burn intensity was variable, with low-intensity surface fire on 34 percent of the burned area, a mosaic of moderate-intensity surface and crown fire on 46 percent, and high-intensity crown fire on 18 percent. Crown fire mostly occurred on slopes greater than 30 percent, in areas exposed to high winds, and in dense, closed-canopy ponderosa pine stands. Numerous structures were threatened, and more than 1,000 residences were evacuated. Aggressive suppression efforts were successful, and only two outbuildings and no residences were burned.

The Black Mountain Fire burned primarily lodgepole pine, with a small amount of aspen, bristlecone pine, spruce/fir, and meadow. About 75 percent of the fire was high-intensity crown fire on steeper,

exposed slopes and in dense timber stands, while the rest was surface fire. More than 1,700 residences were evacuated, but aggressive suppression was successful at preventing any damage to private property.

An analysis of past fire events across the PSICC suggests that slightly more than two ignitions per year can be expected in the project area, with most fires being held at less than 10 acres in size. This analysis also showed that there is a 35 percent chance of a fire exceeding 1,000 acres in any 20-year period, and a 12 percent chance of a fire exceeding 10,000 acres in any 20-year period. The analysis also predicted that slightly more than 2,000 acres are likely to burn in the project area over the next 20 years, mostly in fires larger than 100 acres. This prediction is close to the actual extent of fires that burned in the project area in the last 20 years.

3.1.11 Wildlife Habitat Improvement

A wildlife habitat improvement project was conducted in the project area in the mid-1980s. Patches of dense lodgepole pine with residual aspen were cut to encourage aspen regeneration and increase habitat diversity. This treatment was successful, creating young aspen stands at several locations south of Harris Park. No future wildlife habitat improvements are planned other than those that are part of the proposed project.

3.2 VEGETATION

This section discusses current condition and proposed changes to the current condition for vegetation in the project area.

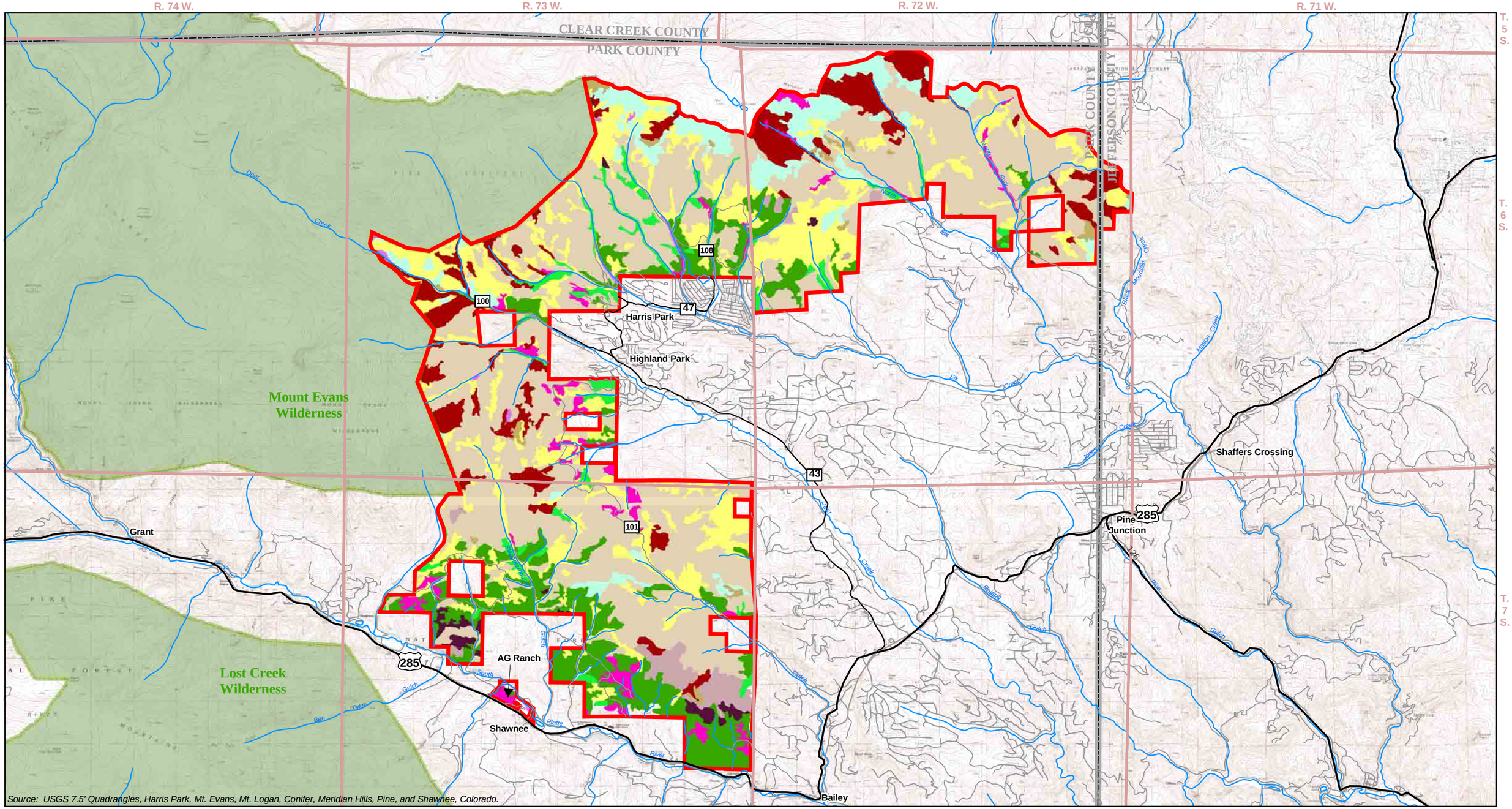
3.2.1 Cover Types

The dominant cover types in the project area are lodgepole pine, aspen, and ponderosa pine (**Figure 3-2**). These three types combined cover 76 percent of the area, with lodgepole pine occupying 46 percent of the project area. Lodgepole pine is found at higher elevations, often in nearly pure stands or mixed with ponderosa pine and other conifers. The majority (60 percent) of lodgepole pine stands are dense with trees less than 9 inches diameter at breast height (dbh) and 41 to 70 percent canopy cover. Most of the remaining stands are equally dense, but contain trees larger than 9 inches dbh.

Aspen is the second most common cover type, accounting for 19 percent of the project area. Aspen occurs on all aspects and across all elevations throughout the project area. Stands are of mixed sizes and densities, but are primarily poles less than nine inches dbh with moderate canopy closure. Decline in aspen vigor is widespread, as shade-tolerant conifers have regenerated in the aspen stands, out-competing the aspen. Aspen regeneration has been reduced to non-sustainable levels through succession to conifers.

Ponderosa pine occupies 11 percent of the project area. It is found in the lower elevations of the project area, often as pure stands or with other conifers. Ponderosa pine stands are located primarily on southern aspects in the project area. Trees greater than 9 inches dbh characterize most stands. Half of the stands have a canopy cover greater than 71 percent.

Several other cover types occupy small portions of the project area. Together, spruce/fir, bristlecone pine, and Douglas-fir cover types occupy 17 percent of the project area and open grasslands cover 3 percent. Small inclusions of limber pine, blue spruce, and willow, along with non-forested cover types such as shrubs, rock, and bare soil, account for the remaining area. Each of these cover types is shown in **Figure 3-2**.



Source: USGS 7.5' Quadrangles, Harris Park, Mt. Evans, Mt. Logan, Conifer, Meridian Hills, Pine, and Shawnee, Colorado.

Legend

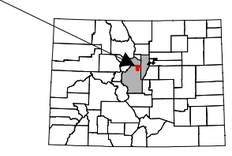
- Harris Park Project Boundary
- Wilderness Area
- Highway
- Road
- Stream
- County Boundary
- Aspen
- Bare Soil/Rock
- Blue Spruce
- Bristlecone Pine
- Douglas-fir
- Grassland
- Limber Pine
- Lodgepole Pine
- Mountain Shrub
- Ponderosa Pine
- Spruce/Fir
- Tufted Hairgrass-Sedge
- Willow

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-2
VEGETATION COVER TYPES

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO	
Date: 3/1/2005	File: I/1703/VEGETATION.MXD
Drawn By: MS	Layout: VEGETATION PDF

3.2.2 Habitat Structural Stages

HSSs describe the current successional stages of the vegetation, corresponding primarily to stand age and tree size. HSSs are defined in the glossary (**Section 4.2**). Stands of pole-sized trees (HSS 3B), primarily lodgepole pine and aspen, cover 49 percent of the project area. Twenty-five percent of the area is closed canopy, mature lodgepole and ponderosa pines (HSS 4B). Just 4 percent is classified as open grassland or shrubland. The distribution of cover types and HSSs in the project area is shown in **Table 3-1**.

TABLE 3-1 CURRENT HSS DISTRIBUTION

Cover Type	HSS (acres)										
	1M	2S	3A	3B	3C	4A	4B	4C	5[1]	NA[2]	Total
Aspen	0	0	205	2,593	1,681	21	366	71	0	0	4,938
Bare Soil/Rock	0	0	0	0	0	0	0	0	0	208	208
Blue Spruce	0	0	0	0	0	26	0	0	0	0	26
Bristlecone Pine	0	0	146	928	7	61	454	0	0	0	1,595
Douglas-fir	0	0	0	378	37	1	363	0	0	0	779
Grassland	676	0	0	0	0	0	0	0	0	0	676
Limber Pine	0	0	11	351	0	0	172	0	0	0	535
Lodgepole Pine	0	0	304	7,264	1,142	135	3,126	121	0	0	12,091
Mountain Shrub	0	225	0	0	0	0	0	0	0	0	225
Ponderosa Pine	0	0	178	404	0	874	1,580	0	0	0	3,035
Spruce/Fir	0	0	83	959	266	15	758	0	0	0	2,081
Tufted Hairgrass-Sedge	17	0	0	0	0	0	0	0	0	0	17
Willow	0	96	0	0	0	0	0	0	0	0	96
Total	693	321	926	12,877	3,132	1,133	6,820	192	0	208	26,302

[1] HSS 5 (old growth) is determined by field observation, and is not designated by data used for this analysis
[2] NA - Bare soil and rock are not assigned an HSS

Although the HSSs are based primarily on physical characteristics rather than age, mature forest stands are approximately 150 years old. Sapling-pole stands range in age from 30 to 100 years or older. Seedlings represent the 1- to 30-year age class. Areas in the grass-forb stage are those where there has not been any recruitment of tree species. In addition to species composition and HSSs, canopy closure is a useful attribute to describe the current condition. Currently, 90 percent of the forested acres have a canopy closure of 40 percent or greater. Breaks in the canopy are infrequent and are generally limited to larger areas of previous treatment or wildland fire.

3.2.3 Vegetation Patterns and Historical Range of Variability

In the forests of Colorado's Front Range, logging, grazing, and agriculture have altered the distribution, ages, and types of trees and associated plants, and contributed to the dominance of mature, closed-canopy HSSs (Foster Wheeler 1999). Timber harvest removed a large portion of the old-growth ponderosa pine and Douglas-fir forests. Grazing and land clearing have created large, even-aged stands. While these factors have influenced forest composition and structure in the project area, fire suppression has likely been the primary driver.

Removal of fire from ponderosa pine stands has allowed the encroachment of lodgepole pine, Douglas-fir, and other fire-intolerant conifers into areas historically dominated by ponderosa pine. Remaining pine stands tend to be denser and more homogeneous than in the pre-settlement condition (Foster Wheeler

1999). Though lodgepole pine cones are serotinous, and regeneration following fire is often prolific, light surface fires would have removed lodgepole pine seedlings. Mature ponderosa pine is more fire-tolerant, and would have survived as the dominant species.

Lodgepole pine currently exists in dense, even-aged stands of small diameter trees, likely created by stand-replacing fires or past timber harvest (Foster Wheeler 1999). These stands often do not experience fire for periods lasting more than 300 years (Foster Wheeler 1999). As they age, lodgepole pine stands are more at risk from insects and wind-throw. In many areas, lodgepole pine has encroached on areas historically dominated by ponderosa pine in the absence of fire.

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

3.2.4 Insects and Disease

Several insects endemic to Colorado forests are present in the project area. High populations of defoliating insects and bark beetles can cause substantial tree mortality; however, endemic populations rarely cause noticeable large-scale damage. Forest insects and diseases have historically played a part primarily in the development of individual stands. Insects and disease most likely to affect the project area are described below.

Defoliators

Defoliators are insects that feed on tree foliage. Damage caused by endemic populations is usually minor; however, under epidemic populations, heavy defoliation causes tree mortality. Outbreaks of defoliators are characteristically sporadic. During the peak of an outbreak, defoliation can be extensive and may cause large-scale host mortality. An outbreak of spruce budworm occurred in several parts of the PSICC in the mid-1980s. This caused mortality of 60 percent of the pole-sized and larger Douglas-fir. Dense, multi-storied stands of predominately Douglas-fir are most susceptible to attack by this insect. Many of the defoliated trees have subsequently died and have caused localized areas of heavy fuel loads. A large outbreak of Douglas-fir tussock moth occurred in 1993 and 1994 in the South Platte Ranger District, and several smaller outbreaks are currently active. Other important defoliators that are endemic to the coniferous forests in the project area include the western spruce budworm and the Pandora moth. Currently, defoliation by these insects above endemic levels is not evident.

Bark Beetles

Bark beetles can be major disturbance agents in western coniferous forests. Outbreaks of these insects have historically killed thousands of acres of forest. Several species of bark beetles have caused the greatest amount of mortality in forests of the western United States. These include the western pine beetle, mountain pine beetle (MPB), Douglas-fir beetle, and spruce beetle. Ongoing outbreaks of MPB are killing large areas of ponderosa pine and lodgepole pine in Colorado and threaten un-infested areas. In addition, several species of beetle in the *Ips* genus have the potential to cause extensive damage. All of these bark beetles are endemic to the project area. Epidemic-level outbreaks of MPB are occurring elsewhere on the PSICC, but have not yet developed in the project area, despite the presence of typical risk factors, including long-term drought and high stand density.

Common signs of bark beetle attack are small globules of pitch that exude from the entrance hole. Healthy pines are able to withstand the initial attack by producing abundant resin, forcing out the insects. If only a few beetles are successful in the initial attack, the tree usually survives. Older, denser stands tend to be more susceptible to insect and disease attack. Higher tree densities create greater demand for limited sunlight, water, and nutrients, placing trees under stress. Limited water resources created by competition and compounded by drought greatly reduce the tree's ability to produce enough resin to withstand an attack by insects. While MPB occurrence in the project area would be described as endemic, ponderosa and lodgepole pine stands are approaching the stage where the MPB population may increase and cause widespread mortality. The abundance of MPB and subsequent mortality of pines may indicate the beginning stages of an epidemic in the project area.

Mistletoe

Dwarf mistletoe is a parasitic flowering plant that reduces growth rates, kills trees directly, or predisposes them to attack by insects, accelerating the death of the tree. Suppression of wildland fire has led to increased distribution of mistletoe. Past practices, such as the incomplete removal of infested trees in timber harvest areas and the perpetuation of uneven-aged stand conditions, have promoted its spread. Heavy infections of mistletoe are common in pine stands on the PSICC (Foster Wheeler 1999). There are areas of mistletoe-infected trees in the ponderosa pine and Douglas-fir stands in the project area. In a few cases, entire stands are infected with dwarf mistletoe.

3.2.5 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on cover type, HSS, vegetation patterns, and insects and disease, and compares and contrasts these effects between alternatives.

Alternative 1

Cover Type

Alternative 1 would change the current species composition in the project area. Approximately 1,415 acres of lodgepole pine and mixed conifer stands would be converted to ponderosa pine dominated stands. Treatment 3 would occur in moderately dense conifer stands with a remnant ponderosa pine component. Stands would be converted to dominant ponderosa pine by retaining the remnant ponderosa pine component. Young regeneration of undesired fire-intolerant conifers would be reduced by broadcast burning following vegetation treatment.

Vigor of existing aspen clones would be enhanced. Over time, the dominance of aspen would increase because this species tends to regenerate when stands of conifers are thinned; however, the extent of this cover type is not expected to increase. Non-forested cover types such as grassland and shrubs would not change. **Table 3-2** displays the acres of each cover type in the project area to receive each type of treatment. **Table 3-3** displays the anticipated changes in cover type from the proposed treatments.

TABLE 3-2 EXISTING COVER TYPES BY TREATMENT TYPE

Cover Type	Treatment (acres)								Total
	2	3	4A	4B	5	6	7	None	
Aspen	275	1,189	240	156	45	12	123	2,898	4,938
Bare Soil / Rock	0	3	0	1	0	3	18	183	208
Blue Spruce	24	0	0	1	1	0	0	0	26
Bristlecone Pine	3	0	0	7	12	5	68	1,501	1,595
Douglas-fir	135	215	3	136	9	36	0	245	779
Grassland	286	24	0	4	66	30	168	99	676
Limber Pine	0	25	1	26	0	0	334	149	535
Lodgepole Pine	263	1,226	17	1,440	62	1,133	282	7,668	12,091
Mountain Shrub	0	110	0	2	0	0	90	23	225
Ponderosa Pine	123	1,439	122	45	132	6	768	401	3,035
Spruce/Fir	11	8	0	31	5	18	69	1,939	2,081
Tufted Hairgrass-Sedge	8	0	0	0	0	0	9	0	17
Willow	53	4	0	0	0	0	0	39	96
Total	1,181	4,244	383	1,849	331	1,243	1,928	15,144	26,302

TABLE 3-3 POST-TREATMENT COVER TYPE DISTRIBUTION

Cover Type	Treatment (acres)								Total
	2	3	4A	4B	5	6	7	None	
Aspen	275	1,189	240	156	45	12	123	2,898	4,938
Bare Soil / Rock	0	3	0	1	0	2	19	183	208
Blue Spruce	24	0	0	1	1	0	0	0	26
Bristlecone Pine	3	0	0	7	12	5	68	1,501	1,595
Douglas-fir	135	12	3	136	9	36	0	245	576
Grassland	287	24	0	4	66	30	168	99	676
Limber Pine	0	25	1	26	0	0	334	149	534
Lodgepole Pine	263	23	17	1,440	62	1,133	282	7,668	10,888
Mountain Shrub	0	110	0	2	0	0	90	23	225
Ponderosa Pine	123	2,854	122	45	132	6	768	401	4,450
Spruce/Fir	11	0	0	31	5	19	70	1,939	2,074
Tufted Hairgrass-Sedge	8	0	0	0	0	0	9	0	17
Willow	53	4	0	0	0	0	0	39	96
Total	1,181	4,244	383	1,849	331	1,243	1,928	15,144	26,302

Habitat Structural Stages

Alternative 1 would alter the distribution of HSSs in the project area through the thinning of conifer stands. The treatments are designed to thin from below to reduce stocking and promote the health and future establishment of ponderosa pine, aspen, and other desired species (see the full treatment descriptions in **Section 2.3.2**). A complete conversion of a stand from one HSS to another would not occur, and is not the objective of the treatments. However, portions of some HSSs would be converted to other HSSs. To enhance habitat and forest structure diversity, portions of stands would remain well-stocked while others would be opened to a relatively low tree density.

The overall effect would be an increase of 2,341 acres of HSS 3A and 2,523 acres of HSS 4A. Because substantial removal of the overstory is not the objective, no forested stands would be converted to a lower HSS, for example, HSS 4C to HSS 3B. Openings that are created within stands would be small enough that no conversion of forested HSSs (3 and 4) to open HSSs (1 and 2) is expected. The HSS distribution

following the implementation of Alternative 1 is shown in **Table 3-4**, and the net change to HSS distribution is shown in **Table 3-5**.

TABLE 3-4 FUTURE HSS DISTRIBUTION

Cover Type	HSS (acres)										
	1M	2S	3A	3B	3C	4A	4B	4C	5[1]	NA[2]	Total
Aspen	0	0	999	2,051	1,428	150	253	56	0	0	4,938
Bare Soil/Rock	0	0	0	0	0	0	0	0	0	208	208
Blue Spruce	0	0	0	0	0	26	0	0	0	0	26
Bristlecone Pine	0	0	152	922	7	74	440	0	0	0	1,595
Douglas-fir	0	0	77	200	17	116	166	0	0	0	576
Grassland	676	0	0	0	0	0	0	0	0	0	676
Limber Pine	0	0	18	344	0	23	149	0	0	0	534
Lodgepole Pine	0	0	881	6,397	989	431	2,069	120	0	0	10,888
Mountain Shrub	0	225	0	0	0	0	0	0	0	0	225
Ponderosa Pine	0	0	1,039	112	0	2,812	487	0	0	0	4,450
Spruce/Fir	0	0	101	946	252	25	750	0	0	0	2,074
Tufted Hairgrass-Sedge	17	0	0	0	0	0	0	0	0	0	17
Willow	0	96	0	0	0	0	0	0	0	0	96
Total	693	321	3,267	10,973	2,693	3,656	4,314	177	0	208	26,302

[1] HSS 5 (old growth) is determined by field observation, and is not designated by data used for this analysis
[2] NA - Bare soil and rock are not assigned an HSS

TABLE 3-5 CHANGE IN HSS DISTRIBUTION AND COVER TYPE

Cover Type	HSS (acres)										
	1M	2S	3A	3B	3C	4A	4B	4C	5[1]	NA[2]	Total
Aspen	0	0	794	-542	-253	129	-113	-15	0	0	0
Bare Soil/Rock	0	0	0	0	0	0	0	0	0	0	0
Blue Spruce	0	0	0	0	0	0	0	0	0	0	0
Bristlecone Pine	0	0	6	-6	0	13	-14	0	0	0	0
Douglas-fir	0	0	77	-178	-20	115	-197	0	0	0	-203
Grassland	0	0	0	0	0	0	0	0	0	0	0
Limber Pine	0	0	7	-7	0	23	-23	0	0	0	0
Lodgepole Pine	0	0	577	-867	-153	296	-1,057	-1	0	0	-1,205
Mountain Shrub	0	0	0	0	0	0	0	0	0	0	0
Ponderosa Pine	0	0	861	-292	0	1,938	-1,093	0	0	0	1,414
Spruce/Fir	0	0	18	-13	-14	10	-8	0	0	0	-7
Tufted Hairgrass-Sedge	0	0	0	0	0	0	0	0	0	0	0
Willow	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	2,341	-1,904	-439	2,523	-2,506	-16	0	0	0

[1] HSS 5 (old growth) is determined by field observation, and is not designated by data used for this analysis
[2] NA - Bare soil and rock are not assigned an HSS

Vegetation Patterns

Treatments under Alternative 1 would focus on the restoration of historical vegetation patterns in ponderosa pine stands. A combination of mechanical fuel treatments and prescribed burning would reduce stand density to create more open, ponderosa pine-dominated stands. Restored ponderosa pine stands would exhibit age and size diversity more characteristic of pre-settlement conditions. Douglas-fir regeneration, a product of fire suppression, would be largely removed. Thinning and other treatments of lodgepole pine stands would improve stand diversity and health. Strategically placed openings would serve to link aspen stands, natural openings, and other features into fuel breaks. Aspen, a desired forest component, would be retained and post-treatment conditions would favor its ability to persist. Aspen stands would be able to expand in size over time because of thinning in adjacent conifer stands and removal of encroaching conifers. These aspen stands would work in conjunction with natural openings, created openings, and other landscape features to provide a network of fuel breaks across the project area. No seeding or planting is planned, except under Treatment 7 in areas burned by wildfires, and natural regeneration would occur. Treated areas would be returned to conditions more closely resembling the historic range of variability.

Insects and Disease

Alternative 1 would reduce the occurrence of dwarf mistletoe and MPB in affected areas and create a forest structure more resistant to outbreaks. Thinning treatments would target diseased and weakened host trees, inhibiting the spread of current infestations. Endemic populations of forest pests would be kept in check by more open forest structure, reducing the potential for an outbreak of epidemic level.

Cumulative Effects

Alternative 1 would add to the cumulative effects of the timber harvest that probably occurred in the project area and on surrounding lands between 1870 and 1900 (Foster Wheeler 1999). The proposed action would be the first large-scale project in the area since that period, and would treat 11,158 acres, primarily aspen, lodgepole pine, and ponderosa pine. No future timber harvests are currently planned on NFS lands or known on private lands. Future precommercial thinning is not anticipated. The proposed fuel treatments in the project area and on nearby state and private lands would thin many stands, favoring future growth of residual trees. However, the purpose of these treatments is fuel reduction, not development of commercial timber stands. Any future removal of commercial timber would likely be secondary to fuel treatments projects, as is the case with the proposed project. The use of broadcast burning, pile burning, and hand or mechanized thinning would be necessary to preserve the beneficial effects of the proposed treatments.

Alternative 2

Cover Type

Alternative 2 would not alter the distribution of cover types in the project area in the short term. Natural processes such as succession, insect and disease outbreak, or other disturbance would continue. In the absence of large-scale fire, lodgepole pine would continue to increase in frequency in ponderosa pine stands, expanding its current extent and dominance. Aspen dominance would continue to decrease as conifers encroach into aspen stands.

Habitat Structural Stages

Alternative 2 would not immediately alter the current HSS distribution in the project area. Natural growth and mortality would continue, and mature stands would graduate to higher HSSs over time. Encroachment of shrubs and forest vegetation into grasslands would, over time, move some areas into HSS 2 and higher.

Vegetation Patterns

Alternative 2 would not alter the current vegetation patterns in the project area, and natural processes would continue to drive composition and structure. Over time, forest gaps would fill in with lodgepole pine, causing a decline in ponderosa pine and aspen. This pattern would continue until a landscape-level disturbance, such as wildland fire or insect outbreak, removes the majority of the overstory, allowing the establishment of shade-intolerant species, such as ponderosa pine. These large-scale disturbances would reinforce the current even-aged stand structure that is dominant across the landscape rather than promoting the historical pattern of small-scale, even-aged patches in an uneven-aged landscape. In the absence of fire, conifer expansion into grasslands would continue.

Insects and Disease

Alternative 2 would not reduce the current risk of MPB, tussock moth, mistletoe, or other insects and disease in the project area. Affected trees would continue to decline in health. Trees killed by pests or pathogens would add to fuel loads as both fallen branches and standing dead wood. As stands mature, resources such as water would become less available to trees to adequately resist attack. Areas where MPB and mistletoe are present would likely expand in the absence of control measures.

Cumulative Effects

Alternative 2 would not add to the cumulative effects of past and ongoing projects in the area, except for the continuing effects of fire suppression. As described under Alternative 1, there have been no major forest management activities in recent history. Therefore, the majority of the project area would remain in its current, unmanaged condition. Treatments designed and analyzed for Alternative 1 may not be effective, or even possible, in the future. To accomplish the same objectives, future treatments would likely require longer to implement, cost more, and present a higher risk to personnel implementing prescribed fire treatments. Adjacent fuel treatments on state and private lands would be less effective without implementation of treatments in the project area.

3.3 FIRE AND FUELS

This section discusses current conditions and proposed changes to the current condition for fuels and fire behavior in the project area.

3.3.1 Fire Regimes

The relatively dense, even-aged stands that characterize the current condition favor fires that consume all of the trees over large areas, such as the Snaking, Buffalo Creek, Hi Meadow, Schoonover, and Hayman fires. The density of forested stands in the project area (as evidenced by canopy cover) is generally high enough to sustain a large-scale crown fire under severe weather conditions. As the observed fire behavior

of recent large-scale fires on the Front Range indicates, forested stands no longer have the same characteristics that they developed under historical fire regimes (Romme et al 2003).

Elevations in the project area range from 8,000 to 12,000 feet with all aspects represented. The transitional environmental factors of the project area have created an interesting dynamic between lodgepole and ponderosa pines. It is unlikely that the area was historically subject to a single fire regime, but rather a combination of fire types; therefore, dominance of either lodgepole or ponderosa never developed, creating the current mix of both pine species as well as other fire-tolerant and -intolerant conifers.

Historic fire patterns varied both in size and intensity across the landscape. Lodgepole pine thrives under the influence of infrequent, high-severity (stand-replacing) fire. Although most lodgepole pines are killed by fire, they provide an abundant seed supply for rapid regeneration of lodgepole stands when serotinous cones are present. Fuel loads in lodgepole pine stands vary, as does fire severity. Lodgepole pine has short needles and does not produce a highly combustible litter layer. Changes in fuel loads over time are affected by decomposition of material killed but not consumed by previous fires, the fall and decay of snags, stand development, and the effects of insects and diseases (Anderson 2003). The natural fire frequency of lodgepole pine stands ranges from 25 to 300 years. If the fire return interval exceeds 125 years, lodgepole pine is generally replaced by climax species. In subalpine forests, lodgepole pine may be the exclusive dominant species 50 years after stand-replacing fire, and replacement of this seral forest with climax species (for example, subalpine fir or Engelmann spruce) may take up to 200 years (Anderson 2003). Under some ecological conditions, lodgepole pine can form climax stands. Lodgepole pine climax communities occur on marginal sites including frost pockets; sites subject to temperature extremes; well-drained or droughty, infertile soils; poorly-drained, highly organic soils; cold, dry sites; and many sites with soils that are saturated in the spring but very dry in late summer (Anderson 2003). Many of the lodgepole pine stands in the project area may be in a climax condition because of poor soil and cold, dry conditions. Lodgepole pine stands in the project area are probably within the historic range of variability for their natural fire regime and are in condition class 1 (Hann et al. 2003).

Aspen-dominated stands do not readily burn, especially when they are young and healthy. Slow burning, low-severity surface fires are typical. Decadent aspen stands contain more fuel and are more likely to burn than younger stands. An understory of conifer species increases the flammability of aspen stands. Healthy, aspen-dominated stands generally do not support severe fires. Crown fires are generally slowed into surface fires when they enter aspen stands (Howard 1996). Aspen stands in the project area may be outside the historic range of variability for their natural fire regime and on average are in condition class 2 (Hann et al. 2003).

Ponderosa pine is better adapted to survive surface fires than other conifers in its range, particularly when it occurs in widely spaced stands, the natural condition before fire suppression. Periodic surface fires remove the heavy litter and duff that accumulate in these forests (Howard 2003). Ponderosa pine evolved under a regime of frequent, low-severity surface fires and less frequent, mixed-severity fires. Pre-settlement fires in lower-elevation (less than 8,000 feet) ponderosa pine communities were mostly low- to moderate-severity surface fires that are estimated to have recurred every 5 to 50 years (Howard 2003, Kaufmann et al. 2000). This fire behavior thinned small trees, especially the less fire-resistant firs, and maintained open, park-like stands of ponderosa pine. However, the combined effects of 60 to 80 years of fire exclusion, logging that removed many overstory pines, heavy livestock grazing, and climate change have created closed-canopy stands with dense understories and ladder fuels (Brown et al. 1999, Howard 2003). When wildland fires burn dense ponderosa pine stands under dry conditions, the abundant fuel quickly allows the development of high-intensity fire behavior, including active crown fire. Severe, stand-replacing fires were infrequent in ponderosa pine forests in the past, but are now common and may indicate a shift to a fire regime characterized by extensive crown fires (Howard 2003). Ponderosa pine

stands in the project area are clearly outside the historic range of variability for their natural fire regime and are in condition class 3 (Hann et al. 2003).

3.3.2 Values at Risk

The numerous values at risk on both NFS lands and adjacent private lands were deciding factors in the selection of the project area for treatment. These values include:

- The presence of numerous residences in communities adjacent to the project area. Substantial areas of wildland-urban interface exist around the project area. Wildland fires originating in or moving through the project area would put homes and communities at risk.

- The South Platte River watershed, which is a municipal watershed for the city of Denver, is managed to protect wild and scenic river values and provide recreational opportunities. Fifty-two percent of the project area has highly erosive soils.

- A large wildland fire in the project area would have substantial negative effects to air quality, not just in surrounding communities, but also potentially in Denver and other Front Range cities with existing air quality concerns.

- The local economy is based in part on tourism, which is supported in the project area by scenic landscapes and the presence of numerous, heavily-used recreational opportunities. Recent large fires, particularly the Hayman Fire, have had substantial negative effects on tourism and related businesses.

- The project area supports important fish and wildlife habitats and has the potential to provide forest products. Use of these resources is an important part of the economy of surrounding communities.

3.3.3 Fuel Models and Potential Fire Behavior

The project area generally falls into six fuel models (**Table 3-6**) (Anderson 1982). A small portion of the project area was not assigned a fuel model and consists of bare soil, rock, and other non-vegetated areas.

TABLE 3-6 FUEL MODELS – CURRENT CONDITION

Fuel Model	Acres	Portion of Project Area (percent)
1	586	2.2
2	4,663	17.7
5	254	1.0
8	14,723	56.0
9	2,298	8.7
10	3,706	14.1
NA[1]	72	0.3
Total	26,302	100.0

[1] NA = Not applicable.

Fuel Model 1 covers a small amount of the project area in riparian areas and meadows. Fire behavior in this fuel model is characterized by surface fires that move rapidly through grass.

Fuel Model 2 characterizes former burn areas, open ponderosa pine, limber pine, and bristlecone pine stands, shrub cover types, and mountain grasses in the project area. This model occurs in mature ponderosa pine stands where trees are widely spaced with little understory growth. Surface fires spread easily in Fuel Model 2 as fire is carried by the grasses or woody litter. However, crown fires are rare because tree crowns are generally too widely spaced to support active crown fire.

Fuel Model 5, continuous stands of low brush, characterize the smallest amount of the project area. Fire in this fuel model is generally carried in surface fuels. Because surface fuel loads are light, fires are generally not very intense.

Fuel Model 8 represents the dense lodgepole pine stands that dominate the project area, as well as some Douglas-fir and other conifer stands. These stands generally have closed canopies and little undergrowth with little needle and woody litter. Fire behavior in Fuel Model 8 is characterized by slow burning, low-intensity fires moving through surface fuels. Where heavier fuel loads exist, crown fires can develop under severe fire weather conditions.

Fuel Model 9 characterizes dense ponderosa pine stands with some dead, down woody material and closed canopies, as well as some Douglas-fir stands with a pine component. Fires in this fuel model move through the surface litter quickly. Individual tree or group torching can occur in areas of ladder fuels or surface fuel accumulations. Under high winds, fast rates of spread can occur because of spotting.

Fuel Model 10 represents the over-mature conifer stands with heavy dead, down woody material and closed canopies. Fire behavior in Fuel Model 10 can be moderate to extreme. As fires move through the heavy surface fuels, torching of trees and spot fires are more frequent, making crown fires likely.

3.3.4 Fuel Loads

Fuel load and depth are important factors for predicting whether a fire will ignite and how it will behave (Anderson 1982). Stand data are not available for the project area; therefore, fuel loads are discussed in general terms related to their fuel model. **Table 3-7** represents the expected fuel loads for the fuel models found in the project area (Anderson 1982).

TABLE 3-7 FUEL LOAD BY FUEL MODEL

Fuel Model	Fuel Load (tons per acre) by Fuel Size			
	1 hour	10 hour	100 hours	Live
1	0.74	0.00	0.00	0.00
2	2.00	1.00	0.50	0.50
5	1.00	0.50	0.00	2.00
8	1.50	1.00	2.50	0.00
9	2.92	0.41	0.15	0.00
10	3.01	2.00	5.01	2.00

3.3.5 Fire Frequency and Risk Analysis

Fire occurrence data collected by the PSICC between 1970 and 2003 were analyzed to determine the frequency of fires in each fire size class on the Forest. These data show that, on average, slightly more than two ignitions can be expected in the project area each year.

Fire frequency data were then used to calculate the probability of having a certain number of fires of a given size class in a 20-year period and the probability of exceeding various fire size thresholds in that same period. These data show that several small fires can be expected over a 20-year period and that the probability of having a larger fire (greater than 1,000 acres) is relatively high (35 percent). However, these results contain averages from the last 30 years. Within this period, most years had precipitation higher than the long-term average. If the current multi-year drought and increasing incidence of large fires is part of a trend of increasing dryness and large fires rather than a cycle of wet and dry years, these results probably underestimate the potential for the predicted small fires to transition to larger fires in the future.

Based on historical PSICC fire data and the risk analysis, the total acreage that would be burned by wildfires during the next 20 years would be 2,068 acres, or 8 percent of the project area. This prediction is close to the actual extent of fires that burned in the project area in the last 20 years.

3.3.6 Fire Intensity

Fire intensity was estimated to provide information on potential fire effects to watersheds and other resources. These estimates were based on current and post-treatment vegetation type and canopy cover; published information on fire regimes, fire ecology, and fire effects for dominant species; standard fuel models; and field observations of stand and fuel conditions in the project area. The analysis assumed 90th percentile (severe) fire weather conditions. It was assumed that areas of moderate- and high-intensity burns have the potential to cause negative effects to soils, watersheds, and other resources because of the erosive nature of many of the soil types in the project area. It was assumed that all prescribed burning conducted under the proposed treatments would be of low intensity and would not affect these same resources.

Under current stand and fuel conditions, 23 percent of the project area (6,015 acres) would support low-intensity fire, while 25 percent (6,607 acres) would support moderate-intensity fire and 52 percent (13,680 acres) would support high-intensity fire. Wildland fires in 77 percent of the project area (20,286 acres) could cause adverse effects to watersheds and other resources.

3.3.7 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing Alternatives 1 and 2 on vegetation patterns, fire regimes, fuel models, fire behavior, fire frequency, fuel loads, and fire intensity.

Alternative 1

Fire Regimes

Alternative 1 treatments have been designed to contribute to a shift towards vegetation patterns that are more typical of pre-settlement fire regimes and connect to fuel treatments on adjacent private and public lands. These treatments would create a more complex and heterogeneous mosaic of trees than currently exists. Treatments would move ponderosa pine stands towards the pre-settlement condition and create openings, reduce canopy continuity, and increase size and age diversity in other conifer stands. These stands would be moved back towards condition class 1. All of these changes would shift the treatment areas towards conditions that are less susceptible to severe, stand-replacing wildland fires (Kaufmann et al. 2000; Kaufmann et al. 2001).

Fuel Models and Potential Fire Behavior

Treatments in Alternative 1 would change the distribution of fuel models in the project area (**Table 3-8**). The extent of fuel models 8 and 10 would decrease, while the extent of fuel models 2 and 9 would increase. These changes would be the direct result of thinning dense stands and the conversion of some mixed conifer stands to ponderosa pine stands. For example, areas that are currently in fuel model 10 would be converted to fuel model 8 through removal of younger trees and most down logs and other ground fuels. Stands that are currently in fuel model 8 and have a mix of different conifer species with some residual ponderosa pine would be converted to fuel model 2 when most conifers (except the ponderosa pine) are removed.

Treatment activities would reduce stem density, basal area, canopy cover, crown bulk density, and ladder fuels, while raising crown base height in treated stands. Each of these changes would alter potential fire behavior in treated areas. By opening up stands and removing dense fuel accumulations, fires burning in these areas are more likely to remain as surface fires and less likely to cause torching or crown fire. In addition, fire behavior in untreated areas would be reduced once it ran into treated stands. For example, a crown fire running through an untreated stand may drop down and become a surface fire when it hits a treated area because the crown density would be too low to support crown fire. This type of change in fire behavior was observed on the Hayman Fire (Martinson et al. 2003).

These changes to fuel model and expected fire behavior would improve the effectiveness of fire suppression forces, increase firefighter and public safety, and reduce firefighting costs. Safety concerns often limit firefighting efforts to the most costly methods (such as using aircraft) in areas of active and passive crown fire. In addition, these efforts are less likely to be successful because of high flame lengths, high rates of spread, extensive spotting, and other extreme fire behavior. On the other hand, surface fires do not raise as many safety concerns and can often be attacked more effectively with less expensive, ground-based resources. These resources are also more likely to be successful because of shorter flame lengths, lower rates of spread, less spotting, and generally more moderate fire behavior.

TABLE 3-8 FUEL MODELS – POST-TREATMENT

Fuel Model	Acres	Portion of Project Area (percent)	Change from Current Condition (percent)
1	586	2.2	0.0
2	6,735	25.6	+44.4
5	254	1.0	0.0
8	13,061	49.7	-11.3
9	2,694	10.2	+17.2
10	2,899	11.0	-21.8
NA[1]	72	0.3	0.0
Total	26,302	100.0	0.0

[1] NA = Not applicable.

Fuel Loads

Alternative 1 would reduce fuel loads in treatment areas. Treatments would reduce fuel loads as thinning slash is removed, piled and burned, or broadcast burned. Broadcast burning would also reduce portions of the litter and duff layer, contributing to overall lower fuel loads across each burned area.

Because stand data were not available for the project area, changes to fuel loads can only be discussed in relation to changes in fuel model. The changes in fuel models shown in **Table 3-8** support reduced fuel loads based on standard fuel loads, as shown in **Table 3-7**. The reduction in fuel models 8 and 10, with a shift towards fuel models 2 and 9 would reduce fuels in most categories. In particular, the amount of heavy fuels would be reduced, even though a corresponding increase in fine fuels may occur. Fine fuels are less of a concern because, although higher rates of spread can occur, fire suppression is also more effective. In addition, heavy fuels are more likely to cause torching and initiate crown fire behavior.

The changes to fuel model do not incorporate one aspect of fuel loads that is particularly important for this project. Each of the treatments would substantially reduce the amount of ladder and crown fuels in the treatment units. Reduction of these fuel types is the main reason that the treatments would reduce the potential for torching and crowning fire behavior (Graham et al. 2004).

Fire Frequency and Risk Analysis

For Alternative 1, it is assumed that the number of fire occurrences would not change from the current condition. The USFS (2002a) estimated that similar treatments would reduce the fire risk on any given acre by 2 percent. Applying this risk rate to all treated acres, the overall fire risk in the project area would be reduced from 8 percent to 6 percent, and the predicted area burned in the next 20 years would be reduced from 2,068 acres to 1,414 acres. This represents a reduction of 32 percent (654 acres) from the current condition.

Fire Intensity

Even more important than the reduction in fire extent would be any reduction in fire intensity. Reduced fire intensity is important because it would also reduce adverse watershed effects, improve firefighter and public safety, and increase firefighting efficiency.

The proposed treatments under Alternative 1 would reduce predicted fire intensity. Thirty-nine percent of predicted fires over the next 20 years (546 acres) would be low-intensity burns, 17 percent (244 acres) would be moderate-intensity burns, and 44 percent (623 acres) would be high-intensity burns. Eight hundred and sixty-eight acres (the moderate- and high-intensity burn areas) would contribute to negative watershed effects in the project area. This represents a 46 percent decrease in the extent of adverse watershed effects from the current condition.

Cumulative Effects

Past timber harvest and fire suppression were the primary forces that created the current landscape in and near the project area. Alternative 1, when combined with ongoing fuels treatments at Staunton State Park and the Arapaho/Roosevelt National Forest, and planned treatments on adjacent private lands, would begin to reverse the cumulative effects of these past activities and create a more natural pattern of vegetation across the landscape. This would, in turn, substantially reduce the risk and hazard of wildland fire in the project area and adjacent wildland-urban interface. Alternative 1 would be an important

component of the planned fuel treatments considered in the interagency Conifer to Bailey 285 Fuels Treatment Initiative. As such, its implementation is crucial to the interagency objective of reducing fire risk and hazards across agency boundaries in this crowded wildland-urban interface area.

The cumulative changes to vegetation patterns and fuel loads would work together to create a landscape where potential fire behavior is changed from the current undesirable condition. Flame lengths and rates of spread of surface fires would increase in some areas, but the potential for crown fires and the size of many fires would be reduced. The overall effect would be increased firefighter and public safety, increased suppression ability, and decreased suppression costs.

Alternative 2

Fire Regimes

Fire regimes under Alternative 2 would not change from the current condition. Ponderosa pine stands would remain outside of the historic range of variability for wildland fire. Dense conifer stands would remain at risk for a stand-replacing fire, which is likely different than the historic mixed-severity fire regime. Many stands in the project area would remain in condition classes 2 and 3.

Fuel Models and Potential Fire Behavior

Fuel models under Alternative 2 would remain the same as current conditions in the short term. Over time, conifer stands would become denser, increasing the amount of acreage in fuel models 9 and 10. More of the project area would become susceptible to torching and crown fires in the event of a wildland fire. Firefighter and public safety, along with the efficiency of firefighting resources, would decrease in the long term because of the potential for large-scale crown fire.

Fuel Loads

Alternative 2 would not change fuel loads in the project area in the short term. Fuel loads would increase as conifer stands continue to grow and become denser over time. Epidemic-level insect infestations may occur as forest health decreases. Such an event could dramatically increase fuel loads in affected stands.

Fire Frequency and Risk Analysis

For Alternative 2, it is assumed that the number of fire occurrences would not change. Based on historical PSICC fire data and the risk analysis, the total acreage that would be burned by wildfires during the next 20 years would be 2,068 acres, or 8 percent of the project area.

Fire Intensity

For Alternative 2, 23 percent (473 acres) of future fires over the next 20 years would be low-intensity burns, 25 percent (519 acres) would be moderate-intensity burns, and 52 percent (1,076 acres) would be high-intensity burns. 1,595 acres (the moderate- and high-intensity burn areas) would contribute to negative watershed effects in the project area.

Cumulative Effects

Past timber harvest and fire suppression were the primary forces that created the current landscape in and near the project area. Implementation of this alternative would maintain the current landscape conditions.

Alternative 2 would not add to the cumulative effects of past and ongoing projects in the area, except for the continuing effects of fire suppression. The majority of the project area would remain in its current, unmanaged condition. Adjacent fuel treatments have begun to reverse the cumulative effects of these past activities and create a more natural pattern of vegetation, fire regime, fuel loads, and potential fire behavior across the landscape. These treatments would be less effective because treatments in the project area would not contribute to this pattern on a landscape scale. Instead, fuel loads and potential fire behavior, such as flame length, rate of spread, and crown fire activity, are likely to increase over time, causing decreased firefighter and public safety, decreased effectiveness of suppression efforts, and increased suppression costs.

3.4 AIR QUALITY

This section discusses current conditions and proposed changes to the current condition for air quality in the project area.

3.4.1 State and Federal Requirements and Policies

The Colorado Smoke Management Memorandum of Understanding requires the USFS to conduct prescribed burns under conditions permitted by the Air Pollution Control Division of the Colorado Department of Public Health and Environment (CDPHE). Each prescribed burn must have a smoke permit that is reviewed by the CDPHE. Smoke permits are approved based on model outputs of particulate matter concentrations and visibility values at selected sensitive receptors.

The Environmental Protection Agency's (EPA) Interim Air Quality Policy on Wildland and Prescribed Fires provides guidance for mitigating the negative effects of air pollution caused by wildland and prescribed fires, while recognizing the current role of fire in resource management. It identifies the responsibilities of wildland managers and air quality managers to work together to coordinate fire activities, minimize air pollution emissions, and manage smoke from prescribed fire.

The Clean Air Act (CAA) requires federal land managers to protect air quality-related values (AQRVs) within Class I areas and to determine whether proposed new sources of pollution would have an adverse effect on AQRVs. The closest Class I area to the project area is Eagles Nest Wilderness. The Mount Evans and Lost Creek Wilderness Areas are Class II areas.

3.4.2 Air Quality Standards

Wildland fires can generate substantial amounts of fine particulate matter and can affect health and visual range. At close range, these fires can also generate substantial amounts of carbon monoxide (CO), which is usually more of a concern for fireline personnel than others located away from the fire.

Smoke from prescribed burning can affect air quality. Fine particulate matter, particulate matter less than 10 microns (PM_{10}) in diameter and particulate matter less than 2.5 microns ($PM_{2.5}$) in diameter, from these activities would be of specific concern because of its potential to adversely affect human respiratory systems, acting first on the most sensitive individuals such as young children, the elderly, or those with lung disease or asthma.

The CDPHE, Air Pollution Control Division is the primary Colorado authority for protecting air quality in the state under the Colorado Air Pollution Prevention and Control Act. The state is separated into six air quality regions. The project area is located in the Pikes Peak region where the Pikes Peak Area Council of Governments also manages air quality.

All Colorado communities are currently in attainment or unclassifiable for all National Ambient Air Quality Standards (NAAQS) (CDPHE 2004). Air quality in the project area is, therefore, designated as attainment or unclassifiable for all pollutants, including PM_{10} and $PM_{2.5}$. This means that the area is in compliance with federal standards.

3.4.3 Sensitive Sites

Sensitive sites are those areas in or potentially downwind of the project area that are sensitive to smoke effects, such as reduced visibility and increased concentrations of particulates. For the project, sensitive areas include population centers (Harris Park, Highland Park, Bailey, Grant, Shawnee, Pine Junction, Shaffers Crossing); recreational areas (Mount Evans and Lost Creek Wilderness Areas); and the US Highway 285 transportation corridor.

There is a potential for smoke and particulates to accumulate in sensitive areas during inversions. Temperature inversions, generally caused by radiative cooling, are common. Mountain valley inversions can occur overnight when dense, cold air collects in the mountain valleys. Stable atmospheres and low wind speeds are also required for the formation of inversions. Winter inversions are typically stronger and persistent and can last for more than a day under severe conditions. Nocturnal inversions can trap pollutants until daybreak when stagnant air is replaced by strong winds or thermal turbulence generated after sunrise. Summer inversions usually break up by mid-morning. Harris Park and Highland Park are both located in a small basin below parts of the project area. There is a ridge of higher elevation to the east of the two communities. These communities could be vulnerable to smoke inversions. Shawnee, Bailey, US Highway 285, and the South Platte River are generally downwind of the southern part of the project area. These areas could also be vulnerable to inversions.

3.4.4 Air Pollution Sources and Existing Air Quality

Because of the close proximity to the Denver metropolitan region, urban traffic and industrial sources may affect the project area. This region is the most densely populated in the state and air pollution comes from a variety of sources. Substantial emissions come from motor vehicles and include emissions of PM_{10} and CO (Colorado Air Quality Control Commission [CAQCC] 2003). It is assumed that the general air quality of the project area would be influenced by air pollutants generated in the urban areas to the north and east.

The largest source of air pollution from forest activities is smoke from both wildland and prescribed burns, and dust from unpaved roads (Forest Plan, page II-71). In the project area, the primary potential sources of air pollutants would be smoke from prescribed and wildland fire and from home heating, fugitive dust from vehicle traffic on unpaved roads, and lesser amounts of pollutants from tailpipe emissions.

Air quality over the PSICC is good with respect to all air pollutants (Forest Plan, page II-71). CDPHE defines five monitoring areas in Colorado. The project area is located in the Mountain Communities monitoring area, encompassing small towns in tight mountain valleys. CDPHE's primary monitoring concern is particulate emissions from wood-burning stoves and road sanding. There are no air quality monitors in Park County. The project area is in attainment for PM_{10} and $PM_{2.5}$.

3.4.5 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on air quality, and compares and contrasts these effects between alternatives.

Alternative 1

The operation of heavy equipment and vehicles under Alternative 1 would generate low levels of particulate emissions as well as tailpipe exhaust emissions. If the amount of particulates generated in the treatment units becomes a localized problem, dust abatement measures would be applied.

Alternative 1 includes prescribed broadcast burns and pile burns to reduce fuels. Although prescribed fires would generate emissions of air pollutants, these would lower the probability of greater emissions from uncontrolled wildland fires. Prescribed fires would create smoke that would be visible in population centers. Both gases and particulate emissions would be generated during the combustion of forest fuels. Controlled burning would be conducted during meteorological conditions conducive to smoke dispersal. When a fire is planned near a population center, wind direction and the potential for inversions would be considered to avoid negative effects to air quality. Each prescribed burn would have an approved smoke permit based on model outputs of particulate matter concentrations and visibility values at selected sensitive receptors.

Prescribed fires can be effective at reducing the potential for future adverse negative effects to air quality from wildland fires. For example, prescribed fires can be conducted under conditions favorable to air pollutant dispersal. Wildland fires do not necessarily occur when wind velocity, wind direction, and other dispersion factors are conducive to dispersing smoke and minimizing effects at sensitive receptors. Prescribed fires also reduce the potential emission of air pollutants by reducing the availability of fuels for future, uncontrolled wildland fires. Reduced fuel loads and enhanced fuel breaks under Alternative 1 may lessen the severity or extent of future wildland fires.

When added to other past, present, and reasonably foreseeable future actions, management activities associated with Alternative 1 would slightly increase effects to air quality in the short term. Several current and future fuel treatment projects are located near the project area. When combined with the proposed project, these fuel treatments would substantially reduce the cumulative risk of a large-scale wildfire and associated air emissions over the long-term.

Alternative 2

Alternative 2 would lead to an increase in fuel loads and the potential for increased severity or extent of wildland fire, which would cause increased emissions of air pollutants from smoke. Wildland fires could burn more acres and consume more fuel, creating more air pollutant emissions than a prescribed fire might produce. Because they are not timed for favorable meteorological conditions, wildland fires could have more substantial air quality effects on surrounding communities than prescribed fires. Smoke from wildland fires can contain high concentrations of fine particulate matter. This alternative would not cumulatively reduce the hazard of wildland fire and associated air emissions when combined with other past, present, and reasonably foreseeable future actions.

3.5 WATERSHEDS

This section discusses current condition and proposed changes to the current condition for soil and water resources in the project area.

3.5.1 Soil Resources

Soils in the project area are derived from non-calcareous granite. Granite weathers to gruss, which is coarse gravel and fine sand composed of potassium feldspar, quartz, weathered biotite, muscovite, and hornblende (Foster Wheeler 1999). This parent material provides for a weakly-developed and acidic substrate. These weakly developed soils are highly sensitive to both wind and water erosion. Water moving across the soil surface and raindrop impact are the key soil-disturbance processes contributing to soil erosion in the project area. The amount of erosion that occurs is a function of climate, slope, disturbance, and vegetative cover.

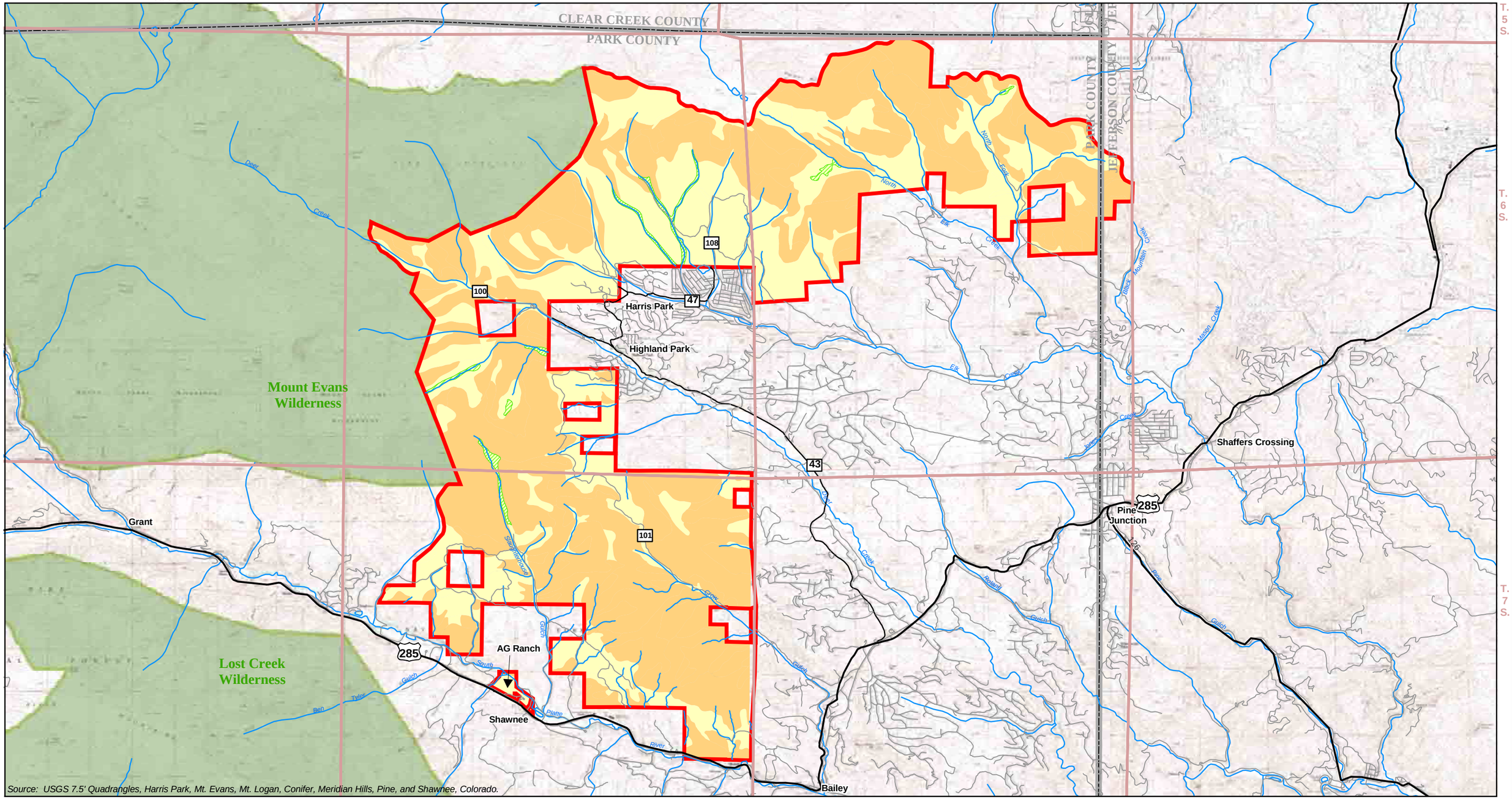
Soils in the project area were mapped as part of a cooperative effort between the Natural Resources Conservation Service (NRCS), the United States Department of Agriculture (USDA), the PSICC, the Colorado Agricultural Experiment Station, and private contractors (NRCS 1994). Twenty-seven soil map units (SMUs) were delineated in the project area. The permeability of most of the soils is moderate or rapid, and none are rated as slow. The surface runoff is moderate to rapid for most SMUs in the project area. The potential for landslides is low, and the potential for debris flows is low or moderate. The sediment delivery potential for most of the soils is high. Four SMUs have severe cut and fill slope stability ratings, and 12 SMUs have severe ratings for roads and trails. Fourteen SMUs have severe revegetation ratings. Only one SMU in the project area is poorly drained. This soil is found on valley floodplains vegetated by willows and sedges. This SMU has a depth to seasonal high water table of 1 foot or less.

Each SMU has an individual soil erosion hazard rating. These ratings are based on the inherent erodibility of the soil (K-factor) and the average slope. A soil's K-factor is a function of the particle-size distribution, organic matter content, structure, and permeability of the soil or surface material. The erosion hazard ratings assume a bare soil surface, which would occur following a fire or intensive mechanical treatments. Using the soil erosion hazard ratings, an SMU was classified as sensitive to erosion if it had a moderate or high erosion hazard. An SMU was classified as sensitive to compaction if it met one or more of the following criteria: (1) the natural drainage class is poor; (2) the permeability is low; or (3) the depth to seasonal high water table is less than one foot.

Using these classifications, 15,992 acres (61 percent of the project area) were rated as sensitive to erosion and 243 acres (less than one percent of the project area) were rated as sensitive to compaction (**Figure 3-3**). The soils that are most sensitive to compaction are found in riparian areas, wetlands, and floodplains because they are typically wet and have finer textures. Upland soils can also be sensitive to compaction in wet conditions, with high ground pressure equipment, or where repeated passes are made with equipment.

3.5.2 Water Resources

The Harris Park project area lies in the Upper South Platte watershed, an important watershed of the State of Colorado. The watershed covers 1,820 square miles in five counties, including Park, Teller, Clear Creek, Jefferson, and Douglas. It supplies 80 percent of the water for the city of Denver, and contains 67 percent of the state's population. The major streams in the project area include Elk Creek, the North Fork of Elk Creek, and Deer Creek. The North Fork of the South Platte River also runs through the southwest portion of the project area.



Source: USGS 7.5' Quadrangles, Harris Park, Mt. Evans, Mt. Logan, Conifer, Meridian Hills, Pine, and Shawnee, Colorado.

Legend

- Harris Park Project Boundary
- Wilderness Area
- Highway
- Road
- Stream
- County Boundary

Soils

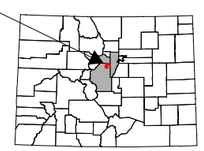
- Sensitive Compaction Rating
- Sensitive Erosion Rating
- Non-Sensitive Erosion Rating

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-3
SENSITIVE SOILS

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/SOILS.MXD
Drawn By: MS	Layout: SOILS PDF

Watersheds

There are three 6th-level watersheds in the Harris Park project area: Deer Creek (Hydrologic Unit Code [HUC] 101900020402), Elk Creek (HUC 101900020403), and Bailey Creek (HUC 101900020303) (**Figure 3-4**). All three creeks drain directly into the North Fork of the South Platte River.

Watershed boundaries were developed from the PSICC's watershed Geographical Information Systems (GIS) layer based on HUC 6th-level watersheds. These watersheds range in size from 27,000 acres to 46,000 acres. The size and extent of each watershed in the project area are shown in **Table 3-9**. For the cumulative effects analysis, the entire watershed area of each 6th-level watershed was considered.

TABLE 3-9 SIXTH-LEVEL WATERSHEDS

Watershed Name	Total Acres	Acres in the Project Area
Bailey Creek	46,463	7,816
Deer Creek	27,149	5,517
Elk Creek	40,429	12,960
Total	114,042	26,294

The total length of the streams in the project area according to stream type and watershed is provided in **Table 3-10**. In the project area, the Elk Creek watershed contains the greatest total length of perennial streams, and the Bailey Creek watershed contains the greatest total length of intermittent streams. Approximately 6 miles of the North Fork of the South Platte River lie within or immediately adjacent to the project area.

TABLE 3-10 PERENNIAL AND INTERMITTENT STREAMS

Watershed	Stream Type (miles)		Total (miles)
	Perennial	Intermittent	
Bailey Creek	5.1	16.5	21.6
Deer Creek	5.2	6.8	12.0
Elk Creek	15.5	12.4	27.9
Total	25.8	35.7	61.5

Water Quality

Water quality is a high priority for the Upper South Platte watershed. It is a major source of water for municipalities along the Colorado Front Range and agriculture throughout northeastern Colorado. The South Platte drainage is a major recreational area in Colorado and is highly regarded for its "Gold-Medal" trout fisheries. Portions of the South Platte River have been recognized by the PSICC as being eligible for inclusion into the Wild and Scenic River system (USFS 2004c).

The CDPHE has designated the beneficial uses for these streams as Aquatic Life Cold Water Class 1, Recreation Class 1, Water Supply, and Agriculture. The CWA requires states to compile a list of water bodies, known as the 303(d) list, that do not fully support their beneficial uses. Stream segments upstream and downstream of the project area are on the 2002 CDPHE 303(d) list of impaired streams (CDPHE 2002). The upstream segments are Hall Valley Area to Geneva Creek, which is listed for copper and aluminum, and Geneva Creek to the North Fork of the South Platte River, which is listed for zinc. The downstream segment is Trout Creek and its tributaries on NFS lands, which is listed for sediment (CDPHE 2002). The CDPHE also maintains a Monitoring and Evaluation List for those streams where documentation is not adequate for a 303(d) listing, but where water quality is a concern. Sixteen segments in the Upper South Platte watershed are on the Monitoring and Evaluation List. Two of these segments are listed for mining impacts on Geneva Creek, and the rest, one of which is on the Lower North Fork of the South Platte River, are listed for sediment (CDPHE 2002).

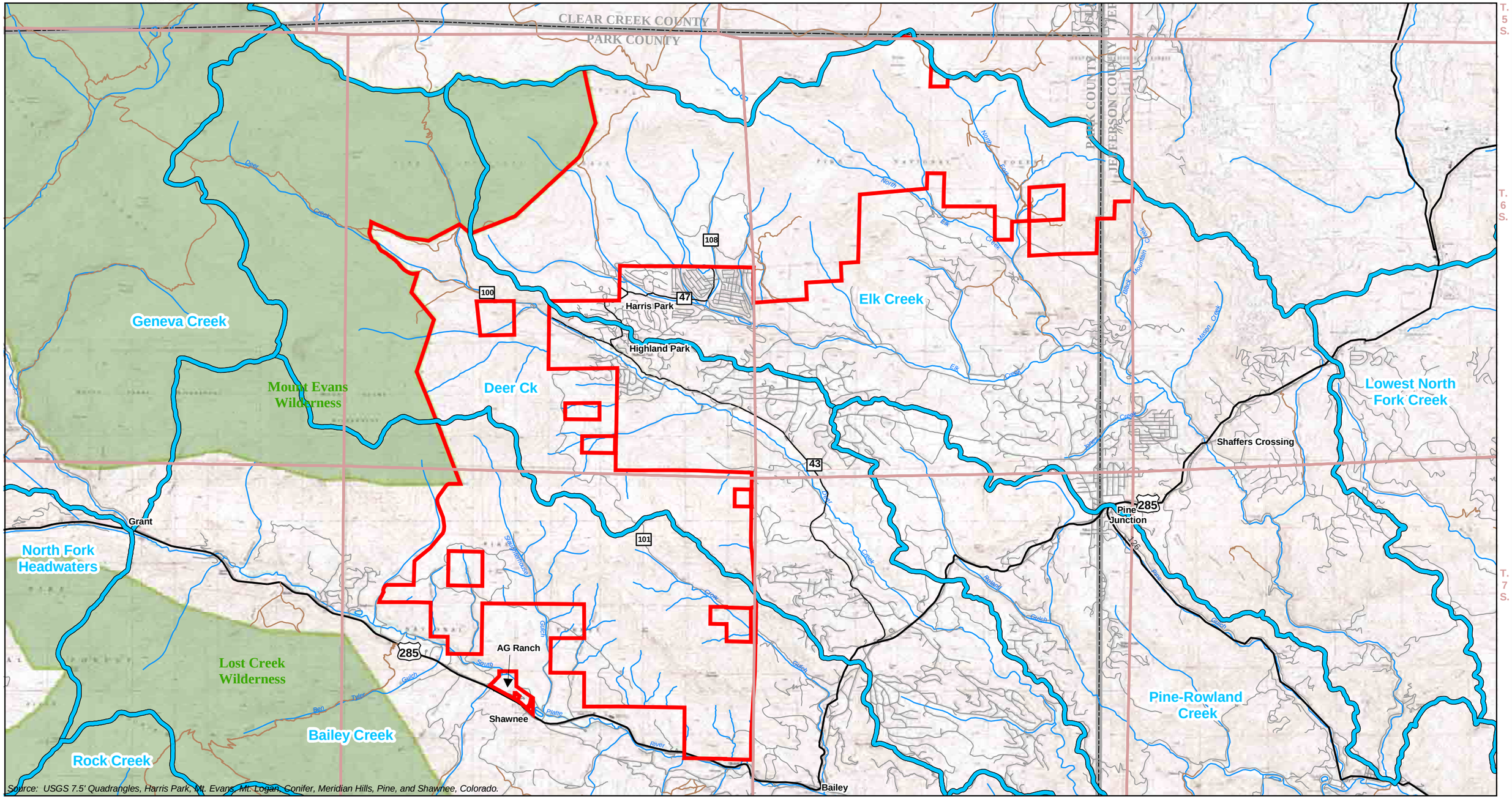
Existing water quality in the project area is influenced by natural characteristics of the watersheds along with the effects of activities that occurred there, such as timber harvest, grazing, recreational use, mining, and residential development. Water quality parameters that may affect beneficial uses in these drainages include sediment, temperature, and heavy metals.

The greatest threats to water quality in the project area are total suspended sediment (TSS) and metals, which are the focus of most regulatory efforts. TSS is the concentration of solids in the water column and can affect water quality both physically and chemically (MacDonald and Stednick 2004). The high surface area of fine particles has the potential to absorb phosphorus and other chemicals, leading to further water quality degradation. An unnatural sediment load can also remove a stream from its state of equilibrium and cause it to become unstable. Roads are most likely the current sources of erosion and sediment deposition. The metals that have been a problem in the watershed include cadmium, lead, copper, zinc, and iron. Metal-laden discharge from historic upstream mining and mineral-rich geology are likely the source of these contaminants. Cadmium, lead, and zinc were determined in 2002 to be inapplicable for Total Maximum Daily Load (TMDL) determination, but aluminum and copper are still listed.

Water Yield

Stream flows in the project area are in the North Fork of the South Platte River, Deer Creek, Elk Creek, and the North Fork of Elk Creek. Peak flows typically occur in June or July in response to peak snowmelt periods. Stream flow data for the North Fork of South Platte River is only available for the years 1942 through 1946. During that time, the monthly mean stream flow at Pine in June and January was 299 and 31 cubic feet per second (cfs), respectively (U.S. Geological Survey [USGS] 2004a). The Roberts Tunnel alters flows in the North Fork of the South Platte River. More recent data (1898 to 2003) for the South Platte River at South Platte show that the mean monthly stream flow is 869 cfs in June and 113 cfs in February (USGS 2004a). Between 1996 and 1998, the monthly mean stream flow on Deer Creek in June was 54 cfs (USGS 2004a). The monthly mean stream flow in February at this location was 3 cfs (USGS 2004a). Stream flow data for Elk Creek and the North Fork of Elk Creek were not available.

Extensive studies of flow regime in the Upper South Platte watershed show that peak flows are dominated by snowmelt above an elevation of 7,500 feet. Water flows higher than bankfull discharge are uncommon (MacDonald and Stednick 2004). Channel formation above this elevation is primarily determined by long-term snowmelt patterns. This elevational effect is important because peak flows from rainfall events have a greater potential to transport sediment into stream channels by overland flow and sheet wash processes than do peak flows that are snowmelt dominated. In Colorado, most summer rainstorms have little effect on summer stream flows, as the amount of rain is small relative to the available soil moisture storage capacity. Watershed studies indicate that only one to three percent of summer precipitation is



Source: USGS 7.5' Quadrangles, Harris Park, Mt. Evans, Mt. Logan, Conifer, Meridian Hills, Pine, and Shawnee, Colorado.

Legend

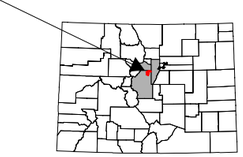
- Harris Park Project Boundary
- Wilderness Area
- Watershed Boundary
- Highway
- Road
- Trail
- Stream
- County Boundary

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-4
SIXTH LEVEL WATERSHEDS

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/HYDRO.MXD
Drawn By: MS	Layout: HYDRO PDF

converted into runoff (MacDonald and Stednick 2004). However, it should be noted that although higher elevation peak flows are primarily caused by snowmelt, the largest peak flows include some rainfall events (Foster Wheeler 1999).

Riparian Areas

Riparian areas in the project area are along Deer Creek, Elk Creek, North Fork Elk Creek, and the North Fork of the South Platte River, and comprise seven percent of the landscape. Riparian areas are defined as a form of wetland that is transitional between permanently saturated wetlands and upland terrestrial areas. They are characterized by visible vegetation or physical features reflective of permanent surface or subsurface water influence. Riparian areas are the green zones adjacent to lakeshores and along permanently or seasonally flowing rivers and streams. They are among the most productive ecosystems in the watershed. Properly managed riparian areas offer wildlife habitat, bank stability, dissipated flood energy, and improved water quality through the filtering and trapping of sediment. Water flow volume, longevity, and timing are all closely tied to riparian condition.

Surveys conducted by the USFS on the North Fork of the South Platte River show that bank erosion in riparian areas has substantially increased in the lower gradient meandering reaches (USFS 2004a). Bank erosion on these reaches is outside of what is typical for these stream types. Potential causes include previous wildland fires, roads, increased flows, and recreation.

Wetlands

For regulatory purposes under section 404 of the CWA, the term wetlands is defined as “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Effects to wetlands are regulated by the U.S. Army Corps of Engineers (USACE) and the EPA. According to the PISCC inventory data, there are 1,728 acres of wetlands or riparian areas in the project area.

Floodplains

Floodplains are the level land along the course of a river formed by the deposition of sediment during periodic floods. Floodplain communities are classified as wetlands, despite their proximity to rivers, because they contain still water. Floodplains provide numerous benefits including ground water recharge, fertile soils, wildlife habitat, and flood control. As a river's water exceeds its banks and enters a floodplain, it is forced to spread out, losing most of its velocity and capacity for rising, which is especially important following wildland fires or large storm events. The floodplains in the project area are generally constrained by topography to narrow bands along streams, such as the North Fork of the South Platte River, Elk Creek, the North Fork of Elk Creek, and Deer Creek. Noticeable floodplains have generally not developed along intermittent or ephemeral streams in the project area.

3.5.3 Watershed Conditions

Unpaved roads are a large and chronic sediment source (Libohova 2004). Roads in the project area provide access for management activities and public use, but can have adverse effects on watershed function. The road system intercepts surface and subsurface flows and routes them more quickly to stream channels. In addition, roads have lower infiltration rates, generate greater runoff, and cause increased soil

erosion from road surfaces, cuts, and fills. This can increase sediment delivery to surface drainages, cause higher peak flows, and accelerate timing of peak flows. This process is most prevalent where roads encroach on streams. However, a study in the project area indicated that the amount of fire-related sediment in the first year after a wildland fire is nearly three orders of magnitude larger than the estimated mean annual sediment production rate from roads (Libohova 2004). In addition, much of the sediment from roads may not be delivered to stream channels, unlike sediment eroded from wildland fires.

The sediment produced from roads depends on several factors, including the amount of traffic, ground cover, precipitation, and slope (Libohova 2004). The lengths of existing roads in project area watersheds are provided in **Table 3-11**.

TABLE 3-11 ROADS BY WATERSHED

Watershed	Road Type (miles)			
	Existing			Total
	Primary	Secondary	Primitive	
Bailey Creek	0.2	0.1	12.2	12.5
Elk Creek	0.0	9.8	2.0	11.9
Deer Creek	0.0	6.4	0.0	6.5
Total	0.2	16.3	14.2	30.7

The WIZ is a riparian buffer that includes the floodplain, riparian vegetation, inner gorge, unstable areas, or highly erodible soils. The minimum width of the buffer on each side of a stream is the greatest of 100 feet or the mean height of mature, dominant, late-seral vegetation (USFS 2001b). Neither the Forest Plan nor the WCPH has a numeric standard for disturbance allowed in the WIZ. Instead, these documents restrict any action in the WIZ that may damage stream health (USFS 2001b). The current condition of the WIZ in the project area was evaluated based on the PSICC roads GIS layer in reference to a 100-foot WIZ buffer on either side of perennial and intermittent streams in the project area (**Table 3-12**). A 100-foot buffer was used because the height of the dominant vegetation is generally less than 100 feet. Twenty-four percent of the roads in the project area fall within the WIZ.

TABLE 3-12 ROADS IN THE WIZ

Watershed	Road Type (miles)			
	Existing			Total
	Primary	Secondary	Primitive	
Bailey Creek	0.2	0.0	3.4	3.6
Elk Creek	0.4	2.2	0.0	2.6
Deer Creek	0.0	1.4	0.0	1.4
Total	0.6	3.6	3.4	7.6

Existing roads in the project area related to SMU sensitivity to soil erosion and compaction are shown in **Table 3-13**. Eleven percent of the existing roads in the project area cross SMUs that are sensitive to erosion and 2 percent of the existing roads cross SMUs that are sensitive to compaction.

TABLE 3-13 ROADS ON SENSITIVE SOILS

Sensitivity	Roads (miles)			
	Existing			Total
	Primary	Secondary	Primitive	
Sensitive to Erosion	0.1	0.9	2.3	3.3
Sensitive to Compaction	0.0	0.6	0.0	0.6
Not Sensitive	0.1	14.7	11.9	26.7
Total	0.2	16.2	14.2	30.6

3.5.4 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on soil and water resources, and compares and contrasts these effects between alternatives.

Alternative 1

Soils

The amount of erosion from forest management activities is proportionate to the amount of soil exposed by these activities. Erosion is a natural process. Human activities that accelerate this process typically cause compaction; modification of surface drainage patterns; or removal of vegetation, surface litter, and soil organic matter. Studies in Colorado suggest that erosion rates are acceptably low when there is less than 30 percent bare soil (Gary 1975, Benavides-Solorio 2003). A study of the effects of mechanical thinning near Trumbull, Colorado found that litter and downed wood increased by more than 70 percent, while the amount of live vegetation on the ground decreased by less than 10 percent after thinning. Erosion rates were not expected to change because bare soil was unchanged (Libohova 2004). Although soils would be disturbed and compacted by the operation of equipment in mechanical treatment units, regional standards (USFS 2001b) restrict soil disturbance to less than 15 percent of an activity area, thereby maintaining acceptably low erosion rates.

Soil erosion has the potential to increase after a prescribed fire. However, because prescribed fires are designed to burn at lower intensities than wildland fires, prescribed fires should have relatively small effects on water quality (MacDonald and Stednick 2004). Pile burning would remove the majority of the vegetation and soil organic matter in the small portions of each treatment unit where slash is piled and burned. Hydrophobic soils may be created in these locations. Soils under burned piles may be sterilized, exposing it to water and wind erosion and invasion by unwanted or noxious weed species. Large piles at landings or other locations would be ripped or otherwise scarified and seeded. This would reduce hydrophobic soils and minimize the potential for soil erosion. Pile locations throughout treatment units would not be scarified or seeded because they would be small and would not cause adverse soil effects across the treatment units. Broadcast burning would remove most surface vegetation and some soil organic matter, but hydrophobic soils would generally not be created because burning intensity would be low. Localized areas of moderate- or high-intensity burning may create hydrophobic soils; however, these areas are expected to be small and would not cause adverse soil effects across the landscape.

Under Alternative 1, mechanical thinning and prescribed fire treatments would be applied to 4,783 acres (52 percent of the treatment area) of soil that is sensitive to erosion and compaction. Erosion prediction

modeling, described in the WEPP modeling section below, was used to predict the amount of soil loss that would occur. The effects to soils that are sensitive to compaction would be limited because these soils occur in riparian areas or floodplains that would be avoided by treatments. Only Treatments 2 and 5 take place adjacent to riparian areas, and ground disturbance would be minimized in these areas in accordance with Forest Plan and WCPH standards.

Water Quality

Water quality may be affected by the implementation of Alternative 1. Mechanical treatments and prescribed fire have the potential to indirectly affect turbidity, TSS, temperature, nutrients, and bed load. The only water quality parameters that are likely to be affected by this alternative are related to increased sediment. No increase in sediment yield is anticipated from the loss of surface cover caused by mechanical treatments and prescribed fire.

New temporary roads needed for treatment access and log removal, and the increase in traffic related to fuelwood and Christmas tree sales, may increase the amount of sediment transported into streams. The effect of roads on water quality would depend on their connectivity to streams (Libohova 2004). The potential for sediment from treatment areas to enter streams would be minimized by avoiding operations in the WIZ to the extent possible. Up to 30 miles of new temporary roads would be needed for this alternative, but no more than 10 miles would be open at any time during implementation of the project. Sediment barriers would be installed below any temporary road drainage structure outlets if needed to control down gradient and downstream sediment transport. Closed roads would be obliterated and monitored to prevent adverse water quality effects.

Water Yield

Under Alternative 1, 11,158 acres of forest stands would be thinned. Removal of live trees is generally thought to increase water yield through reduced interception and transpiration. Where the annual precipitation exceeds 18 to 20 inches, a change in vegetation density can have a detectable effect on water yield. An increase or decrease in the density of vegetation cover would have a corresponding effect on runoff (MacDonald and Stednick 2004). However, in dry areas like Colorado, reduction in vegetation has little or no effect on runoff. Any water that would be gained from the removal of live trees is lost to increased evaporation from the soil surface (MacDonald and Stednick 2004). This would not be true if basic runoff processes, such as infiltration rate and soil moisture storage capacity, were altered by compaction, paving, or erosion during tree removal. The average annual precipitation for 30 years of record at Bailey, Colorado is 16 inches. Therefore, the proposed thinning would not cause a measurable change in water yield or peak flow.

Riparian Areas, Wetlands and Floodplains

Riparian areas, wetlands, and floodplains are particularly sensitive to ground disturbance, hydrological modifications, and vegetation removal. Under Alternative 1, ground disturbance would be caused by the construction of temporary roads and the use of ground-based yarding systems during mechanical treatments. These disturbances are particularly relevant in Treatments 2 and 5 because they would take place adjacent to riparian areas. The adverse effects of ground disturbance from these treatments would be minimized by limiting treatments in these areas, using hand treatments on steep slopes, and by minimizing WIZ crossings as described in Chapter 2. No hydrological modifications are expected under Alternative 1, but vegetation may be removed in some riparian areas, wetlands, and floodplains. Vegetation removal in riparian areas, wetlands, and floodplains would not adversely affect these areas because treatments would be limited to those that would benefit fish and wildlife while providing a

connection between the natural riparian fuel break and other fuel treatments. All treatments in these areas would follow the WCPH (USFS 2001b), relevant standards and guidelines for MA 9A of the Forest Plan (USFS 1984a), Executive Order 11990 for wetland protection, and Executive Order 11988 for floodplain protection. Construction in surface drainages and wetlands would meet the requirements of the CWA and appropriate permits.

Watershed Conditions

There are 31 miles of existing roads in the project area. There would be no new NFSRs under Alternative 1, but up to 30 miles of new temporary roads would be needed. These new temporary roads may cause a short-term increase in sediment yield. Adverse effects from these roads are expected to be negligible because they would be used where the topography and drainage requirements are minimal and the potential effects to other resources are low. The short road length could reduce sediment production and sediment delivery to streams (Libohova 2004). Temporary roads would be constructed according to the minimum standard needed for safe use by equipment. These roads would be closed thoroughly after use, and physical barriers would be used to prevent future use by motorized vehicles.

Under current stand and fuel conditions, wildland fires in 77 percent of the project area could cause adverse effects to watersheds (see **Section 3.3**). This alternative would reduce the fire risk in the project area. The predicted area burned in the next 20 years would be reduced by 32 percent from the current condition and the extent of adverse watershed effects from moderate- and high-intensity wildland fire would be reduced by 46 percent.

WEPP Modeling

WEPP is a complex computer simulation that predicts soil loss and sediment deposition. This model was used to estimate the potential sediment delivery that would be caused by the proposed treatments. The WEPP model contains multiple components, including a climate component that uses a stochastic generator to provide daily weather information, a hydrology component, a daily water balance component, an irrigation component, and a plant growth and residue decomposition component (USFS 2000a). The WEPP model provides estimates of how much erosion would occur so that management activities that most effectively minimize soil loss and sediment yield can be selected.

Assumptions of the forest condition were entered into the WEPP model to simulate the proposed treatments. The forest soil was assumed to be in the sandy loam classification described as glacial outwash areas, decomposed granites and sandstones, and sand deposits. Climate data from Bailey, Colorado (approximately 11 miles from the project area) were used for the modeling. A slope of 40 percent was used in the WEPP model because the proposed mechanical thinning would take place on slopes less than 40 percent. Model predictions therefore represent the maximum expected sediment production because, excluding the small area in Treatment 5, most treatments would occur on slopes of less than 40 percent. Treatment 5 can be discounted because all activities under this treatment would be completed by hand thinning and piling, which would cause minimal soil disturbance.

The 5-Year-Old Forest condition is considered a reasonable condition to describe a forest that has been logged, leaving some trees and ground cover, or to describe a forest one to two years after a prescribed fire. Results of the modeling showed that the annual sediment leaving the mechanical thinning and prescribed burn treatment area is estimated to be 815 tons, with a seven percent probability that there would be runoff, erosion, and sediment delivery. This result is relatively small (less than one percent) compared to the 90,000 tons of sediment that is annually loaded into the South Platte River.

Cumulative Effects

Current and historic land uses in the project area continue to affect soil and water resources. Grazing, mining, extensive logging, and fire suppression have historically affected the land. The effects from these uses include loss of bank stability from livestock, water quality impairments caused by heavy metal inputs upstream, soil erosion after clear-cuts, and large-scale fires caused by many years of unnatural disturbance regimes. The effects on soil and water resources from these uses include soil compaction from ORVs and hiking trails, stream flow alterations caused by an increased demand for water, and soil erosion caused by mechanical thinning, prescribed fire, and roads. Cumulatively, human use of the project area has altered, and would continue to alter, the landscape from its historic pre-European condition.

The mechanical thinning and prescribed fire treatments proposed in Alternative 1 would contribute to soil erosion, compaction, and sedimentation. These effects would be in addition to the current and historic effects from other land uses. The use of best management practices (USFS 2001b), mitigation measures, and careful design of treatments would minimize the risk of additional cumulative effects to soil and water resources in the project area.

The cumulative effects of future large-scale wildland fires may be reduced in Alternative 1. Potential wildland fire effects include landscape-scale soil loss, dramatic increases in sediment to streams and rivers, water quality impairments, and degraded aquatic habitats. Nearly total loss of the litter layer was observed in high-severity burn areas of the Hayman Fire, and the threat of erosion in these areas was relatively high. In contrast, low-intensity areas of this fire did not completely consume surface litter and were often found in a complex mosaic with unburned areas. In addition, unburned foliage from scorched and killed tress fell to the ground, helping to reduce erosion on the forest floor (USFS 2003b). By reducing fuels and the potential for large-scale fires, the proposed project would reduce the potential cumulative effects to soil and water resources if such an event were to occur.

Alternative 2

Soils

There would be no changes to soil properties in the project area under Alternative 2. Sensitive soils would remain, but they would not be affected beyond the current condition. The amount of soils eroded in the project area would depend on future and current management activities. The risk of soil erosion from a large-scale wildland fire would increase over time. The shallow and granitic nature of the soils in the Upper South Platte watershed makes them susceptible to hydrophobic conditions following a wildland fire. The indirect effects of this may be severe erosion and sedimentation. Eighty-six percent of the soils on the Hayman Fire were estimated to be water-repellent, and soil erosion was estimated to have increased from 1 ton per acre to 86 tons per acre (Hessel 2002). Severe erosion after the Buffalo Creek fire filled in approximately one-third of the Strontia Springs Reservoir (USFS 2000b).

Water Quality

Water quality would continue to be affected under Alternative 2. Effects from recreation, mining, current timber harvest, grazing, and residential development would remain at current levels or would increase as recreational and residential use of the project area increases. Streams would continue to be monitored and evaluated for water quality parameters of concern such as TSS and metals. The risk of impaired water quality would increase under this alternative because of the long-term potential for large-scale wildland fires. Degradation in water quality from wildland fires can include increases in turbidity, TSS, nitrates, manganese, and dissolved organic carbon, which may indirectly affect the beneficial uses and aquatic

habitat. The aftermath of the Hayman Fire had devastating effects on the Denver metropolitan water supply. More than one million customers were affected by taste and odor problems caused by fire (Hessel 2002).

Water Yield

Stream flows in the project area would remain unaltered. There would be no reduction in vegetation and no change in water yield or peak flow is expected. Water yield could be affected if large-scale wildland fires were to occur. Intense wildland fires and the area's propensity for high-intensity thunderstorms could lead to severe flooding, which occurred after the Hayman and Buffalo Creek Fires. Severe flooding after the Buffalo Creek Fire caused two deaths and substantial property and highway losses (USFS 2000b).

Riparian Areas, Wetlands, and Floodplains

Riparian areas, wetlands, and floodplains would remain unchanged. Current effects from roads, recreation, previous wildland fires, and increased flows would continue. Bank erosion in riparian areas would remain outside what is typical for the stream types in the project area.

Watershed Conditions

Soil erosion from existing roads would continue at or near current levels under this alternative. Unpaved roads would remain a chronic source of sediment in the watersheds, but the amount of sediment would depend on the amount of traffic in the project area.

The risk of wildland fire and adverse watershed effects from wildland fire would not be reduced compared to the current condition. In the long term, the risk of large-scale wildland fire and the corresponding extent of adverse effects to watershed are likely to increase.

WEPP Modeling

Results of the WEPP model showed that the annual sediment leaving the project area under Alternative 2 would be 578 tons with a three percent probability of runoff, erosion, and sediment delivery, compared to the 815 tons and seven percent chance for Alternative 1. This describes the 20-Year-Old Forest condition that is well established and whose ground is completely covered with a substantial layer of duff. The modeling of a high-severity wildland fire estimated the annual sediment to be 51,394 tons with a 97 percent probability that there would be runoff, erosion, and sediment delivery. The High Severity Fire describes the condition of a high-severity fire with hydrophobic soils, as was the condition in the area affected by the Hayman and Buffalo Creek Fires, and portions of the Snaking and Black Mountain Fires. These models follow the assumptions described under Alternative 1.

Cumulative Effects

Cumulative effects on soil and water resources from current and historic land use in the project area are the same as those described in Alternative 1. No new effects from the proposed project would occur under this alternative. The potential for cumulative effects to soil and water resources from large-scale wildland fires would not be reduced under this alternative. If one of these fires were to occur, it is likely that it would cause the severe burning that occurred on the Hayman and Buffalo Creek Fires, and soil and water resources in the project area would be adversely affected.

3.6 MANAGEMENT INDICATOR SPECIES

This section discusses current condition and proposed changes to the current condition for MIS in the project area. The Management Indicator Species Report in the project file contains a more detailed discussion of the analysis conducted for each species. Predicted habitat and population trend for each MIS are summarized in **Table 2-2**.

3.6.1 Management Indicator Species Selection

MIS are used to indicate the welfare of other species with similar habitat needs. These species are designated as surrogates for other species with similar life histories or habitat requirements in order to assess the effects of management activities. Each MIS listed in Chapter 3 of the Forest Plan (USFS 1984a) was evaluated for its potential to be affected by the proposed project. Some MIS were eliminated from further consideration based on lack of habitat and lack of known occurrence in the project area. Some species were eliminated because other species that were selected are more common in the project area, are more likely to show effects related to the proposed project, or are better indictors for the types of habitats that would be affected by the proposed project.

3.6.2 Habitat Modeling

The Habitat Capability (HABCAP) model was selected by Region 2 of the USFS to assess the effects of habitat alterations on wildlife resources. HABCAP rates habitat conditions to indicate the relative potential value of the habitat for MIS. The PSICC's Common Vegetation Unit (CVU) database was used to establish the amount of suitable habitat available as cover and forage for MIS. HABCAP calculated the ability of the analysis area to provide habitats capable of effectively supporting these species, and the modeling results were used to:

- Establish the existing quantitative habitat values for selected MIS in the analysis area;
- Compare changes in habitat capability or effectiveness values by alternative and species;
- Compare model outputs to Forest Plan MA standards; and
- Identify trends in relation to Forest Plan standards.

3.6.3 Species Discussion and Analysis

The species selected for analysis as MIS include mule deer, elk, Abert's squirrel, mountain bluebird, red-naped sapsucker, Lewis' woodpecker, three-toed woodpecker, Wilson's warbler, and brook trout. This section discusses natural history and habitat preferences; HABCAP analysis results; direct, indirect, and cumulative effects; and population and habitat trends for each of these species.

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 in the mountainous regions of the West (Carpenter and Wallmo 1981). In the high ranges of the Rocky Mountains, mule deer migrate during winter, sometimes moving 50 to 100 miles (Mackie et al. 1987). Open road densities greater than one mile per square mile of habitat are considered a limiting factor (Hoover and Wills 1984). Habitat suitability for mule deer depends on both the presence of food and cover plant species and their arrangement across the landscape. Plants that provide food and cover for mule deer in the project area include sumac, snowberry,

chokecherry, willow, ponderosa pine, cottonwood, Rocky Mountain juniper, and mountain mahogany. Cover types that provide mule deer cover in the project area include Douglas-fir, spruce/fir, aspen, lodgepole pine, blue spruce, bristlecone pine, and limber pine.

Global and Colorado mule deer populations are known to be increasing (Ryke and Wagner 2002). There was a population decline at the turn of the century, but the mule deer has recovered (Mackie et al. 1987). Population estimates in Colorado show a decline from 1989 to 1995, but stabilization from 1995 to 2000 (Colorado Division of Wildlife [CDOW] 2001). The project area is located in Game Management Unit (GMU) 46. The current population estimate in and near the project area (in GMUs 39, 46, 51, 391, and 461) is 8,500 mule deer. This population size is at the objective level and has not varied much among recent years (Myers 2004).

HABCAP Analysis

Current (and Alternative 2) mule deer habitat effectiveness in the project area exceeds Forest Plan (USFS 1984a) standards for both summer and winter habitats. Implementation of Alternative 1 would increase forage and cover values, and thus habitat effectiveness, during summer and winter. Thinning and prescribed fire treatments under Alternative 1 would reduce stand density, creating a more productive and diverse herbaceous understory that would provide more forage for deer. The availability of cover would increase in treated stands through the maintenance of increased aspen regeneration and shrub density over time. Under both Alternatives 1 and 2, future conditions would exceed Forest Plan standards.

Analysis of Effects

Implementation of Alternative 1 is not expected to cause injury or mortality to this species. Increased human activity associated with project implementation may temporarily disturb or displace deer from otherwise suitable habitats. The project design would include the protection of mule deer fawning concentration areas from habitat modification and disturbance from May 15 to June 30. Alternative 2 would not cause any new direct effects to mule deer because current conditions would be maintained.

Management standards for big game, including mule deer, are included in the Forest Plan (USFS 1984a) and would minimize the potential for effects to mule deer habitats in the project area. Implementation of the proposed treatments is expected to improve the suitability and availability of mule deer habitats in the project area. Foraging habitat would benefit from thinning and prescribed burning because stand density would be reduced and cover by grasses, forbs, and shrubs would likely increase. Over time, the availability and condition of cover would increase because of increased aspen regeneration and shrub density in treated stands. However, maintenance treatments would maintain a low density of conifer regeneration and shrub density in some areas. Construction of temporary roads may decrease cover. However, decommissioning of these temporary roads following project completion would decrease disturbance and reduce negative effects during high stress seasons, including winter and parturition.

Under Alternative 2, cover would be maintained and may increase, but forage may decrease as stands become denser. This alternative would not increase diversity or decrease the risk of large-scale crown fire, disease, and insect outbreak, as would Alternative 1. Large-scale disturbance events such as these could dramatically reduce cover in the burned area. However, both cover and forage would recover as shrubs and young trees become established, and these areas would provide high-quality deer habitats.

Overall, fire suppression has decreased habitat capability for mule deer in lower-elevation forests in the project area by increasing forest density and decreasing understory productivity and diversity. However, current conditions in the project area exceed Forest Plan standards. The potential for large-scale habitat loss from these forest conditions is a concern, though it is less so in the longer term because suitable deer

habitats would recover relatively quickly. Fuel treatment projects near the project area could benefit this species by decreasing stand density and increasing understory productivity and diversity. Continued prescribed burning and other maintenance activities would begin to restore natural fire regimes to parts of the project area, which would also contribute to the creation and maintenance of mule deer habitats.

Habitat and Population Trend

The structure, composition, and landscape pattern of vegetation in many areas used by mule deer on the PSICC, particularly the lower montane zone, has been substantially altered from its pre-European conditions by cumulative human effects. The effectiveness of mule deer habitat has declined, and the current conditions are not sustainable. Future Forest Service projects are likely to create more heterogeneous natural landscapes with diverse habitats that benefit mule deer (Ryke and Wagner 2002). Alternative 1 would promote this change, improving mule deer habitat effectiveness by increasing foraging opportunities and cover availability. Alternative 2 would maintain current mule deer habitat effectiveness. In the long-term, the potential for large-scale habitat changes from insect outbreak, disease, or wildfire would be higher under Alternative 2 than under Alternative 1 because fuels would not be reduced and forest health would not be improved. This would lead to habitat loss, but habitats would recover eventually and would provide high-quality deer habitats.

Colorado mule deer populations are increasing (Ryke and Wagner 2002), and populations in and surrounding the project area are stable (Myers 2004). No mule deer population studies have been conducted on the PSICC to measure the direct effects of forest management activities on mule deer population numbers (Ryke and Wagner 2002). Alternative 1 may contribute to an increase in deer populations because habitat conditions would improve. Current population stability is likely to be maintained in the short-term under Alternative 2. In the long-term, the risk of large-scale habitat change may increase; however, the occurrence of such events and their effects on deer populations cannot be predicted with certainty.

Elk

Elk tend to inhabit open coniferous forests associated with rugged, broken terrain or foothill ranges. Summers are spent in high mountain meadows in the alpine or subalpine zones or in stream bottoms. Winters are spent at lower elevations. Either cover or forage may be limiting to elk, particularly on winter ranges or calving habitats (Ryke and Wagner 2002). In the northern and central Rocky Mountains, grasses and shrubs compose most of the winter diet, with grasses and forbs becoming of primary importance in the spring months. In Colorado, aspen stands also provide browse (Fitzgerald et al. 1994). Use of forage areas depends on proximity to cover. 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 (Ryke and Wagner 2002).

Global and Colorado elk populations are known to be increasing (Ryke and Wagner 2002). Elk are widespread throughout the northern United States and southern Canada. Their range is expanding because of reintroductions, management, and habitat conversion (Ryke and Wagner 2002). The project area is located within GMU 46. The current population estimate within and surrounding the project area (in GMUs 39, 46, 51, 391, and 461) is 3,000 elk. This population size is at the objective level and has not varied much among recent years (Myers 2004).

HABCAP Analysis

Current (and Alternative 2) elk habitat effectiveness in the project area exceeds Forest Plan (USFS 1984a) standards in MAs 2A, 2B, 5B, 7D, and falls slightly below the standards in MA 9A. Implementation of Alternative 1 would generally increase elk habitat effectiveness by improving summer and winter forage and cover values. Thinning and prescribed fire treatments under Alternative 1 would reduce stand density, creating a more productive and diverse herbaceous understory that would provide more forage for elk. The availability of cover would increase in treated stands through the maintenance of increased aspen regeneration and shrub density over time.

Both Alternatives 1 and 2 would create future conditions that exceed Forest Plan standards. The primary reason that the Forest Plan standard is not being met for elk in MA 9A is the high density of roads in MA 9A. Roads, such as NFSRs 100 and 108, have historically been constructed along valleys, which places them in MA 9A. The length of open roads in the relatively small area of MA 9A over-emphasizes the road effect on elk habitat effectiveness. The uplands surrounding MA 9A provide extensive areas isolated from road disturbance. Neither alternative would affect the density of roads in MA 9A. The individual scores for cover and forage currently exceed and would continue to exceed the Forest Plan standards under both alternatives. The effectiveness of all elk habitats in the project area is expected to provide for an increasing trend in the elk population in the analysis area.

Analysis of Effects

Implementation of Alternative 1 is not expected to cause injury or mortality to this species. Increased human activity associated with project implementation may temporarily disturb or displace elk from otherwise suitable habitats. The project design would include the protection of elk calving concentration areas from habitat modification and disturbance from May 15 to June 30. Alternative 2 would not cause any new direct effects to elk because current conditions would be maintained.

Management standards for big game, including elk, are included in the Forest Plan (USFS 1984a) and would minimize the potential for negative effects to elk habitats in the project area. Implementation of the proposed treatments would improve the overall suitability and availability of elk habitats in the project area. Foraging habitats would benefit from thinning and prescribed burning because stand density would be reduced and cover by grasses, forbs, and shrubs would increase. Over time, the availability and condition of cover would increase because of the maintenance of increased aspen regeneration and shrub density in treated stands. However, maintenance treatments would maintain a low density of conifer regeneration and shrub density in some areas. Forest fires that create a mosaic of thermal and hiding cover and forage areas have been shown to increase the carrying capacity for elk (Martinka 1976). Construction of temporary roads may decrease cover. However, decommissioning of these temporary roads following project completion would decrease disturbance and reduce negative effects during high stress seasons, including winter and parturition.

Under Alternative 2, cover would be maintained and may increase over time, but forage may decrease as stands become denser. In addition, this alternative would not increase diversity or decrease the risk of large-scale crown fire, disease, and insect outbreak, as would Alternative 1. Large-scale disturbance events such as these would dramatically reduce cover in the burned area. However, both cover and forage would recover eventually as shrubs and young trees become established, and these areas would provide high-quality elk habitats.

Overall, fire suppression has decreased habitat capability for elk in lower-elevation forests in the project area by increasing forest density and decreasing understory productivity and diversity. However, current conditions in the project area exceed Forest Plan standards, except in MA 9A where road density is high because of a historical preference for building roads along valleys. The potential for large-scale elk habitat loss from these forest conditions is a concern, though it is less so in the longer term because suitable elk habitats would recover relatively quickly. Fuel treatment projects near the project area could benefit this species by decreasing stand density and increasing understory productivity and diversity. Continued prescribed burning would begin to restore natural fire regimes to parts of the project area, which would also contribute to the creation and maintenance of elk habitat.

Habitat and Population Trend

The structure, composition, and landscape pattern of vegetation in many areas used by elk on the PSICC, particularly the lower montane zone, has been substantially altered from its pre-European conditions by cumulative human effects. The effectiveness of elk habitat has declined, and the current conditions are not sustainable. Future Forest Service projects are likely to create more heterogeneous natural landscapes with diverse habitats that benefit elk (Ryke and Wagner 2002). Alternative 1 would promote this change, improving elk habitat effectiveness by increasing foraging opportunities and cover availability. Alternative 2 would maintain current elk habitat effectiveness. In the long-term, the potential for large-scale habitat changes from insect outbreak, disease, or wildfire would be higher under Alternative 2 than under Alternative 1 because fuels would not be reduced and forest health would not be improved. This would lead to habitat loss, but habitats would recover eventually and would provide high-quality elk habitats.

Elk populations are increasing in the state of Colorado and on the PSICC (Ryke and Wagner 2002) and are stable in and surrounding the project area (Myers 2004). No elk population studies have been conducted on the PSICC to measure the direct effects of forest management activities on elk population numbers (Ryke and Wagner 2002). Alternative 1 may contribute to an increase in elk populations because overall habitat conditions would improve. Current population stability would be maintained in the short-term under Alternative 2. In the long-term, the risk of large-scale habitat change may increase; however, the occurrence of such events and their effects on elk populations cannot be predicted with certainty.

Abert's Squirrel

Abert's squirrel is ecologically dependent on ponderosa pine for food, cover, and nest sites (Keith 1965). It is an ecological indicator for ponderosa pine, and preferred habitats include mid- and late-successional stands (HSS 4A, 4B, 4C, and 5) (Patton 1975). Clusters of large pines provide greatest benefits to squirrels (Keith 2003). Depending on the season, primary food sources are seeds, inner bark, terminal buds, and staminate flowers of ponderosa pine, fleshy fungi, and, to a lesser extent, acorns from Gambel oak (Keith 1965).

Data regarding Abert's squirrel population dynamics are lacking. However, the population trend in Colorado is suspected to be stable or increasing (Ryke and Wagner 2002). Extensions of the species' known range have occurred in recent years in southwestern and western Colorado (Fitzgerald et al. 1994). Population estimates range from 12 to 30 animals per km^2 in the Black Forest of El Paso County, Colorado and from 82 to 114 per km^2 near Boulder, Colorado. An analysis of hunter harvest surveys suggests that populations have been relatively stable on the PSICC over the last five years and that forest trends are similar to statewide trends (Elson 2004a). A pilot program was initiated by the PSICC in 2003 to track Abert's squirrel population trends using a feeding index. Trends are not yet available for this effort; however, Abert's squirrels appear to be widely distributed in appropriate habitats, based on

preliminary results (Elson 2003). The species is known to occur in suitable habitat in and near the project area (CDOW 2004a).

HABCAP Analysis

Current (and Alternative 2) Abert's squirrel habitat capability in the project area is above Forest Plan (USFS 1984a) standards for all evaluated MAs. Implementation of Alternative 1 would decrease the availability of cover and particularly forage, causing a decline in habitat capability in summer and winter habitats in all MAs. Forest Plan (USFS 1984a) standards would be met for MAs 2B, 5B, 7D, and 9A, and would almost be met for MA 2A.

The dominant cover type in MA 2A is lodgepole pine. Most of the ponderosa pine stands in MA 2A are young, moderately dense (HSS 3B), and provide only marginal habitats for Abert's squirrel. Only 71 acres in this MA provide preferred Abert's squirrel habitats. Alternative 1 would increase the amount of ponderosa pine cover type, but would also decrease canopy cover in existing ponderosa pine stands, reducing their short-term capability as habitat for Abert's squirrel. To prevent adverse effects to any Abert's squirrels in these stands, site-specific surveys would be conducted before project implementation and treatments would be modified as necessary to minimize the potential for the project to cause a declining trend in the local population. In the long-term, these stands are more likely to grow into high quality habitat for Abert's squirrel than if no treatment is undertaken. In the absence of treatment (under Alternative 2), growth in these stands would be reduced and the potential for tree mortality from drought, insects, diseases, and wildfire would be high. The proposed treatments under Alternative 1 would thin these stands, increase growth, and reduce the risk of loss, at the cost of a short-term reduction in Abert's squirrel habitat capability.

The HABCAP model ranks the forage and cover values for ponderosa pine HSS 4B higher than HSS 4A. However, this model only accounts for the overall shift in HSSs and does not account for variability within each treatment unit. Trees would be thinned in a manner that creates clumps of trees intermingled with small, irregular openings or areas of lower tree density, creating a mosaic of different stand characteristics across the landscape. This treatment would provide appropriate Abert's squirrel habitat that may not be fully accounted for in the model. Therefore, the habitat capability under Alternative 1 may be higher than is predicted by the HABCAP model. Research in northern Arizona suggested that this approach may reduce the effects of forest treatments on Abert's squirrels (Elson 1999), and a recent USFS species assessment (Keith 2003) makes similar recommendations.

Analysis of Effects

There is a slight chance that Alternative 1 could cause injury or mortality to this species. This could occur if larger trees used for nesting are cut during the summer; however, few larger trees would be cut. Increased human activity associated with project implementation may temporarily disturb or displace Abert's squirrel from otherwise suitable habitats. Alternative 2 would not cause any new effects to Abert's squirrel.

Management standards for Abert's squirrel are included in the Forest Plan (USFS 1984a) and would minimize the potential for effects to Abert's squirrel habitats. Alternative 1 would alter the abundance and distribution of ponderosa pine in the project area. Mechanical thinning and prescribed fire would maintain stands currently dominated by ponderosa pine and would promote the survival and re-establishment of ponderosa pine in stands where a remnant ponderosa pine component currently exists. The retention of a clumpy, more diverse forest structure would maintain the suitability of Abert's squirrel habitats. In addition, thinning may enhance cone production in ponderosa pine, which can translate into high squirrel

densities during periods of high cone availability (Dodd et al. 1998). Under Alternative 2, the risk of large-scale habitat loss would remain high.

Fire suppression may have contributed to increased habitat capability for Abert's squirrel in some parts of the project area because of increased forest density, while it may have decreased capability in other areas because of decreased tree vigor and cone production and the invasion of other conifer species into ponderosa pine stands. In the short-term, fuel treatment projects near the project area could decrease habitat capability for Abert's squirrel, but could provide long-term benefit to this species by increasing forest health and reducing the risk of widespread habitat loss. Continued prescribed burning and other maintenance treatments would begin to restore natural fire regimes to parts of the project area, which would also contribute to the creation and maintenance of Abert's squirrel habitat.

Habitat and Population Trend

Abert's squirrel habitat on the PSICC has probably increased from historic conditions, but is currently declining from the effects of insect outbreaks and wildland fire. Since 1989, fires and insect activity have combined to remove the canopy cover on more than 120,000 acres of ponderosa pine and Douglas-fir habitats in large blocks of habitat on the PSICC (Ryke and Wagner 2002; USFS 2003b). While some Alternative 1 treatments would temporarily reduce habitat capability for Abert's squirrel (through a shift from HSS 4B to 4A), other treatments would improve capability (through promotion of remnant ponderosa pine and retention of a clumpy forest structure). Alternative 2 would maintain current habitat suitability. In the long-term, the potential for large-scale habitat changes from insect outbreak, disease, or wildfire would be higher under Alternative 2 than under Alternative 1 because fuels would not be reduced and forest health would not be improved.

Statewide, Abert's squirrel populations appear to be stable or increasing. Populations on the PSICC are probably also stable, based on the observation that Abert's squirrels are "fairly common" in the seven counties that include the PSICC (Ryke and Wagner 2002). While Alternative 1 may slightly reduce Abert's squirrel population levels, it is not likely to do so to the extent indicated by the HABCAP modeling results. Any population reduction is likely to be within the range of natural fluctuations and may not be measurable. Mitigation has been included as part of the proposed action to minimize effects to the local population in MA 2A, where habitat capability is relatively low. In the long-term, Alternative 1 may allow the population to increase because ponderosa pine would be emphasized, larger trees would be retained, and growth of remaining trees is expected to increase, promoting preferred Abert's squirrel habitat characteristics. Alternative 2 would maintain current population levels in the short-term. In the long-term, the risk of insect outbreaks, wildfire, and large-scale loss of habitat may increase, which could cause a decline in Abert's squirrel populations in the project area.

Mountain Bluebird

Mountain bluebirds are secondary cavity nesters that occupy open woodland or edge habitats (Hutto 1995). Although they need trees for nesting, mountain bluebirds do not breed in heavily forested habitats (Barrett 1998a). They perch 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 (Hutto 1995). As cavity nesters, their habitat choices are restricted by the availability of nest sites. In Colorado, the mountain bluebird uses pinyon-juniper woodlands most frequently, followed by aspen and mountain grasslands (Barrett 1998a). It is considered an ecological indicator in the mountain grassland vegetation type (Ryke and Wagner 2002).

Mountain bluebirds breed in western North America from Alaska to New Mexico. They are common and well distributed in the mountains of Colorado (Barrett 1998a). Some reports indicate that populations have increased at the state level (Barrett 1998a), while other estimates show a declining (but non-significant) trend in Colorado from 1966 to 2003 (Sauer et al. 2004). Breeding Bird Survey (BBS) data on PSICC routes have not been collected long enough to produce accurate trend data. The Monitoring Colorado's Birds program is monitoring populations of the mountain bluebird; however, trend data are not yet available.

HABCAP Analysis

Current (and Alternative 2) bluebird habitat capability in the project area either meets Forest Plan (USFS 1984a) standards or falls slightly below the standards, depending on MA. Implementation of Alternative 1 would increase bluebird cover and forage availability, and thus habitat capability, in all MAs in the project area. This increase would be caused by a shift from denser to more open HSSs throughout the project area, which would create more forest edge habitat for the mountain bluebird.

The HABCAP model does not account for variability in each treatment unit. Trees in the project area would be thinned in a manner that creates clumps of trees intermingled with small, irregular openings or areas of lower tree density. Saab and Dudley (1998) found that retaining clumps of live trees in broadcast burned areas rather than uniformly distributing trees would benefit cavity-nesting birds, such as the bluebird. This treatment would provide appropriate bluebird habitat that may not be fully accounted for in the model. Therefore, the increase in habitat capability under Alternative 1 may be higher than is predicted by the HABCAP model.

Analysis of Effects

Implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing some occupied nest trees and snags. Standards included in the Forest Plan (USFS 1984a) would preserve minimum densities of snags. Alternative 2 would not cause any new direct effects to the mountain bluebird because current conditions would be maintained.

Implementation of the proposed treatments would create new suitable mountain bluebird habitats. Foraging and cover habitats would benefit from thinning and prescribed burning. Habitat capability would increase under Alternative 1 because of the shift from denser to more open HSS distributions and because treatments would promote aspen expansion by removing a portion of the encroaching conifers. This alternative would also be beneficial for the mountain bluebird because it would maintain existing meadow habitats by removing some encroaching conifers, create a heterogeneous landscape, and decrease the potential for large-scale disturbance. Alternative 2 would maintain existing habitat conditions in the short-term. However, increased forest density could eventually cause degradation of existing habitats and increase the potential for large-scale habitat loss from disturbance.

Fire suppression has likely decreased habitat capability for mountain bluebirds in the project area by creating dense, closed-canopy conifer stands. Fuel treatment projects near the project area could benefit this species by reducing forest canopy density, which may increase the availability and suitability of nesting and foraging habitats and reduce the risk of large-scale disturbance. Continued prescribed burning and other maintenance treatments would begin to restore natural fire regimes to parts of the project area, which would also contribute to the creation and maintenance of mountain bluebird habitat.

Habitat and Population Trend

Open woodland habitat that is preferred by the mountain bluebird has decreased across the PSICC because of succession (Ryke and Wagner 2002). The Forest Plan (USFS 1984a, page II-29) states "the relatively low levels of vegetation treatment activities and fire control efforts have permitted mature vegetation to become widespread on the Forest". Vegetation management activities have annually averaged less than 0.3 percent of the lower montane forests (Ryke and Wagner 2002). Cumulatively, the dense forest structure, insect-related mortality of mature trees, fire suppression, and lack of vegetation management are trends leading toward a reduction in habitat capability for mountain bluebird (Ryke and Wagner 2002). Alternative 1 would reverse this trend, leading to increased mountain bluebird habitat capability in the project area. Alternative 2 would not change mountain bluebird habitats in the short-term, but over time, increasingly dense forests would reduce the capability of mountain bluebird habitats in the project area. In addition, the potential for large-scale, high-intensity wildfire would remain high under Alternative 2. High-intensity fires can destroy existing nests and eventually destroy the overstory and potential mountain bluebird nest sites, though they can provide high-quality habitat immediately post-burn by creating openings.

Population trend data for the mountain bluebird in Colorado are stable overall (Sauer et al. 2004). The expected increase in habitat capability under Alternative 1 suggests that the project area may be able to support more mountain bluebirds in the future. Under Alternative 2, habitat conditions would not be improved, and the future population is likely to remain similar to the current level. If lack of treatment causes large-scale disturbance, mountain bluebird habitat and subsequent population size may be negatively affected.

Red-naped Sapsucker

Red-naped sapsuckers are cavity nesters and are primarily associated with mature aspen stands. Nesting red-naped sapsuckers require aspen groves with two characteristics: trees infected with shelf or heartwood fungus (for drilling nesting holes) and nearby willow carrs (for drilling sap wells) (Barrett 1998b). This species is an ecological indicator for aspen (Ryke and Wagner 2002).

Red-naped sapsuckers breed throughout the mountains of Colorado (Barrett 1998b). Population trend data within the state show a non-significant increase between 1966 and 2003 (Sauer et al. 2004). BBS data on routes within the PSICC have not been collected long enough to produce accurate trend data.

HABCAP Analysis

Current (and Alternative 2) red-naped sapsucker habitat capability is above Forest Plan (USFS 1984a) standards for all MAs. Implementation of Alternative 1 would slightly decrease habitat capability in all MAs, but Forest Plan standards would still be met in all MAs. Treatments under Alternative 1 would cause a shift from HSS 4B and 4C to HSS 4A, which would decrease the cover values for the red-naped sapsucker.

The HABCAP model only accounts for the overall shift in HSSs and does not account for variability in each treatment unit. For example, in aspen stands, treatment would focus on removing a portion of the encroaching conifers while retaining aspen. This type of treatment would reduce canopy cover and cause a shift from HSS 4B to HSS 4A in the stand, but the habitat component most favored by sapsuckers, larger aspen, would remain undisturbed. In the long-term, aspen is expected to increase across the project area.

Analysis of Effects

Implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing some occupied nest trees and snags. However, the project design would include Forest Plan (USFS 1984a) standards and guidelines for management of preferred habitats, old-growth and mature aspen stands, and standards for the preservation of minimum densities of snags. In addition, riparian areas would be protected from adverse effects in accordance with MA 9A direction in the Forest Plan (USFS 1984a). Alternative 2 would not cause any new effects to the red-naped sapsucker.

Under Alternative 1, cover habitats would decrease in the short-term because thinning and prescribed burning would decrease forest density. However, treatments would promote regeneration of aspen stands by removing some encroaching conifers and stimulating sucker production, which would increase the availability of sapsucker habitats in the long-term. Proposed treatments under Alternative 1 would also decrease the potential for large-scale crown fire, disease, or insect outbreak, events that could cause widespread habitat loss. Alternative 2 would maintain current levels of habitat capability; however, conifer encroachment in aspen stands and the risk of large-scale disturbance would continue to increase and may reduce the capability of sapsucker habitats in the long-term.

Fire suppression has decreased habitat capability for the red-naped sapsucker by allowing conifer encroachment into aspen stands and preventing disturbance necessary to regenerate existing aspen stands. Fuel treatment projects near the project area may reduce sapsucker cover habitats in the short-term, but should increase habitat capability in the long-term. Continued prescribed burning and other maintenance treatments would begin to restore natural fire regimes to parts of the project area, which would contribute to the creation and maintenance of red-naped sapsucker habitat.

Habitat and Population Trend

A decline in aspen on the PSICC is projected because of conifer encroachment and lack of disturbance to regenerate existing aspen clones (Ryke and Wagner 2002). HABCAP predicts a short-term decrease in sapsucker cover under Alternative 1. However, long-term increases in aspen are expected because some conifers would be thinned from existing aspen stands and new suckering of aspens is expected following both mechanical thinning and prescribed burning. The limited amount of appropriate willow habitats in the project area likely has and would continue to limit the habitat capability for this species in the project area under both alternatives. Under Alternative 2, existing habitats would not be altered in the short-term. However, continued encroachment of conifers into aspen stands could cause a decline in sapsucker habitats in the long-term. This alternative also increases the potential for large-scale wildfire, disease, and insect outbreak. This type of disturbance could cause substantial habitat loss, but also has the potential to cause a large amount of aspen regeneration, increasing sapsucker habitat. Therefore, the occurrence of such events and their effects to sapsuckers cannot be predicted with certainty.

Overall, red-naped sapsucker populations are stable in Colorado (Sauer et al. 2004). Population levels in the project area are probably low because of the limited amount of suitable habitat. Changes in population levels caused by the proposed project are difficult to predict because of low habitat availability and population levels. Based on predicted changes to habitat, Alternative 1 may cause a slight decrease in the population in the short-term because of decreased habitat capability, but a slight increase in the population in the long-term because of increased aspen density. Alternative 2 may maintain a stable population in the short-term because habitats would not be altered, but may affect the population in the long-term because of habitat loss to large-scale wildfire, disease, insect outbreak, or conifer encroachment.

Lewis' Woodpecker

Existing conditions and direct, indirect, and cumulative effects for the Lewis' woodpecker are discussed in **Section 3.7** and not repeated here. Other components of the MIS analysis are discussed below.

HABCAP Analysis

Current (and Alternative 2) Lewis' woodpecker habitat capability is above Forest Plan (USFS 1984a) standards for MAs 2B, 5B, 7D, and 9A, and but below the standards for MA 2A. Implementation of Alternative 1 would increase habitat capability in all MAs except MA 5B. Despite the changes to habitat capability, Forest Plan standards would still be met for MA 5B and would still not be met for MA 2A. Treatments would slightly increase the amount of open, mature ponderosa pine stands, which provide cover and forage for Lewis' woodpecker. Some of the future conditions under Alternatives 1 and 2 would exceed sustainable conditions.

The HABCAP model does not account for variability within each treatment unit. Trees would be thinned in a manner that creates clumps of trees intermingled with small, irregular openings or areas of lower tree density, creating a mosaic of different stand characteristics across the landscape. This treatment would likely provide appropriate Lewis' woodpecker habitat that may not be fully accounted for in the model. Therefore, the increase in habitat capability under Alternative 1 may be higher than is predicted by the HABCAP model.

Habitat and Population Trend

Less than five percent of historical single-storied ponderosa pine exists on the PSICC (Ryke and Wagner 2002). Fire suppression and historic logging have created a dense understory of lodgepole pine, ponderosa pine, or Douglas-fir with an overstory of ponderosa pine, effectively changing the dominant HSS from an open, mature or old-growth HSS to a mid-seral HSS (Ryke and Wagner 2002). Alternative 1 would generally increase Lewis' woodpecker habitat capability in the project area. This effect is based on a shift from ponderosa pine HSS 4B to 4A, removal of portions of other conifer species, and creation of a clumpy forest structure. Alternative 2 would maintain current habitat suitability. However, in the long-term, the potential for large-scale habitat loss from insect outbreak, disease, or wildfire would be higher under Alternative 2 than under Alternative 1 because fuels would not be reduced and forest health would not be improved.

BBS surveys from 1966 to 2003 indicate that the population of this species has declined by a non-statistically significant amount in Colorado (Sauer et al. 2004). Modification of old-growth ponderosa pine habitats has caused a negative change to this species' habitat. In addition, in Colorado, increasing competition for Lewis' woodpecker food and habitat resources has been reported from nonnative species such as the European starling (Ryke and Wagner 2002). Based on the predicted change in habitat capability from Alternative 1, the population size in the project area may increase, although the small amount of habitat and high elevation suggests that few, if any, Lewis' woodpeckers inhabit the project area. Alternative 2 may maintain a stable population in the short-term because habitats would not be altered, but could cause a decrease in the population in the long-term if large-scale disturbance occurs.

American Three-toed Woodpecker

Existing conditions and direct, indirect, and cumulative effects for the American three-toed woodpecker are discussed in **Section 3.7** and not repeated here. Other components of the MIS analysis are discussed below.

HABCAP Analysis

Current (and Alternative 2) three-toed woodpecker habitat capability is slightly below Forest Plan (USFS 1984a) standards for MAs 2A, 2B, and 5B, and above the standards for MAs 7D and 9A. The lack of preferred mature spruce/fir habitats is the primary reason for the low habitat capability scores. Implementation of Alternative 1 would slightly decrease the level of habitat capability in all MAs, primarily through the reduction of available cover habitats. Alternative 1 would not affect mature stands of spruce/fir, but it would reduce the amount of mature lodgepole pine and Douglas-fir in the project area, which provide secondary habitats. Habitat capability would remain below Forest Plan standards for MAs 2A, 2B, and 5B.

Habitat and Population Trend

A suitable habitat matrix for the American three-toed woodpecker is comprised of a patchwork of old-growth conifer forests and recently disturbed habitats (Wiggins 2004); thus, there are short-term and long-term trade-offs associated with the implementation of either Alternative 1 or 2. Alternative 1 would remove a few mature conifers and some dead trees, reducing the short-term habitat capability of the project area. In the long-term, Alternative 1 would reduce and Alternative 2 would increase the potential for large-scale high-intensity wildfire. This type of fire can cause the loss of a large amount of old-growth forest, but often temporarily provides high-quality habitat by creating numerous snags that are used for nesting and foraging. Although immediate post-burn conditions benefit this species, a long-term shortage of mature live trees and snags would follow once the snags began to decay and fall. Alternative 2 would provide some benefits to this species, including in the short-term and immediately after any large-scale disturbance that may occur in the long-term. Conversely, Alternative 1 would not benefit this species in the short-term, but is expected to provide more sustainable woodpecker habitats in the long-term.

American three-toed woodpecker abundance is low in Colorado. State population trend data for this species suggests a decline, but adequate data are lacking (Ryke and Wagner 2002). Based on the HABCAP modeling and other factors, Alternative 1 may contribute to a slight decline in this species' short-term population, but the population is expected to recover to the current level or higher as the natural fire regime is restored to parts of the project area. Alternative 2 would maintain an essentially stable population level over time. Although it may allow a slight increase in this species' abundance in the short-term, this increase would not be sustained in the long-term.

Wilson's Warbler

In Colorado, this species is a fairly common summer resident in mountain parks and higher mountains from 10,000 to 13,000 feet in elevation. They nest in willow and alder thickets of stream banks, lakeshores, and wet meadows, which provide an abundance of insects, their primary food (Ryke and Wagner 2002, Toolen 1998). Wilson's warbler is an ecological indicator for the high elevation riparian habitat type (Ryke and Wagner 2002). Open, early to mid-seral habitats can also be important for this species. The project area contains a limited amount (517 acres) of suitable habitat for Wilson's warbler. Furthermore, this species' elevation range limits its potential to occur in the project area.

HABCAP Analysis

Current (and Alternative 2) Wilson's warbler habitat capability is above Forest Plan (USFS 1984a) standards for all MAs. Implementation of Alternative 1 would increase the level of habitat capability in

all MAs. Both cover and forage values would improve because treatments would increase the availability of some HSSs (such as 3A and 4A aspen) that are favored by this species.

Analysis of Effects

Direct effects to this species from Alternatives 1 or 2 are not likely because of the limited amount of suitable habitat available and the elevation range of the project area. Furthermore, riparian areas would be protected from adverse effects in accordance with MA 9A direction contained in the Forest Plan (USFS 1984a). However, individual warblers outside of riparian corridors may be disturbed by the operation of equipment during project implementation. Alternative 2 would have no direct effect on this warbler because no new activities would occur.

Indirect effects to this species from Alternatives 1 or 2 are not likely because of the limited amount of suitable habitats available and the elevation range of the project area. Some treatments under Alternative 1 would expand preferred habitats for this species; however, the extent of these habitats in the project area would remain limited. Alternative 2 would maintain the current habitat conditions, but may eventually allow the encroachment of conifers into riparian habitats and increasing tree density in other habitats, which would reduce their suitability for Wilson's warbler.

Fire suppression has caused the development of dense, mature, conifer-dominated timber stands in the project area. The proposed project, along with other fuel treatment projects that reduce tree density and increase habitat diversity, may increase the availability of habitats for Wilson's warbler. However, these habitats are likely to remain relatively scarce across the project area.

Habitat and Population Trend

The riparian ecosystems used by Wilson's warbler are unique, highly productive, and sensitive to disturbance. Riparian systems occupy only three percent of the Colorado landscape (Kingery 1998); however, 75 percent of bird species use riparian areas during some part of their life cycle (Ryke and Wagner 2002). HABCAP modeling predicts that the post-treatment habitat capability in the project area would be higher than the existing (and Alternative 2) capability. However, because only two percent of the project area contains suitable habitat for Wilson's warbler, the habitat capability in the project area would remain low under Alternative 1. Alternative 2 would maintain the current habitat conditions, but may eventually allow the encroachment of conifers into riparian habitats, potentially reducing habitat capability in the long-term.

Wilson's warbler may be the most common breeding bird in Colorado's montane and subalpine willow habitats (Ryke and Wagner 2002). However, BBS surveys show a statistically significant decline in this species' abundance in Colorado between 1966 and 2003 (Sauer et al. 2004). Neither Alternative 1 nor Alternative 2 is expected to substantially affect the population size of this species. Because of the increased habitat capability from the proposed project, a slight increase in the population size may be possible under Alternative 1. The lack of treatment under Alternative 2 may eventually cause degradation of the riparian systems, which could limit the population size of Wilson's warbler in the project area. However, most of the habitat patches in the project area, and especially in the treatment units, are below the lower elevation limit for this species and little use of the project area by this species is expected, regardless of which alternative is selected.

Brook Trout

Optimal stream habitat for brook trout is characterized by clear, cold water; silt-free rocky substrate in riffle-run areas; well vegetated stream banks; abundant instream cover; deep pools; relatively stable flow regime and stream banks; and productive aquatic insect populations (Raleigh 1982). Suitable habitat for brook trout exists in several streams in the project area.

Brook trout are a non-native species introduced into Colorado streams some time after European settlement. They spread quickly throughout Colorado mountain streams, competing directly with and displacing native species (Trotter 1987). The CDOW, USFWS, USFS, and other land management agencies have treated streams and lakes to remove brook trout as part of an intensive effort to restore native trout species in Colorado (USFWS 1998). Besides these intentional removals, populations seem to be declining, possibly because of competition with brown trout (another non-native species) or infection of whirling disease.

Most streams draining the project area support brook trout and have been periodically monitored by the CDOW and USFS. Most streams support average to below average populations of small brook trout. Small stream size and summer low flow periods generally prevent the development of larger fish and populations. Stream improvements were done on Deer Creek in 1989 to improve fish habitats.

HABCAP Analysis

This analysis does not apply to fish species.

Analysis of Effects

No direct effects to the brook trout are expected under Alternative 1 because streams and their associated riparian areas would be protected from adverse effects, in accordance with MA 9A direction contained in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

No indirect effects to the brook trout are expected under Alternative 1 because project design features, BMPs, and Forest Plan standards would be implemented to minimize effects to aquatic habitats. Alternative 1 would not alter the amount of water habitat in the project area. Under Alternative 2, no new activities would occur and current habitat conditions would be maintained. The primary risk to aquatic habitats under both alternatives is adverse negative effects to streams from large-scale wildfire. While this type of disturbance is possible under both alternatives, Alternative 2 would maintain a higher risk of this effect in the long-term.

Past timber harvest, livestock grazing, road construction, and other activities have likely caused degradation of aquatic habitats. Some ongoing activities, such as motorized recreation on native surface roads across and near streams may be contributing sediment to streams and otherwise degrading aquatic habitats. Several of the potential stewardship projects that may be implemented as part of Alternative 1 would reduce negative effects to aquatic habitats. The potential for project activities under Alternative 1 to adversely affect aquatic habitats is minimal because of the use of project design features, Best Management Practices (BMPs), and Forest Plan standards during project implementation. Under Alternative 2, no new activities would take place and no new risks to aquatic habitats would be incurred. However, stewardship projects would not be implemented to reduce existing effects to aquatic habitats. Under both alternatives, there would be a continuing risk of large-scale wildfire and subsequent damage

to aquatic habitats. This risk would be reduced under Alternative 1 but would remain high under Alternative 2.

Habitat and Population Trend

Forest management activities carried out under the Forest Plan (USFS 1984a) require protective buffers around wet areas to help maintain stream and riparian habitats. The USFS has carried out or proposes to carry out many stream and riparian habitat improvement projects on the PSICC that benefit brook trout and other trout populations (Ryke and Wagner 2002). The proposed project would not treat and would minimize the risk of new negative effects to aquatic habitats; therefore, the suitability of brook trout habitat in the project area would not change under Alternative 1. Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

Brook trout populations may be declining in the state and on the PSICC (Ryke and Wagner 2002). No changes to brook trout population size or current trend are expected in the project area because aquatic habitats would be protected under Alternative 1 and no new activities would occur near aquatic habitats under Alternative 2.

3.7 SPECIAL-STATUS SPECIES

This section discusses current condition and proposed changes to the current condition for special-status species in the project area. This section also evaluates the potential effects of implementing each alternative on each of these species. General information is reviewed for each species, including distribution, habitat, threats, and environmental baseline. Direct, indirect, and cumulative effects of each alternative are discussed.

3.7.1 Special-status Species Selection

Section 7 of the ESA requires federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of proposed, endangered, or threatened (TEP) species, or cause the destruction or adverse modification of their critical habitats. In addition, the Forest Service has established direction in FSM 2670 to guide habitat management for TEP and sensitive species. The BA and BE in the project file contain more detailed discussions of the analyses conducted for these species.

3.7.2 Threatened, Endangered, and Proposed Species

A complete list of TEP species located on the PSICC and any species located downstream that could potentially be affected by the project can be found in the BA. The BA concluded that three TEP species, the bald eagle, Mexican spotted owl, and Canada lynx, may occur in the project area.

Bald Eagle

Bald eagles live throughout North America from Alaska to Newfoundland, and from southern Florida to southern California (Winternitz 1998). This species is a relatively common winter resident of Colorado; wintering populations in the state number between 400 and 700 individuals (Andrews and Righter 1992). Sporadic nesting occurs across the state, with the highest concentrations found in suitable habitat on the Western Slope (Winternitz 1998). Bald eagle occurrence has not been recorded in the project area (Elson 2004). In the project area, suitable bald eagle nesting and winter roosting habitats may occur in forests near the North Fork of the South Platte River. Cottonwoods are relatively uncommon in the project area,

but stands of large, mature (HSS 4A and 4B) ponderosa pine and appropriate mixed conifer species are present.

Bald eagles build large, heavy nests in tall, living trees, generally no more than two miles from water (USFWS 1995a). Cottonwoods and sometimes ponderosa pines are the tree species used for nesting in the Rocky Mountain region. If suitable trees are unavailable, nests may be built on rocky cliffs or the ground (DeGraaf et al. 1991). The primary characteristic of winter habitat is an abundant and available food supply in conjunction with one or more suitable night roost sites. Hunting perches and roosting sites are located in large trees that provide cover. In Colorado, cottonwoods are preferred, but ponderosa pine and mixed conifer are also used (Towry 1984). Bald eagles in Colorado are known to roost along lakes, streams, and rivers that support large, mature trees and that are isolated from human disturbance (Winternitz 1998).

Analysis of Effects

In general, Alternative 1 has a low potential to affect bald eagles because they are not known to inhabit the project area. In the event that an active bald eagle nest is identified during project implementation, mitigation measures would be incorporated into the project design to minimize direct effects to this species. Treatments would be conducted in other bald eagle habitats (particularly ponderosa pine stands), which may disturb individuals if they are present; however, the potential for this disturbance is low. Alternative 2 would have no direct effects on bald eagles because no new activities would occur.

The project area contains a limited amount of preferred bald eagle habitats. Breeding habitat is particularly lacking because there are no large bodies of water in the project area. Other aquatic habitats and their associated riparian areas would be protected from adverse effects. Fuel reduction treatments would include the removal of some snags, which may reduce the availability and suitability of potential hunting perches; however, Forest Plan (USFS 1984a) standards would preserve minimum densities of snags. Many of the larger trees that are most suitable for nesting and roosting would be retained. Thinning and prescribed burning treatments may benefit bald eagles by reducing forest density in ponderosa pine and mixed conifer stands. Lower forest density could improve habitats by increasing average tree sizes in those stands and reducing the potential for large-scale disturbance events (wildfire or insect outbreak) that could cause habitat loss. Alternative 2 would maintain the current availability of habitats, but the potential for large-scale wildfire or insect outbreak would remain high.

Future increases in recreational use and residential development in and near the project area should not change the habitat suitability for bald eagles because these uses would likely be concentrated in areas where disturbance from similar uses is already occurring. Alternative 1 would not promote or restrict these types of activities. Riparian and aquatic habitats are expected to be maintained or improved in the future. Future fuel treatment projects could improve long-term habitat suitability for the bald eagle. Continued prescribed burning would contribute to a more natural fire regime, potentially creating and maintaining roosting and foraging habitats.

Mexican Spotted Owl

The Mexican spotted owl (MSO) is geographically isolated from the northern and California subspecies. It ranges from the Colorado Rockies and southern Utah to central Mexico (Boyle 1998), and is distributed discontinuously throughout its range in isolated mountain systems and canyons (USFWS 1995b, Boyle 1998). The MSO was designated as federally threatened in 1993 (USFWS 1993). The total MSO population in the United States is estimated to be between 777 and 1,554 birds (Boyle 1998).

Throughout their range, spotted owls nest and roost in rocky canyons of forested mountains below 9,500 feet in elevation. Occupied cover types are typically Douglas-fir or white fir overstories with co-dominant species including southwestern white pine, limber pine, and ponderosa pine. These forests are typically of complex structure, being uneven-aged, multistoried, and having high canopy closure (USFWS 2004a). In Colorado, all known MSO nests have been found on cliff ledges or in caves along steep-sided canyon walls (USFWS 1995b, Boyle 1998), typically with old-growth mixed conifer forests. It also occurs in slick-rock canyons of the pinyon-juniper zone in this state. This species is relatively intolerant of high temperatures, and closed canopy forests and canyons provide cool, shady microclimates (Boyle 1998; USFWS 1995b). Characteristics of foraging habitat generally include more woody debris, higher canopy closure, and greater densities of trees and snags than random sites (USFWS 1995b).

Records for the MSO in Colorado are rare, and the historical distribution is difficult to infer. There are two known breeding populations in Colorado: three adult birds at Mesa Verde National Park, and 20 to 30 adult birds in 22 sites in the south-central mountains. The larger portion of individuals occurs on the southern massif of Pikes Peak, and smaller numbers occur in the Wet Mountains (Boyle 1998). MSOs have been located on the Pikes Peak, South Platte, and San Carlos Ranger Districts on the PSICC (USFS 2000b), but none have been detected during surveys in and near the project area (Elson 2004b). Some suitable MSO cover type exists in the project area, consisting of dense, mature (HSS 4B) Douglas-fir. However, these patches do not generally occur adjacent to nesting substrates that are commonly used in Colorado, such as cliffs and canyon walls. The potential for MSO occurrence in the project area is also limited because much of the project area is above 9,500 feet.

The USFWS has designated 8.6 million acres of critical habitat for the MSO on federal lands in Arizona, New Mexico, Colorado, and Utah. However, no critical habitat has been identified in the project area. The nearest unit (SRM-C-2) occurs within the Pike and San Isabel National Forests in Jefferson and Douglas Counties, Colorado, approximately 40 miles southeast of the project area (USFWS 2004b).

Analysis of Effects

The MSO is not known to occur in the project area. The preferred substrate and the elevation range of this species limit the amount of suitable habitat in the project area. In addition, treatment in suitable habitats would be avoided because of slope restrictions. This indicates that Alternative 1 would not cause the direct injury, mortality, or disturbance of individual MSOs. In the event that MSO use of the project area is identified during project implementation, mitigation measures would be incorporated into the project design to minimize direct effects to this species. Alternative 2 would have no direct effects on MSOs because no new activities would occur.

There is low potential for the proposed action to affect MSOs because of the lack of known occurrences in the project area and the limited amount of suitable habitats that would be treated. While thinning and prescribed burning treatments would reduce the extent of HSS 4B Douglas-fir in the short-term (a potential negative effect for the MSO) and the promotion of larger average tree size and greater forest structure complexity in the long-term (a potential beneficial effect for the MSO), little of this altered habitat is actually likely to be used by the MSO because of slope restrictions. The most likely effect of Alternative 1 on this species would be the long-term benefit of reducing the potential for a large-scale crown fire or insect outbreak. Large-scale disturbance events such as these could cause a substantial loss of MSO habitats. Alternative 2 would maintain the current availability of habitats, but the potential for large-scale wildfire or insect outbreak would remain high.

Future increases in recreational and residential uses in and near the project area should not change the habitat suitability for MSOs because these uses would likely be concentrated in areas where disturbance from similar uses is already occurring. Neither alternative would promote or restrict these types of activities. Future fuel treatment projects could improve long-term habitat suitability for the MSO.

Canada Lynx

The lynx occurs primarily in the boreal forests of Alaska and Canada and adjoining areas in the contiguous U.S., extending southward down the mountain ranges in the western U.S. Large, contiguous areas of boreal and western montane forest appear to be necessary for the persistence of lynx populations (Ruediger et al. 2000). Until recently, it was generally assumed that the lynx was an indigenous but uncommon species in the Southern Rocky Mountain Geographic Area. However, newly discovered records indicate that the lynx may have been relatively common in Colorado, at least near or before the turn of the century. These records of lynx are distributed throughout mountainous areas of Colorado (Ruediger et al. 2000). Since 1999, the CDOW has been conducting a lynx recovery program. A total of 166 adult lynx have been reintroduced into southwestern and central Colorado. The CDOW plans to release up to 50 more lynx in 2005. Monitoring has confirmed that lynx have dispersed across Colorado and that re-introduced lynx have reproduced. No lynx have been observed in the project area (CDOW 2005a).

Lynx live in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare and other mammalian prey. Lynx habitat in the Southern Rockies typically includes the subalpine and upper montane forest zones between 8,000 and 12,000 feet in elevation. Spruce/fir, lodgepole pine, white fir, aspen, and mesic Douglas-fir may provide foraging or denning habitat for lynx. Lynx habitat should be considered in terms of a habitat mosaic within these forest landscapes, rather than as simple vegetation types. Denning females typically select habitats in these forested zones that are mature, dense, and contain a large component of down woody debris (Ruediger et al. 2000).

The snowshoe hare is an important prey species for the lynx, accounting for the majority of its winter diet. This hare requires dense ground- and snow-level cover and forage. The structure of mature and late-successional spruce/fir forests provide premium habitat for snowshoe hares, and subsequently lynx. Conifer-aspen forests, particularly those with dense regeneration (for example, lodgepole pine) or with an extensive shrub and woody debris understory component, may be quality habitat for hares (Ruediger et al. 2000).

Other potentially important lynx habitats in the Southern Rockies include high elevation sagebrush and mountain shrub communities adjacent to or intermixed with forested communities, which afford potentially important alternate prey resources. Riparian and wetland shrub communities found in valleys, drainages, wet meadows, and moist timberline locations may also support important lynx prey resources (Ruediger et al. 2000).

For lynx analyses, habitat conditions are classified as habitat or non-habitat. Lynx habitat is further divided into two categories: suitable (comprised of denning, winter foraging, and other suitable stand conditions) and unsuitable (habitat that has the potential to become suitable in the future through vegetative succession). Examples of suitable habitat characteristics in the project area include mature, dense conifer stands or dense conifer regeneration. Unsuitable habitat includes heavily thinned or burned lodgepole pine or aspen. Non-habitat includes rock, grassland, or tundra cover types, urban environments, and ponderosa pine stands.

The project area is located in the Mount Evans LAU, for which the USFS has mapped lynx habitats (**Figure 3-5**). **Table 3-14** and the following summary present the current availability of lynx habitats in the LAU and in proposed treatment units for Alternative 1.

- Slightly more than one half (51.9 percent) of the LAU is potential lynx habitat (Total Habitat in **Table 3-14**).
- Almost all (98.8 percent) of the potential habitat in the LAU is considered suitable.
- The treatment units occupy 6.9 percent of the LAU.
- Treatments would be conducted in 95.0 percent of the unsuitable habitat in the LAU. In contrast, these treatments would be conducted in only 7.0 percent of the suitable habitat in the LAU.

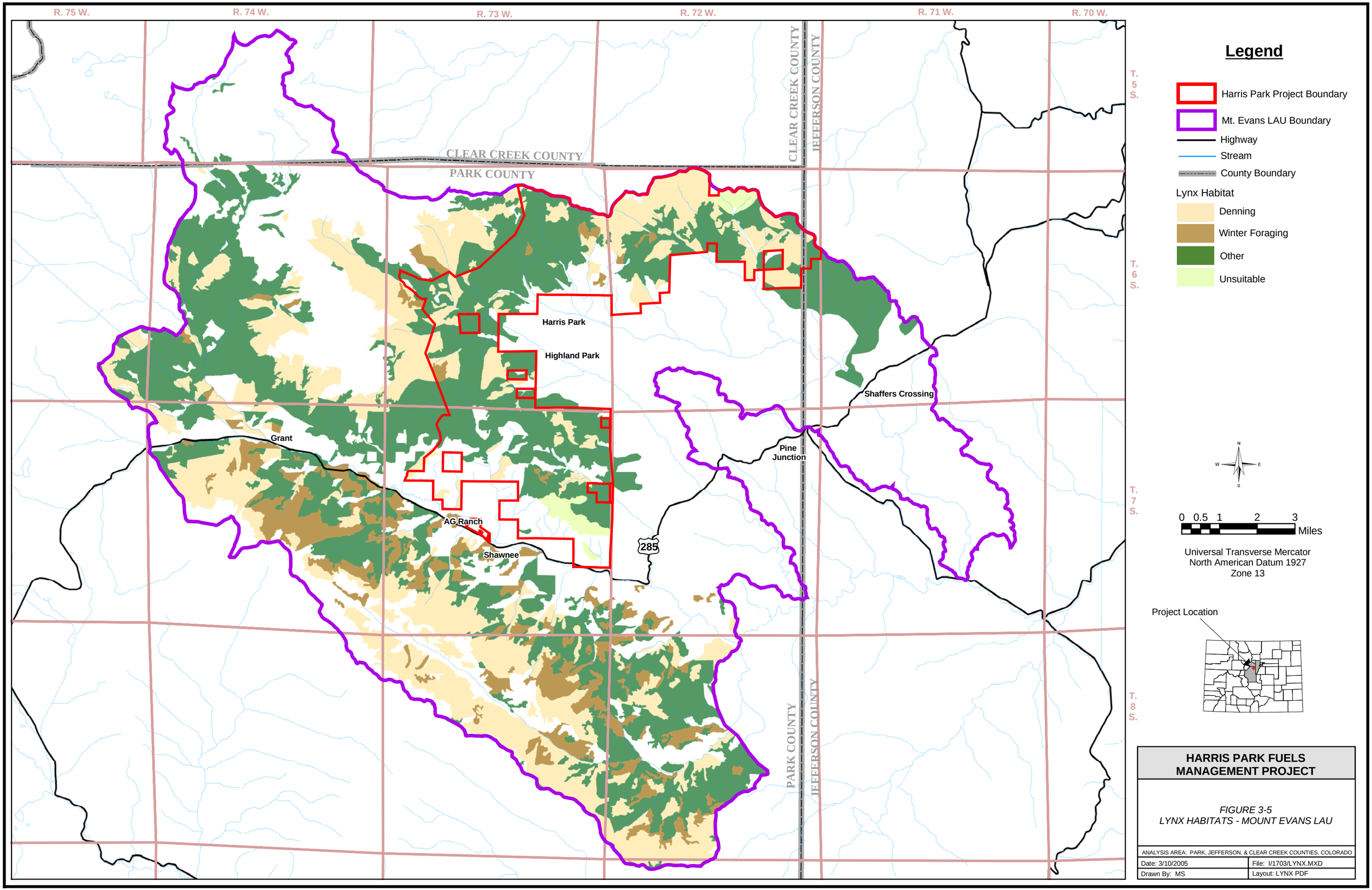
TABLE 3-14 LYNX HABITATS - CURRENT CONDITION

Habitat Type	Mount Evans LAU		Treatment Units	
	Acres	Percent of LAU Total	Acres	Percent of Corresponding LAU Habitat
Denning	29,081	17.9	1,695	5.8
Winter Foraging	9,091	5.6	62	0.7
Other	44,962	27.7	4,082	9.1
Total Suitable	83,135	51.3	5,839	7.0
Total Suitable	83,135	51.3	5,839	7.0
Unsuitable	1,006	0.6	956	95.0
Total Habitat	84,141	51.9	6,795	8.1
Total Habitat	84,141	51.9	6,795	8.1
Non-Habitat	77,996	48.1	4,363	5.6
LAU Total	162,137	100.0	11,158	6.9

Analysis of Effects

Alternative 1 is not likely to cause the direct disturbance, displacement, injury, or mortality of lynx. Lynx are not known to occur in the project area, and the potential for their occurrence is low. In addition, the species is highly mobile and generally avoids areas of human activity. Alternative 2 would have no direct effect on lynx because no new activities would occur.

Alternative 1 may cause the disturbance, displacement, injury, or mortality of snowshoe hares; however, it is not likely to threaten the population status of hares in the project area. The main effects of the proposed action to lynx would be changes to suitable habitats. These effects are summarized below. Alternative 2 would maintain the current availability of habitats, but the potential for large-scale wildfire or insect outbreak, and subsequent large-scale loss of lynx habitats, would not be reduced.



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-5
LYNX HABITATS - MOUNT EVANS LAU

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/10/2005	File: I/1703/LYNX.MXD
Drawn By: MS	Layout: LYNX PDF

Alternative 1 Effects Summary

Each treatment activity would degrade or convert some suitable lynx habitats to unsuitable. Denning habitat would be reduced by 1,278 acres. Winter foraging habitat would be reduced by 47 acres. Other habitat would be reduced by 579 acres. Unsuitable habitat would increase by 1,904 acres. This analysis is based on maximum potential effects. Actual effects are likely to be less because not all habitats mapped as suitable for lynx are actually suitable. During an October 25, 2004 site visit, USFS and USFWS personnel determined that some areas were mapped incorrectly, such that the map appears to over-estimate the amount and quality of lynx habitat that is present in the project area. Many dry-site lodgepole pine stands were mapped as suitable denning or winter foraging habitats when in fact they contain little to no understory vegetation or down woody debris. **Table 3-15** shows the post-treatment lynx habitat availability in the Mount Evans LAU and in the treatment units. Key points in **Table 3-15** are:

- The extent of total habitat in the LAU would not change.
- Almost all (96.5 percent) of the total habitat in the LAU would remain suitable.
- The treatment units would contain a smaller portion (4.8 percent) of the suitable habitat in the LAU than before treatment (7.0 percent).
- Alternative 1 would convert 2.3 percent of the total suitable habitat to unsuitable.
- Alternative 1 would convert 1.9 percent of the denning and foraging habitats in the LAU to other habitat.
- Alternative 1 would convert 1.6 percent of the denning and foraging habitats in the LAU to unsuitable.
- Alternative 1 would convert 1.4 percent of the other habitat in the LAU to unsuitable.

TABLE 3-15 LYNX HABITATS - POST-TREATMENT CONDITION

Habitat Type	Mount Evans LAU		Alternative 1 Treatment Units	
	Acres	Percent of LAU Total	Acres	Percent of Corresponding LAU Habitat
Denning	27,803	17.1	417	1.5
Winter Foraging	9,044	5.6	15	0.2
Other	44,383	27.4	3,503	7.9
Total Suitable	81,231	50.1	3,935	4.8
Total Suitable	81,231	50.1	3,935	4.8
Unsuitable	2,910	1.8	2,860	98.3
Total Habitat	84,141	51.9	6,795	8.1
Total Habitat	84,141	51.9	6,795	8.1
Non-Habitat	77,996	48.1	4,363	5.6
LAU Total	162,137	100.0	11,158	6.9

Some project activities may take place during the winter months when snow compaction along roads is a concern. However, a uniform, deep snow pack rarely forms in the project area. Snow tends to accumulate during storms, and then melt on warmer days. Any compaction of snow along roads is not expected to change accessibility to the project area by lynx competitors because the snow pack is rarely deep enough to exclude them.

Based on the mapped lynx habitat, it appears that some treatments would reduce the amount of denning habitat in the project area. However, it is important to note that the proposed treatment units are not generally representative of the habitat that lynx are known to select for denning in Colorado. Most known dens have been located in Engelmann spruce/subalpine fir forests at high elevations, in areas of extensive downfall and extreme ruggedness and remoteness (CDOW 2005a). No stands that would be treated by this project match these habitat characteristics.

Treatments would reduce forest density and increase forest health, reducing the long-term potential for large-scale wildfire, insect outbreak, or disease. This would benefit lynx by reducing the potential for widespread habitat loss from one or more of these disturbances. Treatments would reduce the amount of downed woody debris, which is used by denning lynx; however, Forest Plan (1984a) standards for snags and coarse woody material would be met.

Many of the treatments would focus on reducing canopy cover, which would have the effect of promoting regeneration. Some of this regeneration would be removed by maintenance treatments; however, some would be retained. The beneficial long-term effect of these treatments would be to recreate the mosaic of young, regenerating, mature, and late-successional forests typical of naturally operating disturbance regimes. This would benefit lynx by creating more denning and foraging habitats and more snowshoe hare habitats.

Future increases in recreational and residential uses in and near the project area should not change habitat suitability for lynx because these uses would be concentrated in areas where disturbance from similar uses is already occurring. Alternative 1 would not promote or restrict these types of activities. Future fuel treatment projects activities would degrade additional lynx habitats beyond those degraded by the proposed project. These include proposed treatments on private, state, and BLM lands near the project area. Maintenance treatments in the project area would keep some potential lynx habitats in an unsuitable condition. However, the interval between maintenance treatments may be sufficient to allow development of foraging habitats. **Table 3-16** summarizes the cumulative effects of past, current, and proposed management activities in and near the project area on lynx habitats in the Mount Evans LAU.

3.7.3 Sensitive Species

A complete list of sensitive species located on the PSICC and any species located downstream that could potentially be affected by the project can be found in the BE. The BE concluded that fifteen sensitive wildlife species (Townsend's big-eared bat, Gunnison's prairie dog, American marten, pygmy shrew, northern goshawk, boreal owl, olive-sided flycatcher, peregrine falcon, white-tailed ptarmigan, Lewis' woodpecker, flammulated owl, American three-toed woodpecker, boreal toad, northern leopard frog, and Hudsonian emerald) and ten sensitive plant species narrow-leaf moonwort, yellow lady's slipper, slender cotton grass, Colorado tansy-aster, white adder's mouth, Weber monkey flower, Kotzebue grass-of-parnassus, Rocky Mountain cinquefoil, nagoonberry, and Selkirk violet) may occur in the project area.

TABLE 3-16 LYNX HABITATS - CUMULATIVE EFFECTS

Habitat Type	LAU Current Condition (acres)	Habitat Change Alternative 1 (acres)	Habitat Change – Other Known Actions (acres)	LAU Future Condition (acres)	Cumulative LAU Habitat Change (percent)
Denning	29,081	-1,278	-5	27,798	-4.4
Winter Foraging	9,091	-47	-51	8,993	-1.1
Other	44,962	-579	-682	43,701	-2.8
Total Suitable	83,135	-1,904	-738	80,493	-3.2
Total Suitable	83,135	-1,904	-738	80,493	-3.2
Unsuitable	1,006	+1,904	+738	3,648	+262.6
Total Habitat	84,141	0	0	84,141	0.0
Total Habitat	84,141	0	0	84,141	0.0
Non-Habitat	77,996	0	0	77,996	0.0
LAU Total	162,137	0	0	162,137	0.0

Townsend's Big-eared Bat

This species inhabits semi-desert shrublands, pinyon-juniper woodlands, and open montane, mixed coniferous forests. Abandoned mines and caves are frequently used for roosts and hibernacula (Fitzgerald et al. 1994; Ryke et al. 2003). This bat occurs in the western and southwestern regions of the United States. In Colorado, it occurs over most of the western two-thirds of the state and the extreme southeastern part of the state to elevations of 9,500 feet. It has been recorded in Park County (Fitzgerald et al. 1994). Townsend's big-eared bat is known to occur in Park County, but its potential for occurrence in the project area is low because of limited habitat availability (Elson 2004b).

Analysis of Effects

Direct effects to this species from the proposed project are not expected because occurrence is unlikely because of the limited amount of habitat in the project area. There is a limited amount of open ponderosa pine stands, and a large amount of the project area is outside of the elevation limit of the species. However, if individuals are present, they could be affected by the project. In that case, Alternative 1 could disturb or displace individuals from occupied or otherwise suitable habitats. Alternative 2 would have no direct effect on Townsend's big-eared bat because this species is not likely to occur in the project area, no new activities would occur, and current habitat conditions would be maintained.

Because this species is not likely to occur in the project area, indirect effects from Alternatives 1 or 2 are not likely. However, proposed treatments would affect suitable habitats for Townsend's big-eared bat. Mechanical thinning and prescribed burning treatments would promote the survival and re-establishment of ponderosa pine, increasing the total amount of potential habitat in the project area by 1,414 acres. Furthermore, existing ponderosa pine habitats within the project area would be improved by increasing the relative amount of HSS 3A and 4A stands compared to HSS 4A and 4B stands. However, some of the new and improved suitable acreage would be above 9,500 feet in elevation, which limits the beneficial effect of increased habitat availability to this species. In the long-term, these changes would also reduce

the potential for large-scale crown fire or insect outbreak, events that could lead to the loss of suitable habitat for Townsend's big-eared bat. Under Alternative 2, forest density would continue to increase, reducing the amount of suitable habitat and increasing the potential for large-scale habitat loss.

Fire suppression has particularly affected habitat for Townsend's big-eared bat by limiting the amount of open ponderosa pine stands. Fuel treatment projects in and near the project area could benefit this species by increasing the availability of habitats. Projects involving continued prescribed burning would begin to restore natural fire regimes to the project area, which would also contribute to the creation and maintenance of habitats for this species.

Gunnison's Prairie Dog

This species inhabits grasslands and montane or semi-desert shrublands. In Colorado, it ranges from 6,000 to 12,000 feet in elevation (Fitzgerald et al. 1994). Gunnison's prairie dog has a very limited distribution, which is known to include only portions of Colorado, New Mexico, Arizona, and Utah. It is restricted to the southwestern and south-central portions of Colorado (Fitzgerald et al. 1994). There are no known populations of Gunnison's prairie dog in the project area (Elson 2004b; Fitzgerald et al. 1994). Very little suitable habitat exists in the project area, consisting of montane meadow.

Analysis of Effects

The project area lacks a population of Gunnison's prairie dog and contains very little suitable habitat. Alternatives 1 and 2 would cause no direct or indirect effects to this species. No previous, current, or reasonably foreseeable future activities under either Alternatives 1 or 2 are likely to affect Gunnison's prairie dogs or their habitats because of the lack of occurrence and habitats in and near the project area.

American Marten

Martens occur at elevations of 8,000 to 13,000 feet in Colorado. They typically inhabit spruce/fir and lodgepole pine forests with mature to old-growth structural stages (HSSs 4B, 4C, and 5), although they may occur in lower-elevation montane forests and alpine tundra as well. They prefer moderate to high canopy cover (greater than 30 percent), especially in winter. Snags and down dead material are important components of denning and foraging habitat. Seral shrub and herb stages that enhance the prey base and berry crops may be favorable (Fitzgerald et al. 1994). This species is widely distributed across the state of Colorado, occurring in most areas of coniferous forest in the higher mountains (Fitzgerald et al. 1994). It is estimated to be the fifth most common mammal in this habitat type (Ryke and Wagner 2002); however, it is considered rare in Park County (CDOW 2004b). This species has been located in Park County, near the project area (Fitzgerald et al. 1994).

Analysis of Effects

Individuals may be disturbed by the operation of equipment during project implementation. Individuals may be displaced by the removal of some snags and down dead material that provide denning and foraging habitat. Alternative 2 would have no direct effect on this species because no new activities would occur and current habitat conditions would be maintained.

Alternative 1 would affect suitable marten habitats in the project area. The amount and structure of the spruce/fir cover type would not change substantially, but the amount of HSS 4B lodgepole pine stands would decline by 1,057 acres. The loss of these stands would occur because lodgepole pine would be targeted for removal; crown continuity would be modified through the creation of shaded fuel breaks and patch cuts; and burning would be conducted in a manner to reduce regeneration of lodgepole pine. In the long-term, treatment activities under Alternative 1 would reduce the potential for a large-scale crown fire or insect outbreak, events that could lead to a substantial loss of suitable habitat. The lack of treatment under Alternative 2 may cause the continual degradation of forest health, which could eventually lead to large-scale habitat loss for the American marten.

Fire suppression has increased the availability of marten habitat by allowing an increase of HSS 4B and 4C stands. Past timber harvest likely removed many of the pre-settlement mature and old growth stands in the project area, substantially reducing available marten habitats. However, some of the stands have regenerated into suitable marten habitats. Two activities in the area have reduced the amount of available marten denning habitat but correspondingly have increased the amount of foraging habitat. These include most of the more recent timber harvesting, which accounts for most of the younger lodgepole pine stands in the project area, and the wildlife habitat improvement project that encouraged residual aspen regeneration in the project area. While the occurrence of stand-replacing fire (a potential result of further fire suppression and lack of fuels treatment) would eventually allow for regeneration of lodgepole pine and spruce/fir (Anderson 2003; Uchytil 1991a, b), the time period necessary to regain dense, mature forests is outside the scope of this analysis.

Pygmy Shrew

The pygmy shrew occupies a wide range of habitats. It has been found in subalpine forests (spruce, fir, and lodgepole pine), clear-cut and selectively logged forests, forest-meadow edges, boggy meadows, willow thickets, aspen/fir forests, and subalpine parklands. All captures in Colorado have been at elevations above 9,600 feet (Fitzgerald et al. 1994). Data on the distribution of this species are scarce. It is known to occur in the northern latitudes of North America. In Colorado, confirmed occurrences are limited. It is possible that the pygmy shrew occupies suitable habitat throughout the mountains of central Colorado, but populations may be discontinuous relicts remaining from glacial times (Fitzgerald et al. 1994). The pygmy shrew is not known to occur in Park County (CDOW 2004c); however, its distribution is poorly understood.

Analysis of Effects

No direct injury or mortality to individuals is expected from Alternatives 1 or 2 because of the lack of known occurrences in the project area. However, distribution data are scarce, and if individuals are present, they could be affected by the project. In that case, Alternative 1 could disturb or displace individuals from occupied or otherwise suitable habitats. Alternative 2 would have no direct effect on this species because no new activities would occur and current habitat conditions would be maintained.

Because of the lack of known occurrences in the project area, neither Alternative 1 nor 2 is expected to affect shrew habitats; however, a conservative analysis should take into account the lack of distribution data. Treatment under Alternative 1 would affect potential shrew habitat in the project area, primarily through the thinning of moderately dense (HSS 3B, 4B) stands of lodgepole pine and aspen. Whether these treatments would affect the availability of habitat for pygmy shrews is uncertain, as this species appears to occupy a wide range of habitats, including selectively logged forests. Treatment activities under Alternative 1 would reduce the potential for a large-scale crown fire or insect outbreak, events that could lead to a substantial loss of suitable habitats. Alternative 2 would cause the continual decline of

forest health and associated long-term effects, such as a higher potential for long-term habitat loss to large-scale fire or other disturbance.

While fuel treatment projects could benefit the pygmy shrew by reducing the potential for substantial habitat loss from large-scale disturbance, this effect would be less important across a longer time frame. Projects involving continued prescribed burning would begin to restore natural fire regimes to the project area, which may contribute to the creation and maintenance of pygmy shrew habitats.

Northern Goshawk

Goshawks generally occur in mature or old-growth forests, often ponderosa pine or aspen in Colorado (Barrett 1998c). Breeding season habitat includes nesting, post-fledging area (PFA), and foraging habitat (Kennedy 2003). The nest stand is the area immediately surrounding the nest tree. Nesting occurs primarily in forests with large trees and high canopy closure (HSS 4B, 4C, and 5), and the nest tree is often one of the largest trees in the stand (Kennedy 2003). The PFA surrounds the nest area and has been estimated at 420 acres (Graham et al. 1994). PFA habitats for goshawks are a mosaic of large trees, large snags, dense immature ponderosa pine stands (HSS 3C), and small openings with productive understories and coarse woody debris (Graham et al. 1994). Beyond the PFA is the remainder of the adult home range, known as the foraging area. Goshawks in the western U. S. hunt in diverse habitats ranging from open sage-steppe to dense forested communities, including riparian areas (Squires and Reynolds 1997). In northern Arizona, the foraging area has been estimated at 5,400 acres (Reynolds et al. 1992). Foraging areas are generally characterized by more open stands of pine, spruce, aspen, and oak (HSS 1, 2, 3A, 4A). Reynolds et al. (1992) recommend 40 percent canopy closure in mid-age forests, 40 to 60 percent canopy closure in mature and old-growth forests, and openings up to four acres in size in ponderosa pine foraging areas. The distribution of the northern goshawk is widespread, including the northern and western United States. Throughout Colorado, the goshawk is considered a rare to uncommon year-round resident of coniferous forests (Barrett 1998, Kennedy 2003). Breeding occurrence has been recorded for Park County (Kennedy 2003). No goshawks were found during surveys conducted just south of the project area in 2000 and 2002 (USFS 2000c, 2002b), but it is possible that they breed in the project area (Barrett 1998).

Analysis of Effects

Project activities may disturb or displace goshawks from occupied or otherwise suitable habitats. However, committed conservation measures would be used to minimize direct effects to goshawks. These measures are described earlier in this BE. Alternative 2 would have no direct effect on goshawks because no new activities would occur and current habitat conditions would be maintained.

Treatments under Alternative 1 would cause a shift from the current HSS 4B and 4C stands to HSS 4A, which would decrease the availability of goshawk nesting habitat by 2,499 acres. However, this shift plus the shift from current HSS 3B and 3C stands to HSS 3A would increase goshawk foraging areas by 4,672 acres. In addition, management activities near goshawk nest sites would be designed to conserve or enhance site conditions (for example, by thinning regeneration and retaining overstory trees). Silvicultural prescriptions and management activities would be designed to enhance prey species habitat by maintaining vegetative diversity and striving for a balance of structural stages, from stand initiation to late successional, in goshawk post-fledging habitat. In the long-term, implementation of Alternative 1 would benefit the northern goshawk by reducing the potential for large-scale crown fire or insect outbreak, which could cause widespread habitat loss. In the short-term, Alternative 2 would maintain the current availability of nesting and foraging habitats, but eventually the increasing forest density may cause an increase in nesting habitat and a decrease in foraging habitat. In addition, the potential for large-scale disturbance would remain high under Alternative 2.

Fire suppression has likely caused the availability and suitability of northern goshawk nesting habitats to increase and foraging habitats to decrease by promoting the development of dense, mature forests (HSS 4B and 4C). Past timber harvest and wildlife habitat improvement projects reduced the availability of goshawk nesting habitats and increased the availability of foraging habitats, producing a better balance of these two habitats. The proposed project would continue this trend, moving the forests in the project area closer to the historical balance of stand types and creating more diverse foraging habitats, while preserving some nesting habitats.

Boreal Owl

Boreal owls occur mainly in mature to old-growth Engelmann spruce and subalpine fir above 9,000 feet in elevation, but they also frequent higher-elevation lodgepole pine, Douglas-fir, and aspen (Hayward 1994, Ryder 1998). Nesting habitat contains large diameter snags that provide cavities, and a mix of spruce, fir, and open meadows that provide prey species. Only a small area around the nest is defended during the breeding season. Boreal owls may use younger tree stands for foraging during the non-breeding season. Home ranges cover as much as 2,200 acres (Ryke and Wagner 2002). The boreal owl is a circumpolar species, well distributed across a large geographic range. It has been found year-round in most Colorado mountain ranges. However, thorough documentation of distribution and population trends is lacking because of low survey effort (Hayward 1994). The Colorado Natural Diversity Information Source (NDIS) considers the range of the boreal owl to include Park, Jefferson, Clear Creek, and Summit Counties (CDOW 2005b). Boreal owls have not been recorded near the project area (Ryder 1998), but survey effort has been low overall (Hayward 1994). No known surveys have been conducted in the project area (Elson 2004b).

Analysis of Effects

Project activities may disturb or displace individuals from otherwise suitable habitats, particularly through the damage or removal of some snags or large trees that are currently occupied or potentially suitable for nesting. In the event that an occupied nest is identified in the project area during project implementation, mitigation measures would be incorporated into the project design to minimize direct effects to boreal owls. In addition, Forest Plan standards (USFS 1984a) would preserve minimum densities of snags within the project area, and some trees suitable for nesting would be retained in most treated areas. Alternative 2 would have no direct effect on boreal owls because no new activities would occur and current habitat conditions would be maintained.

Treatment under Alternative 1 would reduce the total amount of potential nesting habitat by 826 acres through the thinning of HSS 4B, particularly in lodgepole pine stands. However, older spruce/fir forests are the most important cover type for this species and would not be affected by treatment. Alternative 1 would reduce the total amount of foraging habitat in the project area by 133 acres. Implementation of Alternative 1 would benefit this species by reducing the potential for large-scale crown fire or insect outbreak, events that could cause widespread habitat loss. Alternative 2 would maintain the current availability of nesting and foraging habitats, and the potential for large-scale crown fire or insect outbreak would remain high.

Most timber harvesting in the project area consisted of clear-cuts in mature lodgepole pine, and Douglas-fir killed by a spruce budworm epidemic was salvaged. Boreal owls may use both of these habitat types for nesting. A wildlife habitat improvement project conducted in the project area may have increased the availability of foraging habitat through the cutting of patches of dense lodgepole pine to encourage residual aspen regeneration. Fuel treatment projects near the project area may have reduced the availability of boreal owl nesting and foraging habitats. Alternative 1 would continue this trend, moving

the forests in the project area closer to the historical balance of stand types, while preserving some nesting habitats.

Olive-Sided Flycatcher

In Colorado, the olive-sided flycatcher is a summer resident nesting at elevations between 7,000 to 11,000 feet. Olive-sided flycatcher breeding habitat in the western United States is primarily mature spruce/fir, Douglas-fir and, less often, other coniferous forests. It also occurs in montane and foothill riparian and aspen forests (Andrews and Righter 1992). Within these habitats, this species occurs primarily within live, logged, or burned forests with snags, natural clearings, bogs, streams and lakeshores with water-killed trees (Jones 1998). Openings in forested areas are an important component of flycatcher foraging habitat (Jones 1998). Olive-sided flycatchers breed in boreal forests from Alaska to Newfoundland and in the mountains of the western United States, including Colorado. They winter from Mexico to south Peru. Populations across North America show a steady, statistically significant, negative trend (Jones 1998), while Colorado populations show a slight, non-statistically significant negative trend (Sauer et al. 2004). There is evidence that this species breeds near the project area in Park County (Jones 1998).

Analysis of Effects

Under Alternative 1, individual flycatchers may be disturbed by the operation of equipment in occupied habitat. Other potential direct effects include the removal or alteration of some nest trees and snags. Forest Plan standards (USFS 1984a) and mitigation measures would preserve minimum densities of snags within the project area. Alternative 2 would have no direct effect on olive-sided flycatchers because no new activities would occur and current habitat conditions would be maintained.

Treatments under Alternative 1 would increase the total amount of potential habitat in the project area by 456 acres. Treatments that increase forest openings and edge habitats may be particularly effective at increasing the amount of suitable breeding and foraging habitat. This would be accomplished under Alternative 1 via the transformation of stands from HSS 3B and 4B to HSS 3A and 4A, patch cutting, and maintenance or expansion of meadows. Alternative 1 would increase forest health and reduce the potential for large-scale crown fires and insect outbreaks that could cause a loss of flycatcher habitat. The lack of treatment under Alternative 2 could cause the loss of critical forest openings. In the long-term, lack of treatment could cause continual declining forest health and maintenance of the currently high potential for large-scale disturbance. However, the extent to which these disturbed conditions would affect flycatchers is uncertain, because they use burned areas but also need live trees for nesting.

Fire suppression has created dense, homogenous patches of forest that lack the openings used by this flycatcher for foraging. Other activities have created openings that may be used for foraging by this species. These include timber harvesting that accounts for most of the younger lodgepole pine stands in the project area; the salvage of Douglas-fir killed by a spruce budworm epidemic; and a wildlife habitat improvement project in which patches of dense timber were cut in order to increase habitat diversity in the project area. Fuels treatment projects involving continued prescribed burning would begin to restore natural fire regimes to the project area, which would also contribute to the creation and maintenance of flycatcher habitats.

American Peregrine Falcon

Peregrines usually nest on ledges of high cliffs or tall man-made structures. They prey on birds such as waterfowl, shorebirds, grouse, and pigeons. In Colorado, peregrines typically nest on foothills and mountain cliffs between 4,500 and 9,000 feet in elevation. This species hunts and nests in pinyon/juniper,

ponderosa pine, and spruce/fir habitats (Levad 1998). This species occurs across North America and utilizes a variety of habitats. The peregrine falcon is typically associated with open country near rivers, marshes, and coasts. In 1995, peregrines occupied 71 sites in Colorado, and 68 pairs attempted to nest. The highest concentrations of peregrine falcons nest in the river valleys and canyons of the western slope. There is confirmed evidence of breeding peregrine falcons in Park County (Levad 1998). There are known peregrine falcon nest sites near the project area and potential sites in the project area, near the North Fork of the South Platte River (Elson 2004b). The project area contains suitable nesting and foraging habitats consisting of ponderosa pine, spruce/fir, and Douglas-fir forests near the North Fork of South Platte River, Slaughterhouse Gulch, Crow Gulch, Deer Creek, and some branches of Elk Creek.

Analysis of Effects

The proposed activities are not likely to disturb or displace individual falcons. No nesting habitat would be treated because of its high level of inaccessibility. The project design would incorporate protection measures to minimize direct effects to known aeries. This would include avoidance of additional human-caused noise and disruption beyond that occurring at the time of nest initiation. In the event that an active breeding site is identified in the project area during project implementation, mitigation measures would be incorporated into the project design in order to minimize direct effects to falcons. Alternative 2 would have no direct effect because no new activities would occur and current habitat conditions would be maintained.

Alternative 1 would not affect the availability of peregrine falcon foraging habitats. Fuel break treatments located primarily on steep, south-facing slopes adjacent to riparian areas or other natural fuel breaks is the type of treatment most likely to affect foraging habitats. Of the cover types used by peregrine falcons, ponderosa pine would be favored for retention, but Engelmann spruce, Douglas-fir, and subalpine fir would be targeted for removal. In the long-term, Alternative 1 would reduce and Alternative 2 would increase the potential for a large-scale crown fire and the subsequent loss of suitable habitat for the species and its prey.

The only cumulative actions relevant to this species are fire suppression, which has caused a decline in the relative abundance of ponderosa pine stands, and timber harvest of Douglas-fir killed by a spruce budworm epidemic. However, these actions have probably had little effect on peregrine falcon habitats and have probably not affected the suitability of the project area for peregrine falcons.

White-tailed Ptarmigan

This bird is a resident of the alpine tundra during summer, and may move below the tree line in winter. It is dependent on willow thickets for foraging, especially in winter (Ryke et al. 2003). Most nests are located among rock fields or tundra grasses, and a small percentage of nests are among willows or krummholz (Versaw 1998a). The white-tailed ptarmigan inhabits alpine areas from north-central New Mexico into the Yukon and southern Alaska. It inhabits all alpine regions of Colorado except the Wet Mountains and Spanish Peaks. Individuals were transplanted to Pikes Peak in 1975 (Versaw 1998a). This species is considered fairly common in Park County (CDOW 2004b). White-tailed ptarmigan breeding is possible near the project area (Versaw 1998a), in alpine habitats of Mount Evans.

Analysis of Effects

Alternative 1 is not expected to directly affect this species because no breeding habitats occur in the project area and because of the small extent of suitable winter habitats in the project area, particularly in treatment units. Willow habitats would not be treated; therefore, their suitability for ptarmigans would not

be affected. Additionally, streams and their associated riparian areas would be protected from adverse effects in accordance with MA 9A direction contained in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

Project activities are not expected to affect the white-tailed ptarmigan, because of the small extent of suitable habitats in the project area, and particularly in the treatment units. Some treatments would be designed to maintain or expand riparian habitat, but they are not expected to alter the total amount of willow habitat in the project area. Alternative 1 is predicted to increase elk habitat effectiveness in the project area (see Section 3.6). This could eventually cause the loss of some willow habitat in the project area, but is not considered a substantial threat to the white-tailed ptarmigan. Alternative 2 would not affect this species because of the lack of suitable habitat and new activities within the project area.

Past livestock grazing and other activities in riparian and willow habitats may have affected the suitability of these habitats for ptarmigan. However, current management has maintained these areas as high quality ptarmigan habitats. No other previous, current, or reasonably foreseeable future activities under either Alternative 1 or Alternative 2 are likely to affect white-tailed ptarmigans or their habitats because management of suitable habitats in the project area would not change.

Lewis' Woodpecker

In Colorado, Lewis' woodpeckers typically reside in valleys, plains, and foothills from 3,500 to 8,000 feet in elevation (Ryke and Wagner 2002). The species is primarily associated with single storied structural stages of ponderosa pine, multi-storied stages of Douglas-fir, and riparian cottonwood woodlands with scattered snags or live trees and bushy undergrowth. This species is an aerial insectivore and requires openings for foraging maneuvers (Kuenning 1998). An open canopy, brush understory, available perch sites, dead trees with decayed wood, and abundant insects characterize breeding habitat for Lewis' woodpecker. Winter habitats are selected based on availability of food supply (mast) and include oak and riparian woodlands (Abele et al. 2004). Lewis' woodpecker is a species of western North America (Kuenning 1998). Populations in Colorado appear to be stable overall, showing a non-statistically significant decline from 1966 to 2003 (Sauer et al. 2004). This woodpecker has not been recorded in the project area (Kuenning 1998).

Analysis of Effects

The likelihood of the project affecting this species is low because the project area is almost entirely above 8,000 feet in elevation. Implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing some occupied nest trees or some snags; however, Forest Plan (USFS 1984a) standards would preserve minimum densities of snags, and the larger diameter trees most likely to be used by cavity nesters are unlikely to be cut. Alternative 2 would not directly affect Lewis' woodpecker because current habitat availability would be maintained.

Implementation of Alternative 1 would create new suitable habitats for the species. Mechanical thinning and prescribed burning would increase the amount of open, mature ponderosa pine stands in the project area by 1,938 acres, through selectively removing other conifer species and shifting existing ponderosa pine stands from HSS 4B to 4A. In addition, treatments would create a more open and more diverse canopy and a denser and more diverse understory, characteristics that would favor Lewis' woodpecker. Despite these benefits, habitat capability for Lewis' woodpecker in the project area is expected to remain low under Alternative 1 (see **Section 3.6**). However, in the long-term, Alternative 1 would improve the overall health of forested stands and would decrease the risk of large-scale disturbance. Under Alternative 2, forest density would continue to increase, eventually degrading the suitability of habitats within the project area for Lewis' woodpecker because forested stands would become increasingly dense. Increasing

forest density would also degrade forest health and increase the risk of large-scale wildfire. A large-scale fire could temporarily increase nesting and foraging habitats for the Lewis' woodpecker, but could also lead to a long-term shortage of snags once those created by the fire decay and fall.

Because most of the project area is above the upper elevation limit of Lewis' woodpecker, the past, present, and reasonably foreseeable future actions in the project area are not likely to affect this species. However, fire suppression has decreased habitat availability for Lewis' woodpeckers in the project area by allowing development of a dense understory of lodgepole pine, ponderosa pine, or Douglas-fir with an overstory of ponderosa pine, effectively converting open, mature or old-growth HSSs to mid-seral HSSs (Ryke and Wagner 2002). Fuel treatment projects near the project area could benefit this species by reducing forest canopy density, increasing understory vegetation diversity and density, and promoting survival and reestablishment of ponderosa pine.

Flammulated Owl

This species occurs regularly from 6,000 to 10,000 feet in elevation in old-growth forests. It depends on cavities for nesting, open forests for catching insects, and brush or dense foliage for roosting. Ponderosa pine is the most common cover type, but aspen and open Douglas-fir stands are also used (McCallum 1994). The results of a survey for small owls conducted in Boulder County suggest a preference for ponderosa pine/Douglas-fir forests and dense shrubs along small streams that have larger trees and higher densities of snags than average (Winn 1998). This owl is primarily insectivorous (moths, crickets, grasshoppers, and beetles), but is known to prey on small mammals and birds as well. The documented breeding range for this species includes southern British Columbia, Washington, the Cascade and Sierra Nevada mountain ranges, forests of Nevada, New Mexico, and Colorado, and it was recently found in forests of Idaho and Montana. Migration patterns of this species are still poorly understood, but data suggest that this species may migrate long distances north to south (DeGraaf et al. 1991). A flammulated owl was found just south of the project area during two Mexican spotted owl surveys in 1993 (USFS 1993).

Analysis of Effects

Alternative 1 may cause individuals to be disturbed by the operation of equipment in occupied habitat. In addition, implementation of Alternative 1 is likely to remove or damage some snags and trees that are suitable for nesting. Forest Plan standards (USFS 1984a) would preserve minimum densities of these snags within the project area and some trees suitable for nesting would be retained in most treated areas. In the event that an occupied nest is identified in the project area during project implementation, mitigation measures would be incorporated into the project design to minimize direct effects to flammulated owls. Alternative 2 would have no direct effect on this species because no new activities would occur and current habitat conditions would be maintained.

Treatments under Alternative 1 would add 781 acres of suitable flammulated owl habitat to the project area. This would occur by increasing the amount of HSS 4A stands of aspen, Douglas-fir, spruce/fir, and particularly ponderosa pine. These treatments would decrease forest density, improving foraging habitat. The decrease in density would also increase the average tree size, increasing nesting habitat suitability. Additionally, implementation of Alternative 1 would benefit the flammulated owl by reducing the potential for large-scale crown fire and insect outbreak, events that could cause widespread habitat loss. Alternative 2 would maintain the current availability of nesting and foraging habitats, and the potential for large-scale disturbance would remain high.

Fire suppression in particular has reduced the amount of flammulated owl habitats by allowing denser forests, which are poorer foraging habitats for this species. Smaller average tree sizes were created by selective logging of larger trees in the past, which are poorer nesting habitats for this species. Fuel treatment projects near the project area could provide long-term benefit to the flammulated owl by promoting open, mature forests. Projects involving continued prescribed burning would begin to restore natural fire regimes to the project area, which would also contribute to the creation and maintenance of flammulated owl habitat.

American Three-toed Woodpecker

The typical range of this woodpecker in Colorado is from 7,000 to 12,000 feet in elevation, with most occurring above 9,000 feet. This species uses both open and closed canopy forests for nesting and foraging (Versaw 1998b). It prefers old-growth/late seral subalpine and montane forests. In Colorado, it is usually found in spruce/fir, but where insect populations are high, it may also occur in ponderosa pine, Douglas-fir, and lodgepole pine forests (Ryke and Wagner 2002; Wiggins 2004). Nest sites have been found in ponderosa pine and aspen trees (Versaw 1998b). Fire-killed conifers are often sought for cavity nesting (Ryke and Wagner 2002). This species forages for tree-boring insects and is commonly associated with burned, diseased, or logged forests (Versaw 1998b). It appears that a suitable habitat matrix for the American three-toed woodpecker is comprised of a patchwork of old-growth conifer forests as well as recently disturbed habitats (Wiggins 2004). The American three-toed woodpecker occurs throughout the boreal forests of North America. Colorado represents the southern extent of its range. It has a scattered distribution throughout all high elevation mountain ranges in Colorado, including Park County, but has low abundance throughout (Versaw 1998b). Breeding Bird Survey data from Colorado show a relatively strong decrease in abundance, but these trends are based on extremely small samples sizes and are not statistically significant (Wiggins 2004). This species is found in Park County, including the project area (Versaw 1998b).

Analysis of Effects

Implementation of Alternative 1 may cause direct injury or mortality to this species and removal or alteration of some nest trees and snags. Forest Plan standards (USFS 1984a) would preserve minimum densities of snags within the project area, and some trees suitable for nesting would be retained in most treated areas. Alternative 2 would have no direct effect on this woodpecker because no new activities would occur and current habitat conditions would be maintained.

Alternative 1 would cause a slight decline in habitat capability for this species (see **Section 3.6**). The abundance of the preferred habitat type, mature spruce/fir, would not be altered. However, treatments would reduce the availability of mature lodgepole pine and Douglas-fir. This alternative may also be negative for this species in the short-term because of the removal of dead trees as part of fuel reduction treatments. The long-term effect of this alternative on this species would be creation of forest conditions similar to historic conditions, including a more natural disturbance regime, which may favor this species. Under Alternative 2, forest health would continue to decline, which could benefit this species in the long-term if large numbers of snags are created by fire or insect outbreaks. A large-scale fire could temporarily increase nesting and foraging habitats for the three-toed woodpecker, but could also lead to a long-term shortage of snags once those created by the fire decay and fall.

Because the American three-toed woodpecker forages for tree-boring insects and is commonly associated with burned, diseased, or logged forests, many of the management actions have increased habitat suitability for this species. In the short-term, fuel treatment projects near the project area may reduce preferred foraging habitat (snags) in the project area, but may benefit this species over the long-term by

creating forest conditions similar to historic conditions, including a more natural disturbance regime, which may favor this species.

Boreal Toad

This species is most common between 8,500 and 11,000 feet in elevation. It is found in shallow water or among sedges and shrubby willows where soil is damp or wet, including marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds in subalpine areas of Colorado (Ryke et al. 2003). The boreal toad is restricted to the southern part of the Rocky Mountains (Hammerson 1999). It occurs throughout most of the mountainous portion of Colorado but appears to be absent from the Wet Mountains and Pikes Peak region (Ryke et al. 2003). Once very common in the mountains of Colorado, this toad underwent a severe decline in distribution and abundance that likely began in the early 1970s and extended into the 1990s in some areas (Hammerson 1999). The historic distribution of the boreal toad includes the project area (Hammerson 1999). No surveys have been conducted in the project area (Elson 2004).

Analysis of Effects

No direct or indirect effects to the boreal toad are expected from the proposed project because no project activities would be conducted in suitable habitats. Streams and their associated riparian areas would be protected from adverse effects under Alternative 1, in accordance with MA 9A direction in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

Past livestock grazing and other activities in riparian habitats may have affected the suitability of these habitats for the boreal toad. However, current management direction maintains these areas as high quality boreal toad habitats. No future activities under either Alternative 1 or Alternative 2 are likely to affect boreal toads or their habitats because of the lack of new activities in suitable habitats.

Northern Leopard Frog

This species can range from 3,500 to 11,000 feet in elevation (Hammerson 1999) and inhabits the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams, and other bodies of permanent water. It appears to be strongly associated with rooted aquatic vegetation (Ryke et al. 2003). The northern leopard frog occurs throughout Colorado, except in the Republican River drainage and southeastern Colorado, south of the Arkansas River (Ryke et al. 2003). This formerly abundant species has become scarce in many areas of Colorado (Hammerson 1999). The northern leopard frog has not been documented in the project area (Hammerson 1999).

Analysis of Effects

No direct or indirect effects to the northern leopard frog are expected from the proposed project because no project activities would be conducted in suitable habitats. Streams and their associated riparian areas would be protected from adverse effects under Alternative 1, in accordance with MA 9A direction in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

Past livestock grazing and other activities in riparian habitats may have affected the suitability of these habitats for the northern leopard frog. However, current management direction maintains these areas as high quality frog habitats. No future activities under either Alternative 1 or Alternative 2 are likely to affect northern leopard frogs or their habitats because of the lack of new activities in suitable habitats.

Hudsonian Emerald

Hudsonian emerald dragonflies are terrestrial as adults and aquatic as larvae. They breed in boggy wetlands, streams, ponds, and reservoirs (Ryke et al. 2003). In Colorado, this species has been documented in Teller, Lake, Park, and Boulder Counties (Ryke et al. 2003; USGS 2004b). Populations appear to be relict and highly disjunct (Ryke et al. 2003). More information regarding Hudsonian emerald habitat and distribution in Colorado is needed (Ryke et al. 2003).

Analysis of Effects

No direct or indirect effects to the Hudsonian emerald are expected from the proposed project because no project activities would be conducted in suitable habitats. Alternative 1 would not alter the amount of sedge or willow habitats present in the project area. Streams and their associated riparian areas would be protected from adverse effects under Alternative 1, in accordance with MA 9A direction in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and current habitat conditions would be maintained.

Past livestock grazing and other activities in riparian habitats may have affected the suitability of these habitats for the Hudsonian emerald. However, current management direction maintains these areas as high quality aquatic habitats. No future activities under either Alternative 1 or Alternative 2 are likely to affect the Hudsonian emerald or its habitats because of the lack of new activities in suitable habitats.

Narrow-leaf Moonwort

Typical habitat for this moonwort includes grassy slopes, among medium-height grasses, along edges of streamside forests and old mining sites (Spackman et al. 1997). Most populations have been found at elevations between 5,000 to 9,800 feet in mountainous regions. Occupied habitats include meadows dominated by knee-high grass, shaded woodlands, grassy horizontal ledges on a north-facing limestone cliff, and a flat upland section of a river valley (NatureServe 2004). Open habitats and microsites with slight to moderate disturbance appear to be typical habitat for a number of *Botrychium* species, including the narrow-leaf moonwort (Beatty et al. 2003a). Narrow-leaf moonwort is one of the rarest plants in North America, although its distribution includes California, Colorado, Idaho, Montana, Utah, Washington, and Wyoming, as well as New Brunswick and Quebec in Canada (Beatty et al. 2003a, Reyher 2004). There are nine confirmed occupied sites for this species in the entire United States, totaling 190 individual plants (Beatty et al. 2003a). In Colorado, there are between one and four extant sites and one to four historic sites (Popovich 2004), which are found in Boulder, El Paso, Grand, and Lake Counties (Beatty et al. 2003a). The largest number of individuals counted at a single site in Colorado is 53, at an extensively monitored site on Pikes Peak (Popovich 2004). Data collected to date at that site indicate the population is relatively stable; however, only three years of data are currently available, making long-term trend estimates impossible (Beatty et al. 2003a). There are no documented occurrences of narrow-leaf moonwort in Park County.

Analysis of Effects

Direct effects to this species are not expected because of the lack of known occurrences in the project area. Surveys for this plant would not be conducted before project implementation. Therefore, there is a small chance that individual plants or small populations would be destroyed by project activities in occupied habitat. Prescribed burns would be done outside of the season when aboveground parts of this plant are present. Pile burns would also be done outside of this season; however, the soil directly under piles may be sterilized, soil organic matter may be lost, and soil characteristics may be altered. Any individual plants under the burned piles would be destroyed and the pile location may not be suitable for re-occupation by plants for some period of time. Light to moderate disturbance of soils may actually increase the suitability of some habitats. Treatment activities conducted under Alternative 1, such as mechanical thinning and broadcast burning, would potentially improve existing habitats by creating new or larger forest canopy openings that may be suitable habitat. Alternative 2 would have no direct effect on the narrow-leaf moonwort because no new activities would occur and existing habitat conditions would be maintained.

No indirect effects to this plant are expected under Alternatives 1 or 2 because of the lack of high-quality habitat in the project area. Implementation of prescribed treatments, such as broadcast burning, may improve long-term habitat conditions for this species by providing disturbance characteristic of the natural disturbance regime.

No previous, current, or reasonably foreseeable future activities are likely to affect this moonwort or its potential habitat because of the lack of known occurrences and high-quality habitat in the project area. In addition, little is known about the long-term effects of changes in forest structure or fire regime on this species, so it is unclear if large-scale wildfire or insect outbreaks would harm or benefit this species. Continued livestock grazing, noxious weed control, and recreational and residential uses have the potential to negatively affect the narrow-leaf moonwort; however, the actual extent of effects to this species are uncertain because it is not known to occur in or near the project area.

Yellow Lady's Slipper

Typical habitat for the yellow lady's slipper includes subalpine wetlands, moist forests, and aspen groves. It is frequently associated with aspen, ponderosa pine, or Douglas-fir, between 7,400 and 8,500 feet in elevation (Spackman et al.1997; USFS 2004d). The yellow lady's slipper is found in 35 states, including most of the Pacific Northwest (including Alaska), upper Midwest, Northeast, and some Southeastern states. Documented occurrences have been in Clear Creek, Custer, Douglas, El Paso, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Montrose, Park, and Pueblo Counties in Colorado (Spackman et al.1997). Although not found in the project area, yellow lady's slipper has been located within the PSICC along the North Fork of the South Platte River headwaters (USFS 2004d).

Analysis of Effects

Direct effects to the yellow lady's slipper are not expected because most of the project area is above its upper elevation limit and because it is not known to occur in the project area. Surveys for this plant would not be conducted before project implementation. Therefore, there is a small chance that individual plants or small populations would be destroyed or disturbed by project activities in occupied habitat, including mechanical thinning and prescribed burning. Pile burns may sterilize the soil directly under piles, soil organic matter may be lost, and soil characteristics may be altered. Any individual plants under the burned piles would be destroyed and the pile location may not be suitable for re-occupation by plants for

some period of time. Alternative 2 would have no direct effect on the species because no new activities would occur and existing habitat conditions would be maintained.

Implementation of the proposed treatments under Alternative 1 may improve long-term habitat conditions for this species by favoring aspen and ponderosa pine cover types and by reducing the risk of large-scale loss of habitat to wildfires. Large-scale wildfires would open the forest canopy and dry the forest floor, which could reduce the suitability of moist areas for this plant. Under Alternative 2, the level of this risk would not change.

Livestock grazing and timber precommercial thinning and harvesting may have negatively affected habitats for this species. Future livestock grazing may continue to affect this species and its habitats. Herbicide use for weed control may harm or kill individual plants if they occur in sprayed areas; however, the potential for this effect is low. Recreational and residential uses are unlikely to affect this species unless currently unknown occurrences are present in affected areas.

Slender Cotton Grass

Slender cotton grass occurs in fens, wet meadows, and pond edges, at elevations from 8,100 to 12,000 feet (Spackman et al. 1997). The distribution of this grass includes Eurasia, Alaska, east to Newfoundland, and south to California, Nebraska, Illinois, and Delaware. In Colorado, it has been found in Jackson, Las Animas, and Park Counties (Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. Slender cotton grass has not been found in the project area. The closest location is in the headwaters of Tarryall Creek (USFS 2004d).

Analysis of Effects

Direct and indirect effects are not expected from Alternative 1 because occurrence of this species is not known in the project area and because the limited amount of high-quality habitat. Surveys for this plant would not be conducted before project implementation. Treatments under Alternative 1 may be positive for the species because they are designed to maintain or expand natural fuel breaks, such as wet meadows. Alternative 2 would have no direct or indirect effect on slender cotton grass because no new activities would occur and existing habitat conditions would be maintained.

Fire suppression and timber harvest are not likely to have affected this species because it is not known from the project area, and these activities do not occur in the habitats that it occupies. Livestock grazing may have altered the habitats that this species uses, but has most likely not affected the species because it is not known to occur in the project area. Herbicide use for weed control may harm or kill individual plants if they occur in sprayed areas; however, the potential for this effect is low because of the lack of known occurrences in the project area.

Colorado Tansy-Aster

The Colorado tansy-aster is typically found in gravelly areas on high mountain slopes, rock outcrops, scree, and dry tundra between 7,600 and 12,900 feet in elevation (Beatty et al. 2004; Spackman et al. 1997). Macrohabitats range from plains/park grassland, to dry grassland communities within ponderosa pine or bristlecone pine areas, to pinyon-juniper woodlands, to alpine fell-fields and meadows. However, within these areas, it is consistently on rocky substrates with open exposure (Beatty et al. 2004). The Colorado tansy-aster is endemic to south-central Wyoming and Colorado. Within Colorado, it has been recorded from 21 occurrences in Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Rio Grande, Saguache, and San Juan Counties (Beatty et al. 2004, Spackman et al. 1997). Two of these occurrences

are within the PSICC (Beatty et al. 2004). Because of the rarity of this species, no information is available on population trends. There are no documented occurrences of Colorado tansy-aster in the project area.

Analysis of Effects

No direct or indirect effects to individual plants or populations are expected under Alternatives 1 or 2 because of the lack of known occurrences and the limited amount of high-quality habitat in the project area. Treatment activities conducted under Alternative 1 would not occur in habitat potentially occupied by the Colorado tansy-aster because of the lack of trees and steep slopes that are associated with this plant. Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained.

Conditions in the project area for this species have likely been unchanged because of the inaccessible and isolated habitat occupied by this species. Hiking and plant collection may occur over time, but implementation of the project would not contribute to this type of cumulative effect.

White Adder's Mouth

This plant grows along shaded streams in mosses where it is kept wet by water spray (Spackman et al. 1997; USFS 2004d) and in calcareous fens (USFS 2004d). It has a narrow elevation range between 7,200 to 8,000 feet (Spackman et al. 1997). The white adder's mouth occurs in 17 states, primarily in the upper Midwest and Northeastern states, but also in Alaska, California, Colorado, and Tennessee. It has a limited distribution in Colorado, occurring along the Front Range in Boulder, Jefferson, and El Paso Counties (Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. There are no documented occurrences of this plant in the project area, but it has been located on the PSICC near the lower North Fork of the South Platte River (USFS 2004d).

Analysis of Effects

Alternatives 1 and 2 are not expected to directly or indirectly affect this species. This species has not been found in the project area. The project area is almost entirely above its upper elevation limit. Streams and their associated riparian areas would be protected from adverse effects under Alternative 1, in accordance with MA 9A direction contained in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained.

Because of the low potential for the occurrence of this species in the project area, no previous, current, or reasonably foreseeable future activities are likely to cumulatively affect the white adder's mouth or its potential habitat.

Weber's Monkeyflower

Preferred habitat for Weber's monkeyflower includes subalpine wetlands within forest seeps or springs protected by granite overhangs. It is typically found in open sites within spruce/fir and aspen forests between 8,500 and 10,500 feet in elevation (Spackman et al. 1997). Weber's monkeyflower is endemic to Colorado and has been located in Clear Creek, Grand, Jefferson, Larimer, Boulder, and Park Counties (Beatty et al. 2003b, Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. Weber's monkeyflower has been recorded near the project area, on the PSICC along the North and South Forks of the South Platte River (Beatty et al. 2003b, USFS 2004d).

Analysis of Effects

No direct loss of individual plants or populations is expected under Alternatives 1 or 2 because of the lack of known occurrences in the project area. Alternative 2 would have no direct effect on the Weber's monkeyflower because no new activities would occur and existing habitat conditions would be maintained.

No indirect effects to this species are expected under Alternative 1 because treatments would not occur in wetland habitats. Alternative 1 may improve long-term habitat conditions for this species by reducing the risk of large-scale loss of habitat to wildfires. Large-scale wildfires would open the forest canopy and dry the environment along streams, which could reduce suitability for this plant. Under Alternative 2, this risk may increase, but the overall potential for effects to this species are low.

No previous, current, or reasonably foreseeable future activities are likely to affect Weber's monkeyflower or its habitats because of the lack of known occurrences in the project area and avoidance of any new activities in potential habitats for this species.

Kotzebue Grass-of-Parnassus

This grass occurs in subalpine and alpine wet, rocky ledges, in streamlets and moss mats. It ranges from 10,000 to 12,000 feet in elevation (Spackman et al. 1997). This species' distribution includes northeast Asia, Alaska, Yukon, Greenland, Nevada, Wyoming, and Colorado. In Colorado, it is found in Boulder, Clear Creek, Grand, Larimer, Park, San Juan, and Summit Counties (Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. This species has not been documented in the project area (Spackman et al. 1997; USFS 2004d).

Analysis of Effects

Alternatives 1 and 2 are not expected to directly or indirectly affect this species because of the lack of known occurrences in the project area, the elevation limits of the species, and the lack of treatment in habitats for this species in the project area. Treatment activities conducted under Alternative 1 would not occur in habitat potentially occupied by Kotzebue grass-of-parnassus because of the lack of trees and steep slopes that are associated with this plant. Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained.

Habitat conditions for this species in the project area have likely been unchanged because of the inaccessible and isolated habitat occupied by this species. Hiking and plant collection may occur over time, but implementation of the project would not contribute to this type of cumulative effect.

Rocky Mountain Cinquefoil

This species occurs on open, granitic outcrops or thin, gravelly-granitic soils with west or north exposures that often support open stands of ponderosa pine, limber pine, and Douglas-fir (Spackman et al. 1997). Sites occupied by this species are typically exposed and windswept and between 6,900 and 10,500 feet in elevation (Anderson 2004; Spackman et al. 1997). Rocky Mountain cinquefoil is endemic to Colorado and has been reported from Boulder, Clear Creek, Larimer, and Park Counties (Spackman et al. 1997). However, the only occurrences known to remain extant are in Larimer and Park Counties (Anderson 2004). Because of the rarity of this species, no information is available on population trends. No occurrences for Rocky Mountain cinquefoil have been documented in the project area. The closest location is along Tarryall Creek (USFS 2004d).

Analysis of Effects

No direct or indirect effects to individual plants or populations are expected under Alternatives 1 or 2 because of the lack of known occurrences and the limited amount of habitat in the project area. Treatment activities conducted under Alternative 1, such as mechanical thinning and broadcast burning, would not occur in the open, rock outcrop habitat potentially occupied by the Rocky Mountain cinquefoil. Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained.

No previous, current, or reasonably foreseeable future activities are likely to affect the Rocky Mountain cinquefoil or its potential habitat because of the lack of known occurrences and the limited amount of habitat in the project area. One exception that may have affected and that may continue to affect undocumented occurrences of this plant is collection by hikers and other recreational users of the project area. However, the potential for this effect is low because of the lack of known occurrences in the project area.

Nagoonberry

Nagoonberry is found in willow carrs and mossy streamsides from 8,600 to 9,700 feet in elevation (USFS 2004d). The distribution of nagoonberry includes Alaska to Newfoundland, British Columbia, Minnesota, and the Rocky Mountains from Montana to Colorado (Fertig 2000). Because of the rarity of this species, no information is available on population trends. Nagoonberry has been recorded on the PSICC along the North Fork of the South Platte River headwaters (USFS 2004d).

Analysis of Effects

Neither Alternative 1 nor Alternative 2 would directly or indirectly affect nagoonberry because it has not been recorded in the project area. Alternative 1 treatments would not alter the amount of riparian and willow habitat in the project area nor would the quality of these habitats be affected. Streams and their associated riparian areas would be protected from effects under Alternative 1, in accordance with MA 9A direction contained in the Forest Plan (USFS 1984a). Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained.

Fire suppression and timber harvest are not likely to have affected this species because it is not known from the project area and these activities do not occur in the habitats that it occupies. Livestock grazing may have altered the habitats that this species uses, but has most likely not affected the species because it is not known to occur in the project area. Herbicide use for weed control may harm or kill individual plants if they occur in sprayed areas; however, the potential for this effect is low because of the lack of known occurrences in the project area.

Selkirk Violet

Selkirk violet habitats include cold mountain forests and moist woods and thickets from 8,500 to 9,100 feet in elevation (Spackman et al. 1997). Associated species are Douglas-fir, blue spruce, and alder (USFS 2004d). The Selkirk violet occurs in British Columbia, east to Greenland, and south to Washington and New Mexico. It is found in Douglas, El Paso, and Larimer Counties in Colorado (Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. The Selkirk violet has not been found in or near the project area (Spackman et al. 1997, USFS 2004d).

Analysis of Effects

Direct effects to the Selkirk violet are not expected from the project. It has not been found in or near the project area. Surveys for this plant would not be conducted before project implementation. Therefore, there is a small chance that individual plants or small populations would be destroyed by project activities in occupied habitat. Prescribed burning could cause temporary drying of the soil. Pile burns may sterilize the soil directly under piles, soil organic matter may be lost, and soil characteristics may be altered. Any individual plants under the burned piles would be destroyed and the pile location may not be suitable for re-occupation by plants for some period of time. Alternative 2 would have no direct effect on the Selkirk violet because no activities would occur and existing habitat conditions would be maintained.

No indirect effects to this plant are expected under Alternatives 1 or 2 because of the lack of the limited amount of habitat in the project area. In the long-term, Alternative 1 treatment could reduce the risk of large-scale loss of habitat to wildfires. Large-scale wildfires would open the forest canopy and dry the forest floor, which could reduce the suitability of moist areas for this plant. Under Alternative 2, no new activities would occur and existing habitat conditions would be maintained in the short-term. In the long-term, the lack of treatment could cause increased forest density, decreased forest health, and increased risk of large-scale disturbance.

Fire suppression and timber harvest may have affected this species through direct effects or by indirectly altering forest composition and moisture regime. Livestock grazing may have altered the habitats that this species uses, but has most likely not affected the species because it is not known to occur in the project area. Herbicide use for weed control may harm or kill individual plants if they occur in sprayed areas. The potential for each of these cumulative effects is low because of the lack of known occurrences in the project area.

3.8 TRANSPORTATION

A limited number of roads access the project area (**Figure 2-1**). The main highway to the project area from population centers is U.S. Highway 285, which is a main corridor that connects the Denver metropolitan area to portions of the high country and to the South Park area. Highway 285 is a paved, two-lane road that has been widened to four lanes east of the project area to allow better traffic flow for the increasing residential population.

CR 43 provides the primary access to the project area from Highway 285 and is the only public road into and out of the Harris Park and Highland Park portions of the project area. CR 43 would be used to access NFSR 100 and 101 that connect to many of the proposed treatment areas. CR 43 is an improved, paved road used by residents and PSICC visitors. CR 47 provides access from CR 43 in Highland Park to the north into Harris Park. CR 47 would provide access to treatment units north of Harris Park off NFSR 108. The Annual Average Daily Traffic (AADT) volumes on CRs 43 and 47 and all NFSRs are not available. Treatment units north of Elk Creek would be accessed from local roads off Highway 285 at Schaffer's Crossing.

There are 31 miles of NFSRs in the project area, classified as secondary, primitive, and open to motorized use. A few roads are gravel-surfaced and accommodate passenger cars during snow-free months. NFSRs in the project area are partially or completely closed during the winter because they are native-surface and snow is not removed. NFSR 100 is plowed for winter use.

There are numerous residences accessed from Highway 285 and CRs 43 and 47 that are on private land in and adjacent to the project area. The majority of residences in the area are used year-round. Recreation is the primary use of NFS lands in the project area and is evaluated in **Section 3.10**.

Forest Plan standards and guidelines specify that an open local road density of 4.0 miles per square mile should not be exceeded for MAs 2A and 2B. The existing road densities for MAs 2A and 2B are considerably less than this standard (**Table 3-17**). MAs 5B, 7D, and 9A do not have guidelines for maximum road density.

TABLE 3-17 EXISTING LOCAL ROAD DENSITY

Management Area	Existing Road Length (Miles)	Existing Road Density (Miles/square mile)	Maximum Road Density Guideline
2A	0.7	0.2	4.0
2B	9.2	0.8	4.0
5B	11.0	1.0	NA[1]
7D	6.0	0.4	NA
9A	4.0	4.1	NA
Total	30.8	0.8	NA

[1] NA = not applicable.

3.8.1 Analysis of Effects

This section discusses the anticipated direct, indirect, and cumulative effects of implementing each alternative on the transportation system.

Alternative 1

NFSRs used for the project would be maintained as needed to accommodate safety or environmental considerations. No new NFSRs would be constructed. Minor reconstruction of NFSRs may be necessary to access some areas. Reconstruction would generally have a positive effect on other resources by fixing problem areas that are currently causing resource damage. Stewardship contracting may be used as part of this project. Components of the transportation system that may be affected by stewardship contracting include road and trail maintenance to correct existing resource damage or obliteration of non-system roads and trails to protect resource values.

Thirty miles of new temporary roads would be constructed and then closed and obliterated once the project is complete. No more than 10 miles of temporary roads would be open at any time during project implementation. Closed roads would be thoroughly obliterated using physical barriers to prevent future use by motorized vehicles, including ORVs.

Subdivision roads would not be used for access to treatment areas. Several proposed treatments would require access across private lands where no right-of-way currently exists. Treatment in these areas would depend on successful negotiation of access between the USFS and willing private landowners. If access agreements cannot be developed, some areas would not be treated.

Project-related traffic would include trucks hauling equipment and personnel to treatment units and wood products out of treatment units on CRs 43 and 47 and NFSRs. Assuming that the average volume of material treated and removed is 2,500 board feet or equivalent chip volume per acre (USFS 2000b), a total of 2.8 million board feet would be removed over the life of the project. Assuming equal amounts of treatment in each of the first five years of the project, 2,232 acres would be treated each year. If treatment was undertaken by five, three-person crews at a rate of one acre per person-day, each year's treatments would take 149 days or about 30 work weeks. Assuming an average truck capacity of 5,000 board feet per truck (USFS 2000b), this work would generate seven to eight round trips per day, or slightly more than 1,100 truck trips per year. Truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor traffic is lower.

Passenger vehicle traffic would be generated by work crews traveling to and from work sites. Assuming that these workers all reside outside the project area and travel to work alone in personal vehicles, passenger vehicle use would generate 15 round trips a day, or 2,250 trips per year. These trips would be concentrated at the beginning and end of the workday at times when road use by residents commuting to jobs is high.

Approximately half of this traffic would use CR 43 because about half of the acres to be treated would be accessed from this road. During treatments in this area, up to eight truck round trips and 15 passenger vehicle round trips would be added to existing traffic on this road. The introduction of project-related traffic would be noticeable to local residents, as well as other people traveling through the project area. There has been very little logging activity and associated truck traffic in the project area in recent years. There would be potential for conflict with local residential traffic and project-related traffic at road intersections. Traffic control devices, including any regulatory, warning, destination, and information signs, would be installed where needed for the safe and orderly operation of the road.

Increased truck traffic would contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. The addition of trucks hauling equipment and wood products over NFSRs and CRs 43 could cause deterioration of road conditions, as heavy trucks and equipment have a disproportionate effect on road conditions relative to smaller and lighter passenger vehicles. Truck traffic may affect access roads by degrading the surface of the road with repeated trips.

There would be no permanent increase in the local road densities of any MA in the project area because only temporary roads would be constructed for the project and they would be obliterated once treatment activities have been completed. The road densities for MAs 2A and 2B would temporarily increase. If all 10 miles of temporary road were constructed in MA 2A at one time, road density would increase to 3.0 miles per square mile, which is below the standard of 4.0 miles per square mile. If all 10 miles of temporary road were constructed in MA 2B at the same time, road density would increase to 1.7 miles per square mile, which is below the standard of 4.0 miles per square mile.

The proposed project would not contribute to a long-term cumulative increase in the number of road miles and road densities in the project area because proposed temporary roads would be obliterated. Where existing roads are maintained for use in this project, or where stewardship activities are completed, current resource concerns may be improved, leading to better overall resource conditions.

Because there would be no new system roads, there would be no cumulative effect to future demand for permanent access for recreational use. Use of project area roads by ORVs is expected to increase because of a statewide trend of increased ORV use; however, the proposed project would not affect this trend. All temporary roads would be closed and obliterated in a manner that would prevent their future use by ORVs.

Alternative 2

Under Alternative 2, there would be no new activities in the project area. No temporary road construction would occur; therefore, the existing transportation infrastructure would not be affected, existing levels of traffic would not change in the short term, and no costs would be incurred from road construction and closure. Existing levels of traffic are likely to increase in the future as residential development of the area continues. This alternative would not contribute to cumulative effects to the transportation system in or near the project area.

3.9 INVENTORIED ROADLESS AREAS

This section discusses current condition and proposed changes to the current condition for IRAs in the project area. Thirty-nine percent (10,278 acres) of the project area is located in an IRA (**Figure 1-1**). The values to be protected in IRAs include:

- High-quality or undisturbed soil, water, and air;
- Sources of public drinking water;
- Diversity of plant and animal communities;
- Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;
- Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation;
- Reference landscapes;
- Natural-appearing landscapes with high scenic quality;
- Traditional cultural properties and sacred sites; and
- Other locally identified unique characteristics.

IRAs are currently managed according to FSH Interim Directive 1920-2004-1 (USFS 2004b) because of the continued legal uncertainty of implementing the Roadless Area Conservation Rule (USFS 2001a). The Roadless Area Conservation Rule established blanket, nationwide prohibitions generally limiting, with some exceptions, timber harvest, road construction, and reconstruction in IRAs. The Roadless Area Conservation Rule restricts most road construction in IRAs, but does allow for vegetation management under certain circumstances.

3.9.1 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on IRAs, and compares and contrasts these effects between alternatives.

Alternative 1

Thirteen percent of the proposed treatments (1,480 acres) are located in an IRA. The majority of the proposed treatment units are in areas that would receive Treatments 3, 4B, and 6. Only small portions of the IRA would receive Treatments 2, 4A, 5, and 7. No new system or temporary roads would be constructed in the IRA to implement any of the proposed treatments. Mechanical equipment would be used in these areas, but construction of roads, including temporary roads would not be needed to allow for equipment access.

The implementation of this alternative would help maintain or improve the values of the IRA, while maintaining or restoring the characteristics of ecosystem composition and structure within the historic range of variability. The project would maintain or improve roadless characteristics by thinning forests and creating openings similar to historic conditions. This would positively affect forest health and sustainability. The future landscape condition in the treated area, including the IRA, would be more sustainable and similar to conditions prevalent before European settlement.

The proposed project would thin unnaturally dense tree stands that have made the forest in the project area vulnerable to large, stand-replacing fires. In several locations, the IRA on NFS lands is immediately adjacent to private lands. Treatments in these areas would reduce the risk of large-scale wildfires to private property. Areas that would be treated in the IRA have been specifically identified as important to creating a landscape-level network of fuel breaks and other features that would help reduce the risk of large-scale wildfire. Portions of the IRA that are not important to creating this network would not be treated.

Treatment activities would reduce the density of trees and other vegetation in the IRA. This could increase the potential for ORV use and the creation of user trails in the IRA. Increased ORV use could adversely affect the IRA. By avoiding construction of roads in the IRA, the potential for new ORV use of these areas would be reduced. Law enforcement patrols and prompt closure of any new user routes would be needed in the future to protect IRA values.

The IRA exists because roads were not built into this area for past and present activities. Future activities that could cumulatively affect the IRA include fuel treatments and increased recreational use of the area. Timber harvest would be unlikely to occur in the future except as part of fuel treatments similar to Alternative 1. The implementation of this alternative and other fuel treatments adjacent to the project area (see **Section 3.1** and **Figure 3-1**) would create a large area of reduced potential for extreme fire behavior. These fuel treatments would cumulatively reduce the potential for large-scale wildland fires and help maintain the values that are an important aspect of the IRA.

Alternative 2

Under this alternative, no treatments would occur in the IRA. IRA values would not be affected in the short term. The characteristics of the IRA would not be improved to conditions that may have been present before European settlement. The potential for ORV use and the creation of new user routes would not increase as it would for Alternative 1. The risk of large-scale, high-intensity wildland fire would not be reduced. Many of the values of the IRA in the project area would be adversely affected in the event of a large-scale wildland fire, as would private property adjacent to the IRA. This alternative would maintain vegetation and landscape conditions that are substantially different from pre-settlement conditions because of the cumulative effects of past activities. It would also maintain or increase the risk of large-scale wildland fire, which is also a cumulative effect of past activities.

3.10 RECREATION

The project area receives year-round recreational use, and is popular for day visitation by anglers and hikers from regional population centers, as well as seasonal hunters from across the country. Many communities along the urban Front Range are within an hour's drive from the project area. Important recreational resources include a variety of dispersed opportunities on public lands in and adjacent to the project area.

PSICC lands were inventoried using the Recreation Opportunity Spectrum (ROS) classification to define the types of outdoor recreational opportunities the public desires and to determine the opportunities the PSICC can provide. The project area is managed with four ROS classes: semi-primitive non-motorized, semi-primitive motorized, roaded natural, and rural. **Figure 3-6** shows the ROS classifications and recreational facilities in the project area.

Dispersed recreational activities occur primarily from spring through fall throughout the project area. Summer activities include sightseeing, hiking, picnicking, dispersed camping, fishing, ORV use, horseback riding, and shooting. Hunting is primarily a fall activity. Winter activities, such as cross-country skiing, snowmobiling, and snowshoeing, rarely occur in the project area because continuous snow cover is not reliable. The area also provides outstanding wildlife viewing opportunities year-round. Portions of the project area are sparsely roaded or unroaded, and provide some opportunities for solitude and primitive recreation. Unlicensed ORV use also occurs on NFSRs and on non-system trails that connect with NFSRs.

Recreational shooting has been a common use of the project area in recent years. In December 2004, a large portion of the project area was closed to shooting (but not legitimate hunting) because of safety concerns. Recreational shooting is still allowed in other parts of the project area.

Developed recreational facilities consist of two campgrounds, two trailheads, and system trails. These facilities are accessible from the Harris Park/Highland Park area. The two campgrounds are operated by a private concession operator. Both campgrounds are in the roaded ROS category, as shown on **Figure 3-6**. The Deer Creek Campground is located near the end of CR 43, along Deer Creek. The campground is a candidate for future improvements, as the parking area and the interior road are eroded in some places, and some sites are located next to Deer Creek with the potential for damage to the riparian area along the creek.

The Meridian Campground is accessed from CR 47. The campground is a single loop in a stand of young ponderosa pine. Potential future improvements at the campground include the relocation of the trailhead near the campground and the development of a system trail between the campground and the existing trailhead as a part of the Meridian Trail.

Developed system trails in the project area include the Meridian, Tanglewood, and Rosalie Trails, which are managed with the roaded natural ROS. The Rosalie and Tanglewood Trails are accessed from the Deer Creek Trailhead near the Deer Creek Campground. The Meridian Trail is accessed from the Meridian Trailhead, which is in close proximity to residences in Harris Park. The trail connects with a network of system trails north of the project area.

3.10.1 Analysis of Effects

This section discusses the anticipated direct, indirect, and cumulative effects of implementing each alternative on recreational opportunities and experiences in and adjacent to the project area, and compares and contrasts these effects between alternatives.

Alternative 1

Alternative 1 would affect recreational opportunities by altering the physical setting and visual quality of the recreational experience and by directly disrupting recreational activities for short periods. Effects to visual quality are discussed in detail in **Section 3.11**. Temporary restrictions to protect public safety, such as prohibiting public access, would be used in some areas while treatments are conducted. In general, the quality of the recreational experience would remain high. Treatment activities would not occur between Memorial Day and Labor Day in or adjacent to campgrounds. No activities would be allowed in any treatment area on weekends or holidays. There would be no effect to the health and safety of campers from fuel treatment activities.

The Deer Creek and Meridian Campgrounds would be temporarily affected by proposed treatments. The Deer Creek Campground is in a treatment unit. Invading conifers would be removed to promote expansion of aspen clones. This would enhance the scenic beauty of the campground aspen stands over the long term.

The Meridian Campground also is in a treatment unit. Larger ponderosa pine and aspen stands would be maintained, leaving the landscape character at the campground intact. Other trees would be removed or thinned in a manner that would create a mosaic of different stand characteristics across the landscape, which would enhance the scenic attractiveness of the campground over the long term. An ongoing infestation of MPB at the campground would be treated to reduce the threat to surrounding trees.

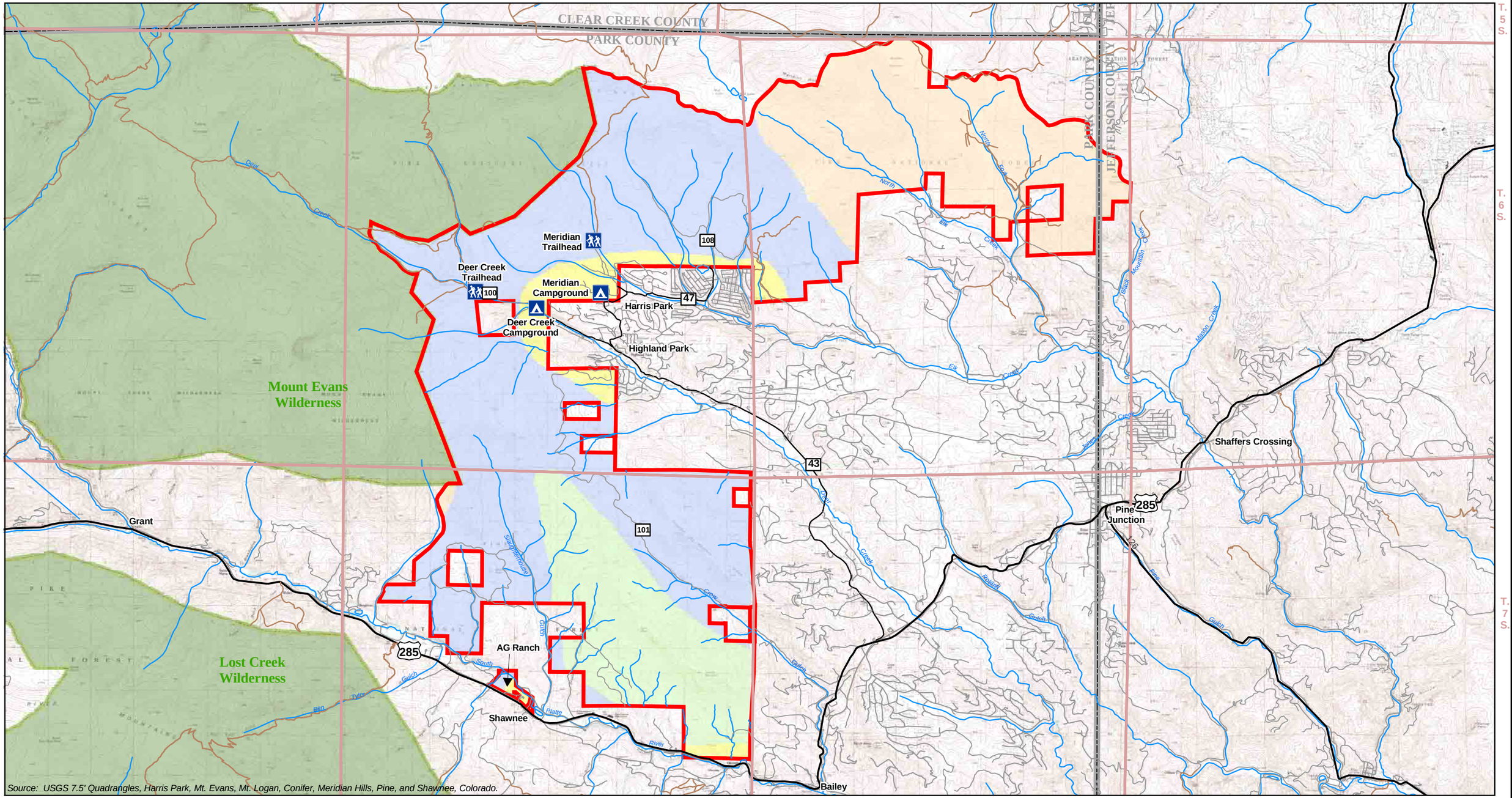
No treatment activities are proposed along the Rosalie, Tanglewood, and Meridian Trails. The trails would not be used to access any treatment areas. The Deer Creek and Meridian Trailheads are located in treatment units because they are close to private lands. Some recreationists may avoid the trailheads while treatment activities are occurring nearby; however, any effects to the trailheads would occur only for the duration of treatment.

Several potential stewardship projects would affect recreational resources. These include maintenance of roads, campgrounds, and trailheads. This would improve the quality of the recreation experience by providing a higher standard of facilities.

Sightseeing along CRs 43 and 47 and NFSRS would be affected when activities occur immediately adjacent to the roadway. These effects would be short-term and may cause some sightseers to avoid these areas during management activity.

Treatments would reduce the potential for wildland fire. An uncontrolled wildland fire would cause considerably greater disruption of recreational activities than would treatment activities. Most of the PSICC was closed to recreational use for a large portion of the summer of 2002 because of fire danger and fire suppression activities.

The current condition of dispersed and developed recreational opportunities are based on past resource management activities. Recreational opportunities have been cumulatively affected by past and ongoing vegetation management activities within the project area and on public lands near the project area. Historic uses such as grazing and mining are being replaced by non-consumptive uses such as recreation, which is a trend that is expected to continue into the foreseeable future. The historic use of the nearby Staunton State Park was rangeland. This area is currently being redeveloped as part of the State Park system. Considering all past, current, and reasonably foreseeable activities together, the proposed project combined with vegetation management activities on the Arapaho/Roosevelt NF and Staunton State Park would enhance recreational opportunities.



Legend

- Harris Park Project Boundary
- Wilderness Area
- Highway
- Road
- Trail
- Stream
- County Boundary

ROS Category

- Roaded
- Roaded Natural
- Semi-Primitive Motorized
- Semi-Primitive Non-Motorized

Recreational Facilities

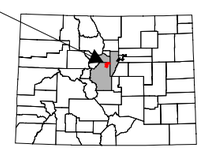
- Campground
- Trailhead

N W E S

0 0.5 1 2 Miles

Universal Transverse Mercator
North American Datum 1927
Zone 13

Project Location



HARRIS PARK FUELS MANAGEMENT PROJECT

FIGURE 3-6
ROS AND RECREATIONAL FACILITIES

ANALYSIS AREA: PARK, JEFFERSON, & CLEAR CREEK COUNTIES, COLORADO

Date: 3/1/2005	File: I/1703/ROS.MXD
Drawn By: MS	Layout: ROS PDF

Alternative 2

If vegetation treatments are not implemented, the existing condition of forest vegetation in the project area would be maintained in the short term, but may deteriorate in the long term. Current recreational opportunities, which are a function of the cumulative effects of past and present management activities, would be maintained. However, stewardship projects to improve recreational facilities would not be conducted. Forest health would not be improved and there would be an increased risk of large-scale wildland fire. Deteriorating forest health would increase the risk of a large-scale wildland fire that could in turn negatively affect recreational use.

3.11 VISUAL RESOURCES

The project area is managed with the modification, retention, and partial retention VQOs. The project area is composed of high-quality scenery that provides a setting for a wide variety of outdoor activities, and provides a scenic setting for nearby residential areas. The project area can be seen from travel routes, residential areas, recreational sites, and dispersed use areas. Public use of the area occurs primarily west and north of the Harris Park and Highland Park communities. Portions of the project area can be viewed from several locations outside of the project area, including U.S. Highway 285, CR 43, and CR 47, and communities and subdivisions near the project boundary. Viewpoints from within the project area include developed campsites, trails, and several NFSRs.

Timber harvest operations in the 19th and early 20th centuries and subsequent fire suppression policies since the 1920s have created a dense forest with trees of similar ages and sizes. When viewed from a distance, the area presents a uniformly forested terrain with a few interspersed openings. When viewed in the middle ground, the landscape appears more stippled with light and dark patches created by variety in vegetation, natural openings, hills, canyons, stream channels, and rock outcroppings. Closer views reveal specific forest vegetation with trees, grassy openings, and rocks creating a mosaic of texture, size, and color.

Existing disturbance in the project area includes past vegetation management units, recreational facilities, CRs, NFSRs, and trails. Public use of the area includes access to private land inholdings, shooting, hunting, fishing, hiking, bicycling, sightseeing, ORV use, and camping. Recreational use is enhanced by the scenic quality of the area. Concern for scenic quality is high for both recreationists and local residents.

The project area has a high level of sensitivity to modification of the landscape, indicating a high number of users with concerns for scenic qualities. The most sensitive viewing areas in and adjacent to the project area are residential areas, campgrounds, and trails. Most residences are located outside of NFS boundaries in several subdivisions and communities near the southern and eastern boundaries of the project area. Residential areas are described in **Section 3.13**. Campgrounds and trails are described in **Section 3.10**. The project area is visible to sensitive viewing areas at recreation sites, residential areas, and travel routes primarily in the foreground distance zone (0.0 to 0.5 mile) because the dense forest canopy and topography limit viewing distances.

3.11.1 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on visual quality, and compares and contrasts these effects between alternatives.

Alternative 1

Part or all of some proposed treatment units can be viewed from U.S. Highway 285, communities near the project area, CRs, recreation sites, and several NFSRs. Alternative 1 may affect the visual landscape by altering forest canopy structure and increasing contrast between treated and non-treated areas. Vegetation treatments that increase ecological diversity usually enhance scenic quality as long as the treatments imitate natural growth patterns and shapes in the surrounding landscape. The accumulation of dead, diseased, and downed trees is generally perceived as a negative visual element in the landscape and increases the potential for wildland fires. Damage from a wildland fire would negatively affect visual elements of the landscape.

Mechanical and hand treatments would directly affect visual resources in the short term as heavy equipment is used and an accumulation of downed trees and slash is created. A combination of methods would be used to dispose of cut trees and slash. The visual effect of both equipment use and slash piles would be temporary. Once the debris is disposed of, treatment areas would generally appear natural to the casual observer, although some individuals may find them to appear managed. Treatment units that have been thinned are characterized by a more open and park-like setting, having a long-term, direct beneficial effect on the landscape. To minimize short-term visual effects, some portions of the project area would not be treated by mechanical means, including some areas that would be highly visible from recreational areas and roads; however, hand and prescribed burning treatments would be used.

Prescribed fire treatments would generally occur after mechanical treatments are completed. In some cases, burning may occur in areas not treated mechanically. Burning of slash piles would create direct, temporary visual effects to foreground views. Broadcast burning can create changes to the overall color and texture of the treatment area. These effects would vary in duration depending on the length of time before vegetation becomes re-established. This treatment activity would occur primarily in areas that are in middle to background views. Smoke from both pile and broadcast burning would have a short-term effect on both recreationists and residents in the project area. Effects of smoke would only last for the time of burning. The treated areas would harmonize with the natural landscape after vegetation is re-established. Over the long term, forest health would be improved, benefiting visual resources.

The construction of temporary roads to access treatment units would be required. In general, the proposed temporary roads would be screened from sensitive viewing areas by intervening vegetation. However, these roads would degrade visual quality in the short-term in some areas. After treatments are complete, these roads would be obliterated and revegetated. The effect of these roads would be temporary with the duration of the effects depending on the length of time for vegetation to become re-established to a level that minimizes the linear band created by contrast between the disturbed areas and surrounding vegetation. No long-term visual effects from temporary roads are anticipated.

Planned fuels treatments in the project area, on the Arapaho/Roosevelt NF, at nearby Staunton State Park, and on private lands contribute to the overall attractiveness of the region to most residents and recreationists by improving forest health and increasing scenic attractiveness. The cumulative effect of the proposed project would be to reduce the hazard of wildland fire and create fuel breaks between residential areas and steep, forested areas. The scenic integrity of forests and the adjacent private lands would be more effectively maintained by the cumulative effect of all proposed and ongoing treatments.

Alternative 2

If vegetation treatments are not implemented, existing conditions in the project area would be maintained in the short term, but may deteriorate in the long term. Deteriorating forest health would increase the risk of a large-scale wildland fire or insect or disease outbreak that could in turn negatively affect visual

quality. Current visual quality, which is a function of the cumulative effects of past and present management activities, would be maintained, and VQOs would continue to be met. However, forest health would not be improved and there would be an increased risk of a large-scale wildland fire in or near the project area. Visual quality may be reduced with the deteriorating condition of the vegetation and would be substantially reduced if a large-scale wildland fire were to occur. The VQOs for the affected areas may not be met in the long term.

Alternative 2 would not have short-term cumulative effects on visual resources. Over the long term, forest health would not be improved and there would be an increased risk of a large-scale wildland fire in or near the project area. The benefits of adjacent treatments on public and private lands would be reduced in the absence of the proposed action.

3.12 CULTURAL RESOURCES

Cultural resources, also referred to as heritage resources, are the physical remains of districts, sites, buildings, structures, and objects used by past residents or travelers. Cultural resource surveys have been completed for several small portions of the project area.

Information on the prehistoric and historic use of the region is available from various sources (Gilmore et al. 1999; Scott 1999; Fraserdesign 1997; Mehls 1984). Human settlement in the region is firmly documented from the earliest known inhabitants of North America, the Paleo-indians, through the Protohistoric period. The prehistoric inhabitants were hunters and gatherers that used the high-altitude environments on a seasonal basis. Evidence of use and temporary occupation is found in the form of sites with limited assemblages of stone tools and debitage, occasional features, animal traps, and isolated stone debris from the manufacture and maintenance of tools. The Cheyenne, Arapaho, and Ute are the Native American populations with traditional claims to the South Platte River watershed, which includes the project area.

Historic use of the area may have first occurred with the trappers and traders visiting in the 1830s to 1850s. With the gold rush of 1858, Euro-americans began to move into the region in large numbers. Driven by the needs of the miners, several historic transportation routes were constructed through or near the project area. Stage roads in or near the project area include the South Platte and Deer Creek Tram and Wagon Road, the Clifford Cutoff of the Denver, Turkey Creek and South Park Wagon Road, Elk Creek Toll Road and Tramway, and the Geneva Wagon Road. The historic railroad that follows the North Fork of the South Platte was first a stage road. It was then used by the Denver, South Park, and Pacific Railway Co., was taken over by the Denver, Leadville, and Gunnison Railway Co., and then operated by the Colorado and Southern Railroad. Some of these routes, such as the South Park Wagon Road and the railroad route, were likely used as aboriginal travel routes. Use of these routes continued with the arrival of Europeans in the area and they have been replaced by modern highways, NFSRs, and trails for recreation. The timber industry also grew from the needs of the mining industry. Historic resources that may be found in the project area include sites associated with transportation, mining, or lumbering.

3.12.1 Analysis of Effects

This section discusses the anticipated direct, indirect, and cumulative effects of implementing each alternative on the cultural resources, and compares and contrasts these effects between alternatives.

Alternative 1

To meet its responsibilities under Section 106 of the National Historic Preservation Act, the PSICC would complete cultural resource inventories in the project area before conducting any management activities. PSICC would complete formal National Register of historic Places eligibility evaluations for all recorded cultural resources that could be adversely affected by this alternative. If eligible cultural resources are present, mitigation measures would be developed in consultation with the State Historic Preservation Office to minimize or eliminate any adverse effect. If any cultural resources are found during implementation, project activities would stop and a qualified archeologist would be contacted immediately. The cultural resource would be evaluated and mitigation measures determined to protect the resource. The implementation of the proposed action would allow previously unknown cultural resources to be documented. This adds to knowledge of how the area was used prehistorically and historically. This also allows for the protection of these resources from future management actions.

Cumulative effects on cultural resources are a matter of risk. Implementation of Alternative 1 would provide the opportunity to locate and protect otherwise unknown cultural resources. Avoidance and protection may reduce, but would not eliminate, risks. The risk of damage from large-scale wildland fire would be lower with the implementation of this alternative. There would be a risk from increased public access and use, which may continue to erode, damage, and destroy sites. Continued use of the project area for recreation may contribute to vehicle and pedestrian traffic through cultural resources and removal of artifacts by illegal collectors.

Alternative 2

With the implementation of Alternative 2, undocumented cultural resources would not be recorded in the project area. An absence of management activity would mean that there would be a risk for undocumented sites to be adversely effected in the event of a large-scale wildland fire. Management activities proposed by Alternative 1 would not occur, and there would be no effect from the proposed management activity to non-significant cultural resources. Continued use of the project area for recreation may contribute to vehicle and pedestrian traffic through cultural resources and removal of artifacts by illegal collectors.

3.13 ECONOMICS

This section discusses current condition and proposed changes to the current condition for economics in the project area.

3.13.1 Local and Regional Economy

Unincorporated communities and residential subdivisions near the project area include Harris Park, Elk Creek, Royal, Upper Deer Creek, Hidden Valley, Singleton, Shawnee, Bailey, Bailey Estates, Ravenswood, and Friendship. These communities form the wildland/urban interface along the project area boundaries, and are most likely to be affected by the proposed project. The Ranchos and Mill Iron D Estates are subdivisions located adjacent to the other communities listed above that are not next to NFS lands, but could also be affected by project activities.

Changes in flexible work place, transportation, and communications have allowed people to continue working for city-based companies while living in rural or mountain communities. Most of the full-time residents of these communities commute to jobs outside of the immediate area. Other residents depend on tourism-based and forest resource-related activities for their economic livelihood. These activities include

collecting wood products, hunting, outfitters and guides, and ranching. Many residents surrounding the project area consider forest resources and forest health an important part of their quality of life.

3.13.2 Population

Population growth near the project area has been high for the last decade. The high growth rate has occurred despite the large proportion of public land in the area, primarily because residences in the area are located near U.S. Highway 285 and within a 30- to 40-mile commute to jobs in the Front Range of Colorado. It is anticipated that this area will continue to grow at a higher rate than the average in Colorado for the foreseeable future. It is likely that the communities around the project area will continue to draw new residents. The growth trend for the area may be slower in future decades than it was between 1990 and 2000 because of the limited availability of land to develop for residential uses.

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

3.13.3 Employment and Income

Nearly 62 percent of workers who lived near the project area commuted to jobs outside the area in 2000. For those workers in communities near the project area, jobs are dominated by government employment. The majority of government employees are local government, primarily county workers. For other job sectors, natural resources and tourism are more important in the local economy relative to the state economy. The second largest sector was construction. The demand for second homes and new homes for an incoming population has stimulated the construction industry. The agriculture sector has a greater share of the local economy than it does for the state, illustrating the importance of rural, resource base sectors. The accommodation and food sector is also of relatively greater importance, as is typical of economies that depend on tourism and recreation. Wildland fires near the project area and in other parts of the state in 2002 had a role in reduced tourist visits to Colorado, as media coverage of wildland fire incidents was extensive in the national press.

3.13.4 Housing

Nearly 26 percent of the current housing stock consists of seasonal housing. This is a decrease of nearly eight percent from 1990. Increased numbers of people have been seeking residence in the area because of opportunities for employment in the regional economy. The median housing price in 2000 was $171,000, which was slightly higher than the state median housing price of $166,600. **Table 3-18** summarizes 2004 property values and estimated taxes for all types of property within a two-mile buffer around the project area. A two-mile buffer was used because a large-scale wildland fire has the potential to influence housing within two miles of the burned area (USFS 2002a). Of all property types listed in the table, residential properties are most at risk for damage from wildland fire. Residential properties are most likely to be located next to forested areas, at greater distances from major access roads than other property types. Commercial and mixed use properties are generally located near U.S. Highway 285, and would have a smaller risk of damage from wildland fire because fire protection providers would have easier access to these properties. It is likely that many vacant properties would be developed with residential units to accommodate projected population growth in the near future.

TABLE 3-18 PROPERTY VALUES FOR ALL PROPERTIES WITHIN 2-MILE BUFFER OF PROJECT AREA

Property Type	Number	Total Value ($)	Median Value ($)	Estimated 2004 taxes ($)
Residential	2,408	499,180,820	193,816	2,373,077
Vacant	915	24,020,892	7,808	436,326
Commercial	63	12,373,540	118,780	258,659
Mixed Use	12	4,918,658	229,110	90,385
Agricultural	75	10,983,595	N/a	183,992
Other[1]	3	34,155	N/a	708
Total	N/a	551,511,660	N/a	3,343,147

[1] - Other consists of three properties, which are mineral rights, personal, and possessory interest.

3.13.5 Community Infrastructure

The PSICC shares wildland fire suppression resources with other federal government agencies nationwide. Interagency wildland fire crews are dispatched where they are needed. Contractors are also employed for wildland fire suppression activities. Fire protection in the project area is provided by the PSICC and the Platte Canyon Fire Protection District. The district has 65 personnel in four fire stations in Bailey, Harris Park, Grant, and Crow Hill. Fire protection is also available through a mutual aid agreement with the Elk Creek Fire Protection District. The services provided by the fire district include fire suppression, medical emergency services, rescue and extrication, hazardous materials response, and service calls. There is a broad range of hospitals, clinics, and other medical services within a 1- to 2-hour driving distance in Front Range urban communities.

3.13.6 Analysis of Effects

This section discusses the anticipated direct, indirect, and cumulative economic effects of implementing each alternative, and compares and contrasts the alternatives. Current and projected population trends in the project area are described above and are expected to continue regardless of which alternative is chosen.

Alternative 1

Population

The project would not have noticeable direct or indirect effects on population. The skills and services required for the project would be provided by current USFS personnel and by local contractors or timber merchants. The long-term effect of vegetation treatment activities would be to decrease the potential for large-scale wildland fire. This may contribute to the attractiveness of the region as a residential destination, causing continued growth of the local economy and the permanent population.

One possible indirect effect of this alternative would be a perceived loss of privacy for homeowners adjacent to treated areas because the forest structure would be thinned and sight distances increased. However, this would only affect a small number of homeowners immediately adjacent to treated areas. This effect may be offset by the perception that future wildland fire hazard has been reduced, with

evidence of this change available for viewing on adjacent forestlands. Because of the recent Hayman Fire and its associated property losses, it is likely that many residents would prefer the reduced fire hazard, even at the cost of reduced privacy. For example, surveys of residents in a nearby community showed a strong preference for using various types of fire and fuels management tools, as opposed to taking no action at all (Kent et al. 2003).

Employment and Income

Minimal merchantable timber would be produced under Alternative 1. The primary goal for treatment is fuel management, which targets trees that are typically smaller than commercial size. Timber harvest and other service contracting opportunities would be available to local wood products companies and some employment would be supported by thinning, harvesting, and other activities. If contractors from outside the community are selected for the project, a minor economic benefit may be realized by local stores, restaurants, and other businesses; however, this effect is expected to be relatively small compared to the effect of ongoing residential and recreational activities in and near the project area.

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

Housing

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

Treatments proposed for Alternative 1 would reduce the hazard to private property from wildland fires. Many existing homes have been built near NFS lands in the project area. In addition, timber stands are interspersed among many homes on private lands adjacent to NFS lands. There are approximately 2,408 houses within a two-mile buffer around the project boundary. The proposed treatments would substantially reduce the risk to private property (USFS 2002a). Based on the reduction in both predicted fire size and intensity, a large-scale fire similar to the Hayman Fire in the project area and adjacent buffer could destroy 169 residences. The destruction of 169 of these houses would cause a $32 million loss of residential properties. In addition to the loss of the property value, residential property tax revenues would be reduced. An estimated $167,000 of residential property tax revenues, based on 2004 property values and mill levies, would not be received in the event that the properties are destroyed. This means that implementation of Alternative 1 represents a 56 percent reduction in loss of residences and taxes compared with the current condition and Alternative 2.

Another housing-related concern is the potential inability of homeowners to secure insurance. There has been increasing discussion in recent years that insurance companies may deny policies to homeowners in fire-prone areas. As yet, there does not appear to be clear indication that this is happening. By reducing potential fire behavior and fire danger on adjacent forest lands, this alternative may reduce the chance that residents would lose their homeowners insurance.

Community Infrastructure

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

Alternative 2

Implementation of this alternative could affect the local economy. Some of the economic consequences could reach beyond the local economy and affect state and federal budgets as well. There is a broad range of possible outcomes on the social and economic resources of Park County from the implementation of this alternative. The analysis focuses of the potential effects of large-scale wildland fire. The total cost of the Hayman Fire has approached $200 million, which includes $42 million in suppression costs, $24 million in rehabilitation costs to date, the possibility of another $37 million in rehabilitation costs over the next five years, $39 million in insured property losses, another $5 million in uninsured property losses, $34 million in timber destruction, and $47 million in other resource losses, the bulk of which is $37 million for losses to the water storage system (Kent et al. 2003).

Population

Direct effects of wildland fire at the wildland-urban interface would likely cause a temporary decrease in the population of communities and subdivisions. The rate of residential development would decrease in the years following a wildland fire because the area would be less attractive. This effect would continue until damages to local property owners and businesses are recovered, and the economy can provide the opportunities of the pre-fire economy.

Employment and Income

The Colorado Economic Chronicle estimated that the effects of wildland fire and drought decreased 2002 visitation at tourist attractions in Fremont County between 12 and 15 percent. These declines occurred after wildland fires in the area in June 2002. None of the attractions were damaged by wildland fire, so the declines in visitors can be attributed to the attention the fires received in the national press. These declines affected tourist activity reported at state levels, although tourist visits to the state increased to pre-fire levels in the following year.

Different results were found for the Hayman Fire. In this case, there were slight changes in employment, business revenue, and income. However, some indicators increased, while others decreased, with little clear pattern (Kent et al. 2003). The conclusion to be drawn from these data is that the Hayman Fire probably affected the local economy, but not in any clear way. At least some declines in tourism revenue were probably offset by spending associated with suppression and rehabilitation efforts (Kent et al. 2003).

A large-scale wildland fire that involves major fire damage to properties would have greater effects to the local economy, and would be felt through all businesses in the local economy for a longer period. The direct effects to the local economy would continue until the scenic landscape has been re-established and property damages have been recovered. Indirect effects include the economic recovery of the area that would take place after the re-establishment and recovery of resources and properties.

Housing

The Hayman Fire caused the destruction of 132 out of 794 houses (16 percent) located within the fire perimeter. The value of these losses was estimated in Teller County, in which 114 privately owned properties had resources lost or homes destroyed. The value of these properties was $5.5 million before the fire. The fire caused losses estimated at $3.3 million, which is a 60 percent loss in value. Values for burned acreages in Jefferson County were reduced by 50 percent, and burned structures were reduced up to 100 percent (Kent et al. 2003) by the Hayman Fire.

The lack of fuel treatments under Alternative 2 would maintain the current risk to private property. There are approximately 2,408 houses in a two-mile buffer around the project boundary. Based on the 16 percent destruction of homes within the Hayman Fire perimeter, 385 houses could be destroyed by a large-scale fire similar to the Hayman Fire in the project area and two-mile buffer. The destruction of 385 homes would cause a $75 million loss of residential properties. An estimated $380,000 of residential property tax revenues, based on 2004 property values and mill levies, would not be received. This analysis is based on the current (2004) level of development in the two-mile buffer. In the future, the number of homes and the value of all properties are likely to increase. In the long term, a large-scale wildfire could cause substantially higher losses than those discussed above.

Community Infrastructure

It is likely that all of the existing fire protection resources in the project area would be involved in any large-scale wildland fire suppression effort. Interagency wildland fire crews would be dispatched from other areas as needed. Many local firefighters are volunteers, and would incur lost income because they would not be working at their regular jobs for the duration of a wildland fire.

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

3.13.7 Financial Efficiency

There would be costs associated with the implementation of Alternative 1 that would not occur under Alternative 2. Net costs for Alternative 1 include planning, mechanical thinning treatments, piling and prescribed burning, and costs for road maintenance, decommissioning, and management. Other costs would be realized under both alternatives. These include fire suppression and rehabilitation costs, road and trail reconstruction and maintenance, noxious weed control, monitoring, reforestation, and stream restoration. This analysis also assumes that there would be losses of private property from a large-scale wildland fire. The fire risk analysis has shown that the risk of a large-scale fire (greater than 10,000 acres) is relatively low (12 percent in the next 20 years). Nevertheless, the comparison of the potential effects of such an event between alternatives is important because it directly addresses the purpose and need for the

proposed project. Alternative 1 would indirectly reduce the potential loss of private property near the project area, while Alternative 2 would not reduce the potential loss of private property.

Because this analysis includes only costs, the present net value (PNV) is negative. The difference between alternatives, however, is positive. The difference is the net savings realized by applying the treatments. The PNV and net savings of each alternative are summarized in **Table 3-19**. There would be a net cost of the project to the USFS; however, the net savings to city and county governments and private property owners would be substantially higher than the cost to the USFS, primarily because of the reduced potential for losses of private property to large-scale wildfire.

TABLE 3-19 COMPARISON OF PRESENT NET VALUE AND NET COST

Cost Category	Alternative	
	1	2
Present Net Value		
All Partners (total)	-$38,670,293	-$77,475,818
Municipality	-$1,003,940	-$1,468,280
County	-$166,803	-$379,995
Private Property Owners	-$32,754,904	-$74,619,160
USFS	-$4,744,646	-$1,008,383
Net Savings		
All Partners (total)	$38,805,525	NA[1]
Municipality	$464,340	NA
County	$213,192	NA
Private Property Owners	$41,864,256	NA
USFS	-$3,736,263	NA

[1] NA = Not applicable

A large-scale fire, such as the Hayman Fire, can substantially reduce tourism and recreational activities and may reduce benefits to the local and state economies more than the cost of Alternative 1. The Hayman fire and associated forest closures caused a substantial reduction in recreational use of surrounding forestlands. For example, visitor use days at developed recreational facilities on the South Park Ranger District were reduced by 68 percent in 2002 during the fire, compared to 2001. Even after the fire was contained, visitor use was reduced by 20 percent (Kent et al. 2003). No complete costs to the tourism industry from the Hayman fire were calculated; however, a similar study showed that extensive fires in Montana in 2000 cost the area economy more than $27 million (Kent et al. 2003).

Alternative 1 would have a beneficial effect on non-priced values relevant to the purpose and need of the proposed action. These values include forest health, scenery, riparian protection, watershed improvements, and fuel reductions. Non-priced values cannot be quantified; however, the benefits to non-priced values may exceed the priced values of Alternative 1 because of the importance of recreation and tourism to the local and state economies. The non-priced values relevant to the purpose of and need of this project are summarized in **Table 3-20**.

TABLE 3-20 COMPARISON OF NON-PRICED VALUES

Indicator	Alternative	
	1	2
Restore the forest to more sustainable conditions that are resilient to fire, insects, and diseases.	Forest conditions would be improved on 11,158 acres, creating a more heterogeneous natural landscape with diverse habitats.	No benefit, tree stands would remain unnaturally dense and vulnerable to large-scale losses from fire, insects, or disease.
Provide habitats for MIS, special-status species, and other wildlife.	Creating more open forest conditions would improve habitat for some MIS and special-status species, but cause small-scale habitat loss for others. The hazard of large-scale habitat loss to fire, insects, or disease would be reduced.	Habitats would be maintained in the short term. Habitat conditions for some MIS and special-status species would be degraded as the forest grows less open and large fires threaten to cause long-term habitat loss. Species that depend on snags and open habitats may benefit from poor forest health or large-scale wildland fire.
Provide recreational experiences.	The risk of large-scale events would be reduced. Existing recreational opportunities would be maintained and may be enhanced by stewardship projects.	No benefit. The current risk of large-scale fire may worsen over time. Such an event could dramatically reduce recreational use. Stewardship projects would not be used to enhance recreational opportunities.

3.14 UNAVOIDABLE ADVERSE EFFECTS

The effects of implementing the proposed treatments would be minimized by the use of mitigation measures and project design standards. However, some adverse effects cannot be avoided. There may be some decrease in long-term soil productivity because of topsoil disturbance during vegetation removal and prescribed burning operations. There may also be a slight decrease in soil quality because of erosion. Some forested habitat would be changed into openings. A more open structure would be created in some closed stands. This would adversely affect those wildlife species that depend on the more closed habitat structure. Some adverse effects would be caused by the use of prescribed fire. Some large woody debris and soil organic matter would be consumed. The severity of these effects would depend on the intensity and duration of the prescribed fire. Recreationists and forest visitors would notice some disturbance to the landscape. This is an unavoidable effect of vegetation treatment activities. Timber harvesting and road building activities may temporarily disrupt normal recreational uses of the area. Effects would include noise, dust, wood debris, smoke, and disturbance of understory vegetation. There is no assurance that every cultural resource site has been located in advance of all planned management activities. Some ground-disturbing activity could unavoidably affect an undiscovered historic or prehistoric site. Sites discovered in this manner would be immediately protected from further disturbance with a site-specific management plan. Some sites could be inadvertently destroyed or damaged.

3.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources refers to the use or commitment of a resource that cannot be reversed. For example, nonrenewable resources, such as the minerals in an ore body being mined, would

be removed forever during the milling of the ore, and would be irreversibly committed. None of the alternatives for this project involve an irreversible commitment of resources because little of the vegetation would be removed from the treatment units. That portion that would be removed would be replaced by incremental growth of remaining vegetation.

An irretrievable commitment is the short-term loss of resources, resource production, or the use of a renewable resource because of land use allocations, or a scheduling or management decision. The proposed treatments that are part of Alternative 1 would cause an irretrievable commitment of the timber resources that are removed for sale or other disposal. In other words, once treatments have occurred and wood products have been removed from treatment units, those timber resources could not be retrieved. Similarly, other vegetation that is burned in prescribed fires could not be retrieved once the burning is complete. Nevertheless, new vegetation would grow and eventually replace any that had been irretrievably committed. Any soil lost to erosion would be considered an irretrievable commitment of the soil resource. There would be a short-term irretrievable loss of productivity in landings, skid trails, and slash piles. Mitigation measures would be used to minimize loss of soil productivity. Conversion of wildlife habitats would be irretrievable because the quality of these habitats would be changed in the long term for many species.

3.16 SHORT-TERM USE VERSUS MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Long-term productivity refers to the capability of forestland, in this case, to produce and provide resources into the future. Application of the soil and other mitigation measures described in Chapter 2 is intended to ensure that this project would maintain long-term soil productivity. Effects to other resources are limited in time and intensity and would not reduce their long-term productivity. The soil resource is a key ingredient for maintaining the long-term productive potential for an area. Accelerated erosion and effects detrimental to the soil resource would be minimized through careful project design and mitigation measures. Soil protection measures in the Forest Plan would maintain critical soil parameters and nutrients, ensuring long-term productivity. The short-term use of vegetation would be for timber production. The long-term productivity of vegetation would be enhanced because the risk of large-scale fire would be reduced. Short-term use of NFS lands may cause a minor increase in total sediment yields. These effects are negligible and would not affect long-term productivity of water resources. None of the activities would adversely affect channel stability. Beneficial uses would not be adversely affected. The proposed activities would increase openings and reduce forest density. This change would favor wildlife species that prefer habitats that are more open or a mosaic of open and forested habitats. Populations of these species would be expected to increase with increased availability of preferred habitats. A concurrent reduction in species associated with more closed forested habitats would also occur. Over the long term, vegetation treatment in these areas would create a greater mixture of multi-aged timber stands that would create increased habitat diversity. The forest would have a lower risk of large-scale fire and subsequent loss of forested habitats. Fire exclusion has created unnatural closed canopy conditions, increasing the risk of crown fires. Prescribed fire could reduce fuel loads, moderating potential fire behavior. This would enhance the long-term productivity of vegetation by reducing the potential for severely burned soil and loss of forested habitats. The long-term recreational use of the area would be only slightly affected. Noise and the feeling of increased human presence would be a short-term effect of the proposed treatments. The visual effects vary in duration and intensity depending on the location of the observer. Initially, the appearance of harvested areas would interrupt the natural appearance of the landscape. Following implementation of all treatments, the more open forest would appear more natural. Long-term reduction of wildfire risk would be a benefit to visual quality in the area.

3.17 OTHER CONSIDERATIONS

3.17.1 Effects of Alternatives on Prime Farmland, Rangeland, and Forest Land

There are no prime farmlands, rangelands, or forestlands within the project area.

3.17.2 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practicable and permitted by law, all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment (Executive Order 12898 and Departmental Regulation 5600-2). None of the alternatives would have a discernible effect on minorities, American Indians, women, or the civil rights of any United States citizen. No alternative would have a disproportionate adverse effect on minorities or low-income individuals.

3.17.3 Possible Conflicts with Other Land Use Plans, Policies, and Controls

All of the alternatives discussed in this EA would be consistent with the objectives of federal, state, regional, or local land use plans, policies, and controls for the project area.

3.17.4 Energy Requirements and Conservation Potential of Alternatives

The energy required to implement each of the alternatives in terms of the use of petroleum products is minimal when viewed in the context of production costs and the effect on national and worldwide petroleum reserves.

3.17.5 Applicable Laws and Regulations

Federal Laws

Based on the issues identified in Chapter 2, the principal federal laws applicable to this proposal include the: NFMA; ESA; National Historic Preservation Act (as amended 1992); American Indian Religious Freedom Act, and Native American Graves and Repatriation Act. Compliance with these laws is discussed below, or referenced within this document as noted. The CAA and CWA are discussed below under the State Laws section.

NFMA/PSICC Forest Plan

Timber production on federal land is a use allowed by several acts of Congress. It is a part of the mission of the USFS to manage the timber resource on a multiple-use/sustained-yield basis. The NFMA restricts timber production to lands classified as suitable for timber management (36 Code of Federal Regulations

[CFR] 219.14). NFMA also set certain management requirements for Forest Plans to meet, pertaining to conservation of such resources as soil and water, and plant and animal diversity (36 CFR 219.27). The PSICC Forest Plan standards and guidelines were established to meet these requirements. Each of the alternatives would be consistent with NFMA requirements.

Healthy Forest Restoration Act

This EA has been conducted under the procedures established by section 104 of the HFRA of 2003 and follows guidance contained in the HFI and HFRA Interim Field Guide (USFS and BLM 2004). The proposed project is covered by the HFRA for several reasons. Many of these reasons are discussed in detail in the preceding sections of this EA. In summary:

- The proposed project was developed as a collaborative effort among federal, state, and local governments, tribes, community groups, landowners, and other interested persons.
- Most of the proposed treatments would be implemented within 1.5 miles of at-risk communities.
- Some of the proposed treatment units are in condition classes 2 and 3 in fire regime groups I and III (Hann et al. 2003).
- The project is in a municipal watershed. A wildland fire in the project area would have adverse effects on water quality and maintenance of a municipal water supply.
- There is a substantial risk to ecosystem components from an insect or disease epidemic.
- Wildland fire is a threat to threatened and endangered species habitat, and the project would enhance protection of this habitat.
- Old-growth timber stands have not been identified in the project area. However, the proposed treatments would focus largely on removal of small-diameter trees. Large trees would be retained to the extent that the objectives of each treatment can be met.

ESA

Under section 7 of the ESA, each federal agency must ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any threatened or endangered species. If a threatened or endangered species, or species proposed for listing as threatened or endangered, occurs in an area where a project is proposed, a BA must be prepared. This analysis would comply with section 7 through completion of a BA for the preferred alternative. A draft BA has been prepared for this project. Once a preferred alternative has been identified by the responsible official, the BA will be finalized and sent to the USFWS for their concurrence.

Heritage Program Laws

Several federal laws provide for the preservation of historic, prehistoric, and other cultural resources. These include the National Historic Preservation Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act. These laws require that adequate and extensive review of these undertakings be conducted in order to assess the possible effects of these activities upon cultural resources. They also provide that federal agencies conduct adequate consultation with pertinent tribes in order to be informed of any possible conflicts an undertaking would have on their ability to conduct traditional religious practices.

The project area has not been surveyed for the presence of cultural resources; however, such surveys would occur before an action alternative is implemented. Mitigation measures to protect cultural resources would be incorporated into any project contracts or other work plans. The likelihood of harming

cultural resources by implementing any alternative is remote. The pertinent tribes were contacted during the scoping stage for the project and they did not express any concerns to the USFS. Therefore, the proposed project is consistent with the applicable heritage program laws.

State Laws

Applicable state laws are as follows:

Clean Air Act

All alternatives would comply with Colorado air quality standards.

Clean Water Act

Consideration of the CWA is given in **Section 3.5** in this EA.

This page left intentionally blank.

4.0 LIST OF ACRONYMS, GLOSSARY, AND REFERENCES

4.1 ACRONYMS

AADT	Annual Average Daily Traffic
AQRV	Air quality related values
BA	Biological Assessment
BBS	Breeding Bird Survey
BE	Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practice
CAA	Clean Air Act
CAQCC	Colorado Air Quality Control Commission
CDOW	Colorado Department of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council of Environmental Quality
cfs	Cubic feet per second
CO	Carbon monoxide
CR	County Road
CSFS	Colorado State Forest Service
CVU	Common Vegetation Unit
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
dbh	Diameter at breast height
DOI	Department of the Interior
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FRFTP	Front Range Fuels Treatment Partnership
FSH	Forest Service Handbook
FSM	Forest Service Manual
GIS	Geographic Information System
GMU	Game Management Unit
HABCAP	Habitat Capability Model
HFI	Healthy Forest Initiative
HFRA	Healthy Forests Restoration Act
HSS	Habitat structural stage
HUC	Hydrologic Unit Code
ID	Interdisciplinary
IRA	Inventoried Roadless Area
LAU	Lynx Analysis Unit
MA	Management Area
MIS	Management Indicator Species
MPB	Mountain pine beetle
MSO	Mexican spotted owl
NAAQS	National Ambient Air Quality Standards
NDIS	Natural Diversity Information Source
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFP	National Fire Plan
NFS	National Forest System
NFSR	National Forest System Road
NRCS	Natural Resource Conservation Service
ORV	Off-road vehicle
PFA	Post-fledging Area
PM_{10}	Particulate matter less than 10 microns
$PM_{2.5}$	Particulate matter less than 2.5 microns
PNV	Present Net Value
PSICC	Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands
ROS	Recreation Opportunity Spectrum
SMU	Soil Map Unit
TEP	Threatened, Endangered, or Proposed
TMDL	Total Maximum Daily Load
TSS	Total Suspended Sediment
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFS	United States Department of Agriculture, Forest Service
USFWS	United States Department of Interior, Fish and Wildlife Service
USGS	United States Department of Interior, Geological Survey
VQO	Visual Quality Objective
WCPH	Watershed Conservation Practices Handbook
WEPP	Water Erosion Prediction Project
WIZ	Water Influence Zone

4.2 GLOSSARY

Active crown fire
A crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fuels for continued spread.

Activity fuel
Surface fuel generated by vegetation management activities, such as slash or cull.

Aspect
The compass direction that a particular sloped area faces.

Basal area
The cross-sectional area of all stems in a stand measured at breast height and expressed in square feet per acre.

Best Management Practice
The set of practices in the Forest Plan which, when applied during implementation of a project, ensures that water related beneficial uses are protected and that State water quality standards are met. BMPs can take several forms. Some are defined by State regulation or memoranda of understanding between the Forest Service and the States. Others are defined by the Forest interdisciplinary planning team for application Forest-wide. Both of these kinds of BMPs are included in the Forest Plan as Forest-wide Standards. A third kind is identified by the interdisciplinary team for application to specific management areas; these are included as Management Area Standards in the appropriate management areas. A fourth kind, project level BMPs, are based on site specific evaluation and represent the most effective and practicable means of accomplishing the water quality and other goals of the specific area involved in the project. These project level BMPs can either supplement or replace the Forest Plan standards for specific projects.

Biological Assessment
An analysis conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under section 7 of the Endangered Species Act. The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species" (FSM 2670.5.2).

Biological Evaluation
A documented Forest Service review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species" (FSM 2670.5.3).

Broadcast burning
A type of prescribed burning where contiguous blocks are burned at the same time. The goal is to have fire burn across most or all of the surface within the block

Cable yarding
A method of moving logs to a landing, using large cable winches and booms.

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

Canopy cover
The extent to which the canopy blocks an open view of the sky. Typically expressed as a percentage.

Canopy fuel
Fuel present in the canopy, including all live and dead fuels above the surface fuel layer.

Chipping
The process of feeding wood material (slash) into a chipper to produce chips, small pieces of wood.

Co-dominant
This term refers to trees that are approximately equal in height to the dominant trees in a stand.

Condition Class
A condition class (FRCC) is a classification of the amount of departure from the natural regime and are defined as follows:

Condition Class 1. Fire regimes are within the natural (historical) range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the natural (historical) range.

Condition Class 2. Fire regimes have been moderately altered from their natural (historical) range. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from natural frequencies by one or more return intervals (either increased or decreased). This result in moderate changes to one or more of the following: fire size, intensity, and severity, and landscape patterns. Vegetation and fuel attributes have been moderately altered from their natural (historical) range.

Condition Class 3. Fire regimes have been substantially altered from their natural (historical) range. The risk of losing key ecosystem components is high. Fire frequencies have departed from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their natural (historical) range.

Council on Environmental Quality
An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cover habitat
Cover is a general term that includes thermal and hiding cover. Thermal cover provides moderation of daytime highs in summer months and nighttime lows in winter months, helping animals maintain energy reserves despite extreme temperatures. Hiding cover provides security from human disturbance by screening animals from audible and visual disturbance and is most important along roads.

Cover type
The vegetative species that dominates a site.

Critical habitat
Under the Endangered Species Act: (1) The specific areas within the geographic area occupied by a federally listed species on which physical and biological features are found that are essential to the conservation of the species and that may require special management or protection; and (2) The specific areas outside the geographic area occupied by a listed species that are determined to be essential for the conservation of the species.

Crown base height
The vertical distance from the ground to the bottom of the live crown of an individual tree, or the average distance in a stand.

Crown fire
A fire that spreads through the tree canopy in conjunction with, or independent of, surface fire.

Crown fire hazard
A physical situation (based on fuels, weather, and topography) with potential for causing harm or damage because of crown fire.

Crush
Break slash into smaller pieces by driving over it with mechanical equipment.

Cull
Trees, logs, or lumber rejected because they do not meet certain specifications of usability or grade.

Cultural (heritage) resources
The physical remains of human activity (such as artifacts, ruins, burial mounds, or petroglyphs) and conceptual content or context (such as a setting for legendary, historic, or prehistoric events or a sacred area of native people) of an area of prehistoric or historic occupation.

Cumulative effects
The combined effects resulting from sequential actions on a given area, including past, present, and reasonably foreseeable actions.

Direct attack
Fire suppression activities that take place immediately adjacent to the flaming front.

Direct effects
Effects that are caused by an action and occur at the same place and time.

Dominant
Trees that are the tallest in a stand.

Duff
Partially decomposed organic matter lying beneath the litter layer and above the mineral soil. It includes the fermentation and humus layers of the forest floor.

Ecosystem
A complete, interacting system of organisms considered together with their environment (for example; a marsh, a watershed, or a lake).

Endemic
Naturally occurring in a particular location at typical levels.

Environmental Assessment
A concise public document for which a federal agency is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with NEPA when no environmental impact statement is necessary; and 3) facilitate preparation of an environmental impact statement when one is necessary.

Ephemeral stream
A stream or portion of a stream that flows only in direct response to precipitation, receiving little or no water from springs and no long continued supply from snow or other sources, and whose channel is at all times above the water table.

Epidemic
An event, such as an insect infestation, that occurs at a rate in excess of typical levels.

Fire behavior
The manner in which a fire reacts to fuel, weather, and topography.

Fire line
An area void of fuel, meant to contain either a prescribed fire or wildfire.

Fire regime – (see also: mixed severity; infrequent, high severity; frequent, low severity)
A generalized description of the role fire plays in an ecosystem. It is characterized by fire frequency, seasonality, intensity, duration and scale (patch size), as well as regularity or variability.

Fire risk
The probability of an ignition occurring as determined from historical fire record data.

Fire suppression
All work and activities connected with fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

Fire type
The expected type of fire, split into surface fire, passive crown fire, and active crown fire.

Flame length
The height of flames at the flaming front.

Fledging habitat
See Post-fledging area.

Floodplain
The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Foraging habitat
Areas used by wildlife to obtain food.

Forb
An herbaceous plant other than a grass or grass-like plant.

Frequent, low-severity fire regime
Regime in which fires are generally not lethal to the dominant vegetation and do not substantially change the structure of the dominant vegetation. Approximately 80 percent or more of the aboveground dominant vegetation survives fires. Applies to forest and woodland vegetation types.

Fuel break
An area cleared of most fuel, especially dead and down fuel and thick ladder and canopy fuel. Designed to provide firefighting forces a strategic location to slow or stop a wildland fire.

Fuel continuity
The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.

Fuel load
The oven-dry weight of fuel per unit area, generally expressed in tons per acre.

Fuel management
Management activities undertaken to alter the amount of fuel in treatment units.

Fuel Model
A set of surface fuel bed characteristics (load, surface area to volume ratio by size class, heat content, and depth) organized for input to a fire model. Standard fuel models (Anderson 1982) have been stylized to represent specific fuel conditions.

Fuelwood
Wood used for conversion to some form of energy, for example, in residential use or in cogeneration plants.

Geographic Information System
A type of computer program used to store and analyze geographic data.

Ground fuel
Fuels that lie beneath surface fuels, such as organic soils, duff, de-composing litter, buried logs, roots, and the below-surface portion of stumps.

Habitat capability
The estimated ability of an area to support wildlife, fish, or plant populations. Habitat capability is modeled using HABCAP and is a function of forage and cover values.

Habitat effectiveness
The percentage of available habitat that is usable by wildlife during the non-hunting season. This concept assumes that some portion of suitable habitat is not used fully because of human disturbance. For example, big game species tend to avoid using otherwise suitable habitats near open roads.

Habitat structural stage
A hierarchical system of classifying vegetation based on both size and density of vegetation present.

HSS 1: Grasses and forbs
HSS 2: Seedlings and saplings
HSS 3A: Young, open forest
HSS 3B: Young, moderately dense forest
HSS 3C: Young, dense forest
HSS 4A: Mature, open forest
HSS 4B: Mature, moderately dense forest
HSS 4C: Mature, dense forest
HSS 5: Late succession ("old growth")

Hand thinning
Removal of live or dead vegetation primarily by hand labor. For example, using chain saws to thin understory vegetation.

Hazardous fuels
Accumulations of fuel that could contribute to uncontrollable fire behavior.

Helicopter yarding
A method of moving logs to a landing, using helicopters.

Herbicide
A chemical compounds used to kill undesirable vegetation.

Hydrophobic soil
Soil that does not absorb water. High intensity fires can alter soil chemistry so that it is no longer capable of absorbing water, which quickly runs off the surface, often initiating excessive soil erosion.

Indirect attack
Fire suppression activities that take place some distance from the flaming front. This method is typically used when fire behavior is too intense for direct attack.

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

Infiltration
The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infrequent, high-severity fire regime
Regime in which fires kill or top-kill aboveground parts of the dominant vegetation, changing the aboveground structure substantially. Approximately 80 percent or more of the aboveground dominant vegetation either is consumed or dies because of fires. Applies to forests, shrublands, and grasslands.

Interdisciplinary (ID) team
A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately analyze the entire range of resource issues. Through interaction, participants bring different points of view to bear on the problem.

Intermediate
Trees that form an intermediate layer beneath the dominant tree canopy but above the understory.

Intermittent stream
A stream or a portion of a stream, that does not flow year-round but only when it (a) receives base flow solely during wet periods, or (b) receives groundwater discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. See also Ephemeral stream.

Inventoried Roadless Area
IRAs are those areas identified in a set of IRA maps, contained in the USFS Roadless Area Conservation Final Environmental Impact Statement, Volume 2, which are held at the national headquarters of the USFS, or any update, correction, or revision of those maps. The Roadless Area Conservation Rule restricts most road construction in IRAs, but does allow for vegetation management under certain circumstances.

Ladder fuel
Combustible material that provides vertical continuity between vegetation strata and allows fire to climb into crowns of trees or shrubs with relative ease.

Landscape-scale
An event that occurs across large tracts of land.

Large-scale wildfire
A stand-replacing wildfire, often covering large tracts of land, and substantially changing the ecosystems it affects.

Litter
The top layer of the forest floor including freshly fallen leaves, needles, fine twigs, bark flakes, fruits, matted dead grass, and a variety of miscellaneous vegetative parts that are little altered by decomposition. Litter also accumulates beneath rangeland shrubs. Some surface feather moss and lichens are considered litter because their moisture response is similar to that of dead fine fuel.

Lop and scatter
A term used in treating fuels during and after harvesting is complete, where the unmerchantable portions of the tree (usually the smaller top of a tree and the limbs) are cut off and scattered about to reduce slash concentrations.

Management area
An area for which a single set of management prescriptions is developed and applied.

Management area prescription
A set of standards and guidelines that apply to a specific management area.

Management indicator species
Species identified in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Mechanical fuel treatment
An activity that alters fuel loads using mechanical equipment. Includes hand treatments using chain saws and other similar equipment.

Mechanized thinning
Removal of live or dead vegetation primarily by mechanized equipment.

Mitigation
Avoiding or minimizing effects by limiting the degree or magnitude of the action and its implementation; rectifying the effect by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the effect by preservation and maintenance operations during the life of the action.

Mixed severity fire regime
A fire regime in which fires either cause selective mortality in dominant vegetation, depending on different species' susceptibility to fire, or vary between low-severity and high-severity.

Monitoring
The periodic evaluation on a sample basis of management practices to determine how well objectives have been met and how closely management standards have been applied.

Nesting habitat
Habitats used by wildlife (birds) for nesting.

Non-system road
A road that is not part of the official road system on a Forest. Often these are user-created routes.

Noxious weed
A plant specified by law as being especially undesirable, troublesome, or difficult to control.

Passive crown fire
A crown fire in which individual or small groups of trees torch out, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior from the occasional torching of an isolated tree to a nearly active crown fire.

Patch cut
A timber harvest method where all trees are removed in small areas (up to 10 acres). This method attempts to mimic natural disturbance patterns, such as a small area of crown fire within a larger area of surface fire, or a localized outbreak of an insect pathogen.

Peak flow
The highest annual flow in a stream.

Perennial streams
Streams that flow continuously throughout most years.

Piling and burning
A fuels treatment method comprised of piling fuel into piles that are burned. Piling may be accomplished by hand labor or with large machinery such as bulldozers, depending on terrain, accessibility, fuels, and other concerns.

Population viability
The ability of a population to persist through time.

Post-fledging area
An area surrounding a goshawk nest stand that is used by the young in the first few months after fledging for both roosting and foraging.

Prescribed fire
Any fire ignited by management actions to meet specific objectives. An approved written burn plan must exist and NEPA requirements must be met before ignition. This term replaces management ignited prescribed fire.

Present Net Value
The difference between the total discounted value of all outputs to which monetary values or established market prices are assigned and the total discounted costs for management.

Project design standards
Standards that are used in developing a proposed action. These are intrinsic to an action, as opposed to mitigation, which is developed to reduce the effects of an action that is already complete.

Proposed, Endangered, or Threatened
Three classifications that species are given under the Endangered Species Act.

Proposed action
In terms of NEPA, the project, activity, or action that a federal agency intends to implement or undertake and which is the subject of an environmental analysis.

Rate of spread
The relative speed with which a fire increases in size.

Recreation Opportunity Spectrum
Provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum, of which four classes are present in the project area:

Semi-Primitive Non-Motorized. These lands are characterized by few or subtle changes by people, with a high probability of isolation from the sights and sounds of people. No roads are present.

Semi-Primitive Motorized. Lands in this category are characterized by moderately dominant alterations by people, with strong evidence of primitive roads or trails. Interaction between users is low, but there is evidence of other users.

Roaded Natural. These lands are characterized by a predominantly natural environment with moderate evidence of other resource utilization. Evidence of the sights and sounds of other users is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from other users.

Rural. The lands in this category are 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.

Regeneration
The process where trees reproduce themselves by either artificial (hand planting of small seedlings) or natural (by seed) means. Often used to refer to the young trees themselves.

Riparian area
A transition between the aquatic ecosystem and the adjacent upland terrestrial ecosystem. It is identified by soil characteristics and by distinctive vegetative communities that require free or unbounded water.

Scoping
An early and open process designed to identify the environmental issues and significant factors to be addressed in the analysis process.

Secondary cavity nester
A bird that nests in cavities in trees that are constructed by other (primary) cavity nesters. Such birds are typically not capable of constructing their own nest cavities.

Sensitive species
Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Shaded Fuel Break
A fuel break with a residual overstory of trees. The trees serve to reduce the amount of grass and shrubs growing in the understory by competing for available light, water, and nutrients. The canopy cover is typically low and tree crowns are not connected to low or stop a crown fire.

Silviculture
A scientific discipline devoted to management of forest resources.

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

Snag
A standing dead tree usually greater than five feet in height and six inches in diameter at breast height.

Soil compaction
The process by which the soil grains are rearranged, resulting in a decrease in void space and causing closer contact with one another, thereby increasing bulk density.

Soil map unit
An area with similar soil types and properties delineated for mapping purposes.

Soil permeability
The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water move downward through saturated soil.

Species diversity
The variety and variability among living organisms and the ecological complexes in which they occur.

Spotting (spot fires)
A process where embers from a fire are lifted or blown ahead of the flaming front and start new fires.

Stand-replacing fire
A wildfire that burns at high intensity, effectively causing mortality of entire stands of trees.

Standards and guidelines
An indication or outline of policy or conduct. Standards have specific, quantifiable measures, while guidelines provide more general direction and flexibility of management options.

Stem density
The number of trees per unit area, typically trees per acre.

Stream flow regime
The pattern of water flow in a stream. Influenced by season, precipitation, and other factors.

Suppressed
Trees growing in the understory that are shaded by overstory (dominant and co-dominant) trees.

Surface fire
A fire spreading through surface fuels.

Surface fuel
The loose surface litter on the soil surface, for example, fallen leaves or twigs, needles, bark, cones, branches, grasses, shrub and tree reproduction, downed logs, stumps, seedlings, and forbs interspersed with or partially replacing the litter.

System road
A road that is part of the official USFS transportation system.

Temporary road
Those roads needed only for the purchaser or permittee's use. The Forest Service and the purchaser or permittee must agree to the location and clearing widths. Temporary roads are used for a single, short-term use, e.g., to haul timber from landings to Forest Development Roads, access to build water developments, etc. Temporary roads must be obliterated as part of a timber sale contract.

Torching
The transition of surface fire into the crown of a single tree, typically caused by ladder fuels, high flame lengths, or low crown base height. Torching often leads to crown fire behavior

Total Maximum Daily Load
The TMDL process was developed as part of the Clean Water Act to identify pollution sources and create accountability. It is an estimate of the greatest amount of a specific pollutant that a water body or stream segment can receive without violating water quality standards.

Tractor yarding
A method of moving logs to a landing on the ground using mechanical equipment such as a skidder.

Understory
The trees and other woody species that grow under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Visual Quality Objective
A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. VQO refers to the degree of acceptable alterations of the characteristic landscape. Two VQO classes are present in the project area:

Partial Retention. This VQO allows activities that alter the landscape that may be evident, but must be visually subordinate to the characteristic landscape, and not recognizable as an unnatural occurrence. This objective must be met as soon after project completion as possible or within a maximum of one year.

Modification. This VQO allows activities that visually dominate the original characteristic landscape when the activities borrow from the naturally established line, form, color, or texture, and at a similar scale so that its visual characteristics are those of natural occurrences within the surrounding areas or character type. Reduction of the contrast should be accomplished within the first years after operations cease, or at a minimum should meet existing regional guidelines.

Water Erosion Prediction Project
The WEPP is a continuous simulation computer program that predicts soil loss and sediment deposition from overland flow on hill slopes, soil loss and sediment deposition from concentrated flow in small channels, and sediment deposition in impoundments.

Water Influence Zone
A zone located on either side of a stream that is 100 feet or height of the tallest tree, whichever is greater, in width. Special management requirements are applied to the WIZ.

Watershed
A region or land area drained by a single stream, river, or drainage network.

Wetland
A transitional area between aquatic and terrestrial ecosystems that is inundated or saturated for periods long enough to produce hydric soils and support hydrophytic vegetation.

Wild and Scenic River
Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the State or States through which they flow.

Wildland-urban interface
The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

4.3 REFERENCES

Abele, S. C., V. A. Saab, and E. O. Garton. 2004. Lewis's woodpecker (*Melanerpes lewis*): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/lewisswoodpecker.pdf. Accessed: November 10, 2004.

Anderson, D. G. 2004. *Potentilla rupincola* Osterhout (rock cinquefoil): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project by Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/ assessments/potentillarupincola.pdf. Accessed: November 17, 2004.

Anderson, H. E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. National Wildfire Coordinating Group publication NFES 1574. USDA Forest Service General Technical Report INT-122. Ogden, Utah.

Anderson, M. D. 2003. *Pinus contorta* var. *latifolia*. Fire Effects Information System, USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Web Page]. Located at http://www.fs.fed.us/database/feis/. Accessed: November 29, 2004.

Andrews, R., and R. Righter. 1992. Colorado Birds. Denver Museum of Natural History, Denver, Colorado.

Barrett, N. M. 1998a. Mountain Bluebird. Pages 386-387 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, Colorado.

Barrett, N. M. 1998b. Red-naped Sapsucker. Pages 256-257 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, Colorado.

Barrett, N. M. 1998c. Northern goshawk. Pages 116-117 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Beatty, B. L., W. F. Jennings, and R. C. Rawlinson. 2003a. *Botrychium ascendens* (triangle-lobe moonwort), *Botrychium crenulatum* (scalloped moonwort), and *Botrychium lineare* (narrowleaf moonwort): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project by CDM, Denver, Colorado [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/botrychiums.pdf. Accessed: November 17, 2004.

Beatty, B. L., W. F. Jennings, and R. C. Rawlinson. 2003b. *Mimulus gemmiparus* W. A. Weber (Rocky Mountain monkey flower): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project by CDM, Denver, Colorado [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/ mimulusgemmiparus.pdf. Accessed: November 17, 2004.

Beatty, B., W. Jennings, and R. Rawlinson. 2004. *Machaeranthera coloradoensis* (Gray) Osterhout (Colorado tansy-aster): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project by CDM, Denver, Colorado [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/machaeranthers coloradoensis.pdf. Accessed: November 17, 2004.

Benavides-Solorio, J. 2003. Post-fire runoff and erosion at the plot and hillslope scale, Colorado Front Range. Ph.D. Dissertation. Colorado State University, Fort Collins, Colorado. 210 pages.

Boyle, S. 1998. Spotted Owl. Pages 222-223 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, Colorado.

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

Carpenter, L. H. and O. C. Wallmo. 1981. Rocky Mountain and intermountain habitats: habitat evaluation and management. Pages 399-422 *in* O. C. Wallmo, ed. Mule and Black-tailed Deer of North America. Lincoln, Nebraska, University of Nebraska Press.

Colorado Air Quality Control Commission. 2003. Report to the Public 2002-2003. [Web page]. Located at http://www.cdphe.state.co.us/ap/down/rttp0203.pdf. Accessed: December 1, 2004.

Colorado Department of Public Health and Environment. 2002. Total Maximum Daily Load Assessment, North Fork of the South Platte River, Segment 4. 28 pages.

Colorado Department of Public Health and Environment. 2004. Attainment/Maintenance Plans for Colorado Communities [Web page]. Located at http://www.cdphe.state.co.us/ap/attainmaintain.asp. Accessed: December 1, 2004.

Colorado Division of Wildlife. 2004a. Wildlife Abert's Squirrel Page [Web Page]. Natural Diversity Information Source. Located at http://ndis.nrel.colostate.edu/wildlifespx.asp?SpCode=050117. Accessed: November 12, 2004.

Colorado Division of Wildlife. 2004b. Park County Known or Likely Species Occurrence [Web Page]. Located at http://ndis.nrel.colostate.edu/aspresponse/spxbycnty_res.asp. Accessed: November 4, 2004.

Colorado Division of Wildlife. 2004c. Pygmy Shrew County Occurrence [Web Page]. Located at http://ndis.nrel.colostate.edu/plugins/co_maps/051054.jpg. Accessed: November 10, 2004.

Colorado Division of Wildlife. 2005a. Colorado's Lynx. Species Conservation Program [Web Page]. Located at http://wildlife.state.co.us/species_cons/lynx.asp. Accessed: February 10, 2005.

Colorado Division of Wildlife. 2005b. Boreal Owl County Occurrence. Natural Diversity Information Source [Web Page]. Located at http://ndis.nrel.colostate.edu/plugins/co_maps/041232.jpg. Accessed: February 21, 2005.

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and Rangeland Birds of the United States: Natural History and Habitat Use. USDA Forest Service Agriculture Handbook 688. 625 pages.

Dodd, N. L., S. S. Rosenstock, C. R. Miller, and R. E. Schweinsburg. 1998. Tassel-eared squirrel population dynamics in Arizona: index techniques and relationships to habitat condition. Arizona Game and Fish Department Technical Report 27. Phoenix, Arizona. 49 pages.

Elson, M. T. 1999. Tassel-eared squirrel foraging patterns and predicted effects of ecological restoration treatments at Mt. Trumbull, Arizona. Master's thesis. Northern Arizona University, Flagstaff, Arizona. 165 pages.

Elson, M. 2003. Summary of 2003 Abert's squirrel surveys, Hayman burn area and South Platte Ranger District. Unpublished report on file at South Platte Ranger District, Morrison, Colorado. 5 pages.

Elson, M. 2004a. Analysis of Abert's squirrel harvest trends and habitat on the Pike and San Isabel National Forests. Unpublished data on file at South Platte Ranger District, Morrison, Colorado.

Elson, M. T. 2004b. Personal communication [*Nov 18* telephone conversation with E. Porter, Greystone, Boulder, Colorado. *RE:* Species to be evaluated for Harris Park Fuels Management Project]. Wildlife Biologist, USDA, Forest Service, PSICC, South Platte Ranger District.

Fertig, W. 2000. State Species Abstract, *Rubus arcticus* var. *acaulis*, Nagoonberry [Web Page]. Located at http://uwadmnweb.uwyo.edu/wyndd/Plants/state_spp_abstracts/R/Rubus_acaulis.pdf. Accessed: November 17, 2004.

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

Foster Wheeler Environmental Corporation. 1999. Landscape Assessment, Upper South Platte Watershed. Volumes 1, 2, and 3. Prepared for the U.S. Forest Service, Colorado State Forest Service, Denver Water Board, and U.S. Environmental Protection Agency. 72 pages.

Fraserdesign. 1997. Railroads in Colorado, 1858-1948, Multiple Property Document Form. The Foundation for Colorado State Parks, Inc. and Colorado Historical Society, Denver Colorado.

Gary, L. H. 1975. Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of our Knowledge. USDA Forest Service Research Paper RM-139. Fort Collins, Colorado. 32 pages.

Gilmore, Kevin P., Marcia Tate, Mark L. Chenault, Bonnie Clark, Terri McBride, and Margaret Wood. 1999. Colorado Prehistory: A Context for the Platte River Basin. Prepared by Tate and Associates, Inc. and SWCA, Inc. Environmental Consultants for Colorado Council of Professional Archaeologists, Denver, Colorado.

Graham, R. T., R. T. Reynolds, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., 1994. Sustaining forest habitat for the northern goshawk: A question of scale. *In* W. M. Block, M. S. Morrison, and M. H. Reiser, editors. The Northern Goshawk: Ecology and Management. Studies in Avian Biology No. 16. Cooper Ornithological Society.

Graham, R. T., McCaffrey, S., and T. B. Jain. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. USDA Forest Service General Technical Report RMRS-GTR-120. 43 pages.

Hammerson, G. 1999. Amphibians and Reptiles in Colorado. University Press of Colorado, Niwot, Colorado.

Hann, W., Havlina, D., Shlisky, A., and others. 2003. Fire Regime Condition Class Definitions. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [Web Page]. Located at: http://www.frcc.gov/docs/FrccDefinitions
Final.pdf. Accessed November 1, 2004.

Hayward, G. D. 1994. Review of Technical Knowledge: Boreal Owls. Chapter 9 *in* G. D. Hayward and J. Verner, editors. 1994. Flammulated, Boreal, and Great Gray Owls in the United States. A Technical Conservation Assessment. Rocky Mountain Forest and Range Experiment Station General Technical Report RM-253. Fort Collins, Colorado. 214 pages.

Hessel, D. 2002. Upper South Platte Watershed Protection and Restoration Project, Pike and San Isabel National Forests, Annual Report-A Year of Fire and Recovery. 14 pages.

Hoover, R. and D. L. Wills, ed. 1984. Managing Forested Lands for Wildlife. Colorado Division of Wildlife in cooperation with USDA, Forest Service, Rocky Mountain Region, Denver, Colorado.

Howard, J. L. 1996. *Populus tremuloides*. Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Web Page]. Located at: http://www.fs.fed.us/database/feis/. Accessed November 23, 2004.

Howard, J. L. 2003. *Pinus ponderosa* var. *scopulorum*. Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Web Page]. Located at: http://www.fs.fed.us/database/feis/. Accessed November 2, 2004.

Hutto, R. L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain conifer forests. Conservation Biology 9(5): 1041-1058.

Jones, S. R. 1998. Olive-sided flycatcher. Pages 268-269 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Kaufmann, M. R., L. S. Huckaby, and P. Gleason. 2000. Ponderosa Pine in the Colorado Front Range: Long Historical Fire and Tree Recruitment Intervals and a Case for Landscape Heterogeneity. *In:* Neuenschwander, L. F., Ryan, K. C., Gollberg, G. E., and Greer, J. D., editors. Rossing the millennium: integrating spatial technologies and ecological principles for a new age in fire management. University of Idaho and International Association of Wildland Fire. Moscow, Idaho. Volume 1: 153-160.

Kaufmann, M. R., P. J. Fornwalt, L. S. Huckaby, and J. M. Stoker. 2001. Cheesman Lake – A Historical Ponderosa Pine Landscape Guiding Restoration in the South Platte Watershed of the Colorado Front Range. USDA Forest Service Proceedings RMRS-P-22, pages 9-18.

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

Keith, J. O. 2003. The Abert's squirrel (*Sciurus aberti*): A Technical Conservation Assessment. Prepared for the USDA, Forest Service, Rocky Mountain Region, Species Conservation Project. 72 pages.

Kennedy, P. L. 2003. Northern goshawk (*Accipiter gentilis atricapillus*): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. 142 pages.

Kent, B., K. Gebert, S. McCaffrey, W. Martin, D. Calkin, E. Schuster, I. Martin, H. W. Bender, G. Alward, Y. Kumagai, P. J. Cohn, M. Carroll, D. Williams, and C. Ekarius. 2003. Social and Economic Issues of the Hayman Fire. *In:* Graham, R. T., technical editor. 2003. Hayman Fire Case Study. General Technical Report RMRS GTR-114. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. 396 pages.

Kingery, H. E., editor. 1998. Colorado Breeding Bird Atlas Partnership and the Colorado Division of Wildlife. Denver, Colorado.

Kuenning, R. R. 1998. Lewis' woodpecker. Pages 248-249 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Levad, R. 1998. Peregrine falcon. Pages 136-137 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Libohova, Z. 2004. Effects of Thinning and A Wildfire on Sediment Production Rates, Channel Morphology, and Water Quality in the Upper South Platte River Watershed. Master's Thesis. Colorado State University, Fort Collins, Colorado. 260 pages.

MacDonald, L. H., and J. D. Stednick. 2004. Forests and Water: A State-of-the-Art Review for Colorado. Colorado State University. Colorado Water Resources Research Institute (CCWRI) Completion Report Number 196. 65 pages.

Mackie, R. J., K. L. Hamlin, and D. F. Pac. 1987. Mule deer. Pages 862-877 *in* J. A. Chapman and G. A. Feldhamer, editors. Wild mammals of North America. Johns Hopkins University Press. Baltimore, Maryland.

Martinka, C. J. 1976. Fire and elk in Glacier National Park. Pages 377-389 *in* Proceedings, Tall Timbers fire ecology conference and fire and land management symposium; 1974 October 8-10; Missoula, Montana. No. 14. Tallahassee, Florida: Tall Timbers Research Station.

Martinson, E., P. N. Omi, and W. Sheppard. 2003. Effects of Fuel Treatments on Fire Severity. Part 3 *in*: Graham, R. T., Technical Editor. 2003. Hayman Fire Case Study. General Technical Report RMRS GTR-114. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. 396 pages.

McCallum, D. A. 1994. Review of Technical Knowledge: Flammulated Owls. Chapter 4 *in* G. D. Hayward and J. Verner, editors. 1994. Flammulated, Boreal, and Great Gray Owls in the United States. A Technical Conservation Assessment. Rocky Mountain Forest and Range Experiment Station General Technical Report RM-253. Fort Collins, Colorado. 214 pages.

Mehls, S.F. 1984. *The New Empire of the Rockies: A History of Northeast Colorado*. Bureau of Land Management, Cultural Resources Series, Number 16, Denver, Colorado.

Myers, D. 2004. Personal communication [*Dec 1* telephone conversation with E. Porter, Greystone, Boulder, Colorado. *RE:* Elk and mule deer population estimates within the Harris Park Fuels Management project area]. Wildlife Manager, Colorado Division of Wildlife, Denver, Colorado, 1 page.

Natural Resource Conservation Service. 1994. Draft Soil Survey of the Northern San Isabel and Western Pike National Forests, Colorado.

NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life. Version 4.1. NatureServe, Arlington, Virginia [Web Page]. Located at http://www.natureserve.org/explorer. Accessed: November 17, 2004.

Patton, D. R. 1975. Abert squirrel cover requirements in southwestern ponderosa pine. USDA, Forest Service Research Paper RM–145. 12 pages.

Popovich, S. J. 2004. *Botrychium lineare* Population Status in Colorado: Clarifications and Suggested Species Assessment Update and Erratum. Unsolicited report prepared for the Arapaho-Roosevelt National Forests and Pawnee National Grassland, Supervisor's Office, Fort Collins, Colorado. [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/popovich.pdf. Accessed: November 17, 2004.

Raleigh, R. F. 1982. Habitat suitability index models: Brook trout. USDI Fish and Wildlife Service. FWS/OBS-82/10.24.

Reyher, D. 2004. *Botrychium lineare* (Narrowleaf moonwort) confirmed in Wyoming [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/reyher. Accessed: November 17, 2004.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. USDA, Forest Service General Technical Report RM-217. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado. 90 pages.

Romme, W. H., T. T. Veblen, M. R. Kaufmann, R. Sherriff, and C. M. Regan. 2003. Ecological Effects of the Hayman Fire. Part 1: Historical (Pre-1860) and Current (1860-2002) Fire Regimes. *In*: Graham, R. T., technical editor. 2003. Hayman Fire Case Study. General Technical Report RMRS-GTR-114. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. 396 pages.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Nancy, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula, Montana.

Ryder, R. A. 1998. Boreal owl. Pages 228-229 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Ryke, N., and T. Wagner. 2002. Management Indicator Species Review for the Pike and San Isabel National Forests Cimarron and Comanche National Grasslands. Unpublished document.

Ryke, N., S. Olsen, T. Wagner, and M. Elson. 2003. Threatened, endangered and sensitive species of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. Unpublished document.

Saab, V. and J. G. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of Southwestern Idaho. Res. Pap. RMRS-RP-11. Ogden, UT. USDA, Forest Service, Rocky Mountain Research Station. 17 pages.

Scott, G.R. 1999. Historic Trail Map of the Denver 1° X 2° Quadrangle, Central Colorado. United States Department of the Interior, United States Geological Survey, Geologic Investigations Series I-2639, prepared in cooperation with the Denver Public Library, Western History and Genealogy Department, Denver, Colorado.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, Maryland. [Web Page]. Located at: http://www.mbr-pwrc.usgs.gov/bbs/bbs.html. Accessed December 1, 2004.

Snyder, S. A. 1991. *Odocoileus hemionus*. USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Fire Effects Information System [Web Page]. Located at http://www.fs.fed.us/database/feis. Accessed: November 12, 2004

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service, and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program, Fort Collins, Colorado.

Squires, J. R., and R. T. Reynolds. 1997. Northern goshawk (*Accipiter gentilis*) in A. Poole, and F. Gill, editors. The Birds of North America, No. 298. The Academy of Natural Sciences, Philadelphia, Pennsylvania; and The American Ornithologists' Union, Washington D.C.

Toolen, J. F. 1998. Wilson's warbler. Pages 436-437 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, Colorado.

Towry, R. K., Jr. 1984. Wildlife habitat requirements. Chapter 3 *in* R. L. Hoover, and D. L. Wills, editors. Managing Forested Lands for Wildlife. Colorado Division of Wildlife, Denver, Colorado.

Trotter, P. 1987. Cutthroat, native trout of the west. Colorado Associated University Press, Boulder, Colorado.

Uchytil, R. J. 1991a. *Abies lasiocarpa*. Fire Effects Information System, USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Web Page]. Located at http://www.fs.fed.us/database/feis/. Accessed: November 29, 2004.

Uchytil, R. J. 1991b. *Picea engelmannii*. Fire Effects Information System, USDA, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory [Web Page]. Located at http://www.fs.fed.us/database/feis/. Accessed: November 29, 2004.

United States Department of Agriculture, Forest Service. 1984a. Land and Resource Management Plan, Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands. Pueblo, Colorado.

United States Department of Agriculture, Forest Service. 1984b. Environmental Impact Statement for the Land and Resource Management Plan, Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands. Pueblo, Colorado.

United States Department of Agriculture, Forest Service. 1993. Results of Mexican spotted owl surveys on the Pike and San Isabel National Forests. Unpublished data on file at South Platte Ranger District, Morrison, Colorado.

United State Department of Agriculture Forest Service. 2000a. Public Review of Environmental Assessment, Upper South Platte Watershed Protection and Restoration Project and Forest Plan Amendment 28. Pike and San Isabel National Forests. South Platte Ranger District. Morrison, Colorado.

United States Department of Agriculture, Forest Service. 2000b. Environmental Assessment for the Upper South Platte Watershed Restoration and Protection Project. Pike National Forest, Morrison, Colorado.

United States Department of Agriculture, Forest Service. 2000c. Results of northern goshawk survey on the Pike and San Isabel National Forests. Unpublished data on file at South Platte Ranger District, Morrison, Colorado.

United States Department of Agriculture, Forest Service. 2001a. Special Areas; Roadless Area Conservation. Final Rule and Record of Decision. Federal Register 66(9): 3244-3273.

United States Department of Agriculture, Forest Service. 2001b. Watershed Conservation Practices. FSH 2509.25. Region 2, Rocky Mountain Region. Amendment 2509.25-2001-1. Denver, Colorado. 23 pages.

United States Department of Agriculture, Forest Service. 2002a. Economic Analysis for Roadless Area Vegetation Treatments, Upper South Platte Protection and Restoration Project.

United States Department of Agriculture, Forest Service. 2002b. Results of northern goshawk survey on the Pike and San Isabel National Forests. Unpublished data on file at South Platte Ranger District, Morrison, Colorado.

United States Department of Agriculture, Forest Service. 2003a. Species Conservation Project: Region 2 Regional Forester's Sensitive Species. Rocky Mountain Region. Golden, Colorado [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/sensitivespecies/index.shtml. Accessed: November 4, 2004.

United States Department of Agriculture, Forest Service. 2003b. Hayman Fire Case Study, Russell T. Graham, technical editor. General Technical Report RMRS-GTR-114. Fort Collins, Colorado.

United States Department of Agriculture, Forest Service. 2004a. FSH 2409.19 – Renewable Resources Handbook. Chapter 60 - Stewardship Contracting. Interim Directive 2409.19-2004-1. Effective Date: January 28, 2004.

United States Department of Agriculture, Forest Service. 2004b. FSM 1900 – Planning. Chapter 1920 – Land and Resource Management Planning. Interim Directive 1920-2004-1. Effective Date: July 16, 2004.

United States Department of Agriculture, Forest Service. 2004c. Wild and Scenic River Study, North Fork of the South Platte and the South Platte Rivers, Pike and San Isabel National Forests Comanche and Cimarron National Grasslands, Final Environmental Impact Statement.

United States Department of Agriculture, Forest Service. 2004d. Sensitive Plant Species of the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands. Unpublished.

United States Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management. 2004. The Healthy Forests Initiative and Healthy Forest Restoration Act Interim Field Guide. FS-799. Washington, D. C.: U. S. Department of Agriculture, Forest Service. 58 pages.

United States Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Indian Affairs, Bureau of Land Management, Fish and Wildlife Service, and National Park Service. 2001. Urban Wildland Interface Communities within the Vicinity of Federal Lands that are at High Risk from Wildfire. Federal Register 66(160): 43383-43435.

United States Department of the Interior, Fish and Wildlife Service. 1993. Endangered and Threatened Wildlife and Plants; Final Rule to list the Mexican spotted owl as a threatened species. Federal Register 58(49): 14248-14271.

United States Department of the Interior, Fish and Wildlife Service. 1995a. Endangered and Threatened Wildlife and Plants; final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states. Federal Register 60(133): 36000-36010.

United States Department of the Interior, Fish and Wildlife Service. 1995b. Recovery plan for the Mexican spotted owl: Vol. 1. USDI Fish and Wildlife Service, Albuquerque, New Mexico.

United States Department of the Interior, Fish and Wildlife Service. 1998. Greenback cutthroat trout recovery plan. Denver, Colorado.

United States Department of the Interior Fish and Wildlife Service. 2004a. Mexican spotted owl: General biology and ecological relationships. Mexican spotted owl recovery program [Web Page]. Located at http://ifw2es.fws.gov/mso/Biology.cfm. Accessed: November 9, 2004.

United States Department of the Interior Fish and Wildlife Service. 2004b. Endangered and Threatened Wildlife and Plants; Final designation of critical habitat for the Mexican spotted owl. Federal Register 69(168): 53182-53230.

United States Department of the Interior, Geological Survey. 2004a. Gauge Data. [Web Page]. Located at: http://nwis.waterdata.usgs.gov/nwis. Accessed: November 17, 2004.

United States Department of the Interior, Geological Survey. 2004b. Dragonflies and damselflies (Odonata) of the United States; Odonata of Colorado; Hudsonian emerald (*Somatochlora hudsonica*). Northern Prairie Wildlife Research Center [Web Page]. Located at http://www.npwrc.usgs.gov/resource/distr/insects/dfly/co/320.htm. Accessed: November 10, 2004.

Versaw, A. E. 1998a. White-tailed ptarmigan. Pages 138-139 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Versaw, A. E. 1998b. Three-toed woodpecker. Pages 264-265 *in* H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Wiggins, D. A. 2004. American three-toed woodpecker (*Picoides dorsalis*): A Technical Conservation Assessment. USDA, Forest Service, Rocky Mountain Region [Web Page]. Located at http://www.fs.fed.us/r2/projects/scp/assessments/shortearedowl.pdf. Accessed: November 10, 2004.

Winn, R. 1998. Flammulated owl. Pages 210-211 in H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Winternitz, B. 1998. Bald eagle. Pages 108-109 in H. E. Kingery, editor. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. Denver, Colorado.

This page left intentionally blank

5.0 LIST OF PREPARERS

The following individuals comprise the ID team that conducted the environmental analysis and prepared this EA.

TABLE 5-1 LIST OF PREPARERS

Name	Title	Responsibility
USDA Forest Service, PSICC		
Brian Banks	GIS Specialist	GIS Analysis
David Bauman	Asst. Fire Mgt. Officer	Fuels/Fire
Steve Culver	Fisheries Biologist	Project Management, Fisheries/Hydrology
Scott Dollus	Recreation Specialist	Recreation/Lands/Uses/Minerals
Mike Elson	Wildlife Biologist	Wildlife
Floyd Freeman	Silviculturist	Silviculture/Timber Management/Logging Operations
Kris Heiny	Fuels Specialist	Fuels/Fire
Ken Kanaan	Soil Scientist	Soils
J.R. Kirkaldie	Resource Assistant	Roads and Trails
Terry McCann	Public Affairs Officer	Social/Political/Public Affairs
Steve Olson	Botanist	Botany
Fred Patten	Project Manager	Project Management
Steve Priest	Recreation & Lands Spec.	Recreation/Lands/Uses/Minerals
Gary Shaffer	Fire Management Officer	Fuels/Fire
Greystone Environmental Consultants		
Deb Ballheim	Writer/Editor	Editorial Review
Dave Cameron	Senior Project Manager	NEPA Compliance, Quality Control
Matt Kizlinski	Silviculturalist	Vegetation, Silviculture
Selina Koler	Watershed Scientist	Watersheds, Soils
Elaine Porter	Wildlife Biologist	Management Indicator Species, Special Status Species, Biological Assessment, Biological Evaluation
Susan Riggs	Senior Air Scientist	Air Quality
Melissa Sartorius	GIS Specialist	GIS Analysis, Mapping
Tisha Schuller	Project Manager	Project Management, Fire and Fuels, Interagency Coordination, Technical Review
Matt Schweich	Project Manager / Senior Ecologist	Project Management, Fire and Fuels, Technical Review
Cherie Walth	Project Archeologist	Cultural Resources, Transportation, Inventoried Roadless Areas.
Lisa Welch	Senior Planner	Recreation, Visual Resources, Economics

This page left intentionally blank.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

Federal Recycling Program Printed on Recycled Paper