Rocky Messenger-Howard Fuels Management Project

Environmental Assessment

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

This environmental assessment (EA) was prepared to address the potential environmental effects of the Rocky Messenger-Howard Fuels Management Project. The information in this EA will be used in making the decision 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).

1.2 DESCRIPTION OF THE PROJECT

The USDA Forest Service (USFS) plans to implement treatments for the Rocky Messenger-Howard Fuels Management Project, located between Lake George and Elevenmile Reservoir, in Park County, Colorado (**Figure 1-1**). The project would include a combination of mechanical and prescribed fire treatments to reduce wildfire 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

The project area includes 14,942 acres in part or all of sections 30-32, Township 12 South, Range 71 West; sections 25-27 and 33-36, Township 12 South, Range 72 West; sections 4, 5, 8, 9, 16, 17, 20, and 21, Township 13 South, Range 71 West; and sections 1-5, 7-11, 15-17, and 20, Township 13 South, Range 72 West (**Figure 1-1**). About 2,060 acres of this area would not be treated; mechanical treatments would be applied to 9,073 acres; and prescribed fire would be applied to 11,448 acres. 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.

1.3 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 Buffalo Creek fire traveled 10 miles and the Hayman fire traveled 19 miles.

The recent Buffalo Creek, Hi Meadow, Schoonover, and Hayman fires all occurred near the project area in similar fuel types to those that would be treated by the proposed project. In addition to destroying or damaging private 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. Fisheries and aesthetic values were also degraded. Wildlife habitats, forest products, and recreational opportunities were lost. Flash floods originating in the area burned by the Buffalo Creek fire caused loss of human life and destroyed homes, bridges, highways, and other facilities. Flash floods and debris movement have also caused extensive damage in and around other nearby burn areas. 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.

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Figure 1-1 Project Location and Management Areas

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The economic effects of these fires were staggering. The Hayman Fire alone cost more than $38 million to suppress and more than $24 million for just the initial emergency rehabilitation measures. More than 10,000 residents were evacuated from their homes, sometimes for weeks, during the Hayman fire alone.

Dense forest conditions also 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 fire risk. Reducing the potential for outbreaks of insects and disease by increasing forest health is important to preventing future high-intensity wildfires. Several disease and insect infestations have affected the project area's forests. Dwarf mistletoe is prevalent throughout much of the project area, adding to the flammability of the ponderosa pine. Mountain pine beetle is also increasing in the ponderosa pine. A spruce budworm outbreak in the mid-1980s killed approximately 60 percent of the Douglas-fir within the project area, further increasing fuel loads.

The Rocky Messenger-Howard project area is also within one of the highest fire occurrence areas of the Pike and San Isabel National Forest and Cimarron and Comanche National Grasslands (PSICC). This area averages five to eight ground lightning strikes per square mile annually. Dense forests and heavy fuel loads increase the potential for lightning fires to grow rapidly to uncontrollable size during severe weather conditions.

Development, population, and recreational use have also increased in the project area. There are hundreds of homes on private land in-holdings within and adjacent to the project area. The project area is located in Park County, which has a population of 15,000, and adjacent to Teller County, which has 20,000 residents. Approximately 600 people live in the Lake George area adjacent to the project area. The Colorado Springs metropolitan area, with a population of more than 450,000 is less than 40 minutes away. The large-scale Hayman Fire affected communities in each of these areas.

1.4 PURPOSE AND NEED

The National Fire Plan (NFP) identifies the areas around Lake George and Florissant as urban interface communities at risk from large-scale wildfire (NFP 2002). In addition, the Upper South Platte River watershed, which includes the project area, provides a substantial proportion of the water supply for the Denver metropolitan area. The NFP identifies two objectives that would be specifically addressed in the Rocky Messenger-Howard project area:

- "Assign highest priority for hazardous fuels reduction to communities at risk and readily accessible municipal watersheds."
- "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 Rocky Messenger-Howard Fuels Management Project is to create sustainable forest conditions that are resilient to fire, insects, and diseases, while still providing for diverse wildlife habitats and recreational opportunities and reducing the risk of large-scale, high-intensity wildfires. This can be accomplished by reducing forest canopy densities and ground and ladder fuels across the landscape.

The proposed project would also contribute to the goals of the Front Range Fuels Treatment Management Partnership. This partnership is a cooperative effort of the USFS, National Park Service, Bureau of Land Management, and the Colorado State Forest Service and is designed to address fire and fuels management issues at a landscape scale across public and private land boundaries along Colorado's Front Range.

1.5 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 fuels treatments in the Rocky Messenger-Howard project area of the South Park Ranger District on the PSICC. In addition, the scope of the proposed action would include temporary road construction and reconstruction, temporary fire line construction, slash treatment, 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 Rocky Messenger-Howard project area. The environmental analysis documented in this EA is tiered to the Land and Resource Management Plan for the PSICC (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 Park 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. Her decision will be documented 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 would be conducted. This decision will take into account the flexibility needed to successfully meet the purpose 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, sets forth 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 its 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), wild and scenic rivers (pages III-16 to III-17), cultural resources (page III-17), visual resources (pages III-18 to III-19), recreation (pages III-19 to III-24), 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), soil resources (III-72 to III-74), and fire and fuels (III-81 to III-82) and are hereby incorporated by reference. This project was also designed in conformance with the area-specific Forest Plan direction that applies to specific MAs. The following section provides the general guidance for each MA within the Rocky Messenger-Howard project area.

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 three MAs in the project area (**Figure 1-1**).

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

This MA covers 61 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 recreational opportunities. The relevant standards and guidelines for MA 2B are found in the Forest Plan on pages III-116 to III-124.

Management Area 4B (Emphasis on habitat for management indicator species)

This MA covers 18 percent of the project area. The habitat needs of one or more management indicator species (MIS) are emphasized by optimizing habitat capability and promoting species diversity. Vegetation is managed through a variety of treatments to provide optimum habitat for MIS. Recreation and other human activity is managed to favor the needs of MIS. The relevant standards and guidelines for MA 4B are found in the Forest Plan on pages III-134 to III-143.

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

This MA covers 21 percent of the project area. Production and utilization of small round wood used for fuelwood, posts, poles, or props is emphasized. The relevant standards and guidelines for MA 7D are found in the Forest Plan on pages III-179 to III-188.

2.2 PUBLIC INVOLVEMENT AND ISSUE IDENTIFICATION

The first step in environmental analysis is to determine what needs to be analyzed. To do this, 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 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 analysis is 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 October 31, 2003 in the Park County Republican and Fairplay Flume. At the same time, a newsletter was mailed to a group of interested parties that had previously requested notification of upcoming projects on the PSICC. In addition to these individuals, newsletters were mailed to all adjacent landowners and homeowners' associations. The newsletter described the project, presented the purpose of and need for the proposal, provided information on how to participate in the scoping process, and set the date and place for the public open houses. Interested parties were invited to comment on the proposal. A total of 554 newsletters were mailed. Comments were accepted on the proposed project for a 15-day period ending November 14, 2003.

Public open houses were held on November 5 and 8, 2003 in Lake George, Colorado to inform the public about the proposed project and to 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 project team members. Those attending the meetings were asked to complete feedback sheets that asked for input—questions, concerns, and suggestions—as to what individuals thought about the project. Twenty-four people attended these meetings.

2.2.2 Development of Issues

Thirteen written responses were received from individuals, groups, and government agencies during the scoping period, seven from the open houses and six in the mail. These letters were reviewed and discussed by the interdisciplinary 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 receive full analysis and disclosure, but not a key issue for

alternative development; or (4) listed as a substantial issue to receive full analysis and disclosure and a key issue for alternative development.

Eleven preliminary issues were identified for consideration based on public comments received during scoping. Further internal discussion during comment analysis lead to the identification of five additional issues, bringing the total number of identified issues to 16. Two issues (liability for loss of private property and fuel treatment on private land) were determined to be not relevant to the decision or beyond the scope of the project and are not discussed further in this EA. The remaining 14 issues are discussed in the next two sections.

2.2.3 Issues Eliminated from Detailed Study

Five 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. Wild and Scenic Rivers

The South Platte River in Elevenmile Canyon is eligible for addition to the Wild and Scenic Rivers system. The Forest Plan requires that this river segment be protected "from activities that could diminish or change the free-flowing character, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation" (Forest Plan III-16). In addition, the Record of Decision (ROD) for the Wild and Scenic River Study of the South Platte River and North Fork of the South Platte River (USFS 2004a) amended the Forest Plan and created a new management area with new goals, standards, and guidelines. Specific resource issues that could affect Wild and Scenic River values, such as vegetation, water quality, visual resources, recreation, and fish and wildlife, are discussed in detail in the EA. All project activities would comply with the Forest Plan goals, standards, and guidelines to protect the qualities of the South Platte River in Elevenmile Canyon that led to its consideration as a Wild and Scenic River.

Issue 2. Noxious Weeds

Ground-disturbing activities associated with the proposed action may increase the susceptibility of the project area to invasion and spread of noxious weeds. Several noxious weeds currently occur in the project area and are presently being treated with the appropriate herbicides. The potential for the introduction and spread of noxious weeds would be minimized by the application of standard resource protection, mitigation, and monitoring measures designed to prevent, detect, and eliminate noxious weed infestations in the project area.

Issue 3. Air Quality

The concern with air quality is primarily related to smoke generated by prescribed burning as part of the proposed action. All burning would comply with State of Colorado air quality guidelines. Mitigation measures would be used to avoid producing smoke at times and places that would affect sensitive people. For example, there would be no burning near private summer camp facilities when children are present.

Issue 4. 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 No. 11593. In addition, USFS policy requires the completion of cultural resource inventories before all ground-disturbing activities. Cultural resource surveys were completed for the area and were forwarded to the State Historic Preservation Officer (SHPO) for their concurrence. Concurrence from the SHPO on the findings was received. Two pre-historic sites (campsites with intact archeological deposits) and two historic sites (construction camps associated with the Midland Railroad) that are eligible or potentially eligible for listing on the National Register of Historic Places were identified. Disturbance of these four sites would be avoided during project implementation. In addition, any treatment contracts would contain a provision for protection of cultural resources if any sites are discovered during operations.

Issue 5. 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). Project design standards and mitigation would be used to minimize risks to public health and safety. For example, there would be no burning near private summer camp facilities when children are present. In addition, treatments that carry a higher level of risk, such as broadcast burning, would be avoided directly adjacent to and downwind of private lands. Treatments with a lower level of risk, such as mechanical thinning and slash treatment, would be used adjacent to private land.

2.2.4 Issues Analyzed in Detail

The following nine 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 full disclosure was determined to be appropriate. No key issues, which would provide a focus for action alternative development, were identified. Each of these issues is summarized below and is discussed in detail in Chapter 3 of this EA.

Issue 1. Vegetation

Forested stands in the project area tend to be dense and lack a diversity of age classes of trees and are, therefore, more susceptible to crown fire, insects, and disease. One of the purposes of the proposed action is to create forest conditions that are resilient to fire, insects, and diseases. The proposed action would substantially alter the existing vegetation in the project area from its present condition in order to meet this purpose.

Issue 2. Fuels/Fire Behavior

One of the primary purposes of the proposed action is to reduce fuel loads and the potential for crown fires so that in the event of a wildfire, suppression opportunities and 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 altering potential fire behavior.

Issue 3. Watersheds

Each of the activities associated with the proposed action may increase water production, decrease water quality, increase soil erosion, or otherwise affect watersheds. Small numbers of wetlands are found in the project area. Effects to, or conversion of, wetlands is a federally regulated activity under Section 404 of the Clean Water Act.

Issue 4. Management Indicator Species

NFMA establishes the use of MIS for planning and monitoring the implementation of land and resource management plans. MIS include species whose response to management activities may be helpful in predicting the likely response of a wide range of species with similar habitat requirements to management activities. The Forest Plan (III-28) has identified 20 potential MIS for the PSICC. From this list, five species (mule deer, Abert's squirrel, mountain bluebird, red-naped sapsucker, and green-tailed towhee) were selected for detailed evaluation because they are most likely to be affected by the proposed project.

Issue 5. Special-status Species

The Endangered Species Act (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 (Forest Service Manual [FSM] 2670, USFS 2003a). The potential effects of the alternatives will be evaluated in detail for 2 threatened species and 11 sensitive species that may occur in the project area.

Issue 6. 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. No new system roads would be constructed. Minor 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. New temporary roads would be needed to access some areas; however, these roads would be closed and obliterated after treatments are complete. Overall, there would be no long-term change in the road system in the project area.

Issue 7. Recreation

The project area receives extensive recreational use from spring through the end of the fall hunting season, including camping, hiking, hunting, off-highway vehicle (OHV) 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. Management activities associated with the proposed project may, at times, interfere with visitor traffic, hunting, and other recreational uses in the area.

Issue 8. Visual Resources

Part or all of some proposed treatment units can be viewed from U.S. Highway 24; Park County Roads 61, 90, 92, 96, 98, and 403; and several National Forest System Roads (NFSRs). Some treatment units for the proposed projects are located in MA 2B, which requires that visual resources be managed to maintain or improve the quality of recreational opportunities. Other units are located within MAs 4B and 7D, which allow management activities to visually dominate the foreground and middle-ground provided 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 non-treated and treated areas.

Issue 9. 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) may be more important than the direct, monetary cost. The cost may also be justified because risk of wildfire to private property that surrounds the project area would be reduced. Timber production would not be emphasized by the proposed project; however, commercial timber products would be sold, if possible, 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.

2.3 ALTERNATIVE DEVELOPMENT

Following completion of scoping and issue analysis, the interdisciplinary team of resource specialists 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. Four 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 two 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 were eliminated from further analysis in the EA.

Alternative A – Increased Extent of Fuel Treatments

This alternative would include all treatments that are part of the proposed action, as described below. In addition, it would include mechanical and prescribed fire treatments in large parts of units 63A, 63B, and 63C above Elevenmile Canyon (**Figure 2-1**). There are currently no roads into this area. Approximately three miles of new specified road and an unknown length of temporary roads would have to be constructed to access this area. The new road would cross steep, potentially unstable slopes and would likely be visible from Park County Road 92. There are no homes or other improvements in close proximity to this area. Any fire starting here would likely move to the north and east on prevailing winds and would encounter treated areas before reaching private property. This alternative was eliminated from detailed study because of the potential for adverse effects to watershed and visual resources, the need to construct a substantial length of new road in a currently unroaded area, the distance to private property, and the extent of treated land between this area and private property.

Alternative B – Modification of Transportation System

This alternative would include all treatments that are part of the proposed action, as described below. In addition, it would include changes to the transportation system. A roads analysis would be conducted and unnecessary roads would be closed. All roads not designated as open to OHV use would be physically

Figure 2-1 Alternative 1 – Proposed Action

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closed. This alternative was eliminated from detailed study because changes to the transportation system do not help meet the purpose and need of the proposed action, and addressing OHV use on existing roads is outside of the scope of the project.

2.3.2 Alternatives Considered in Detail

This section describes the features of the two alternatives that were considered in detail.

Alternative 1 – Proposed Action

This alternative is the proposed action described in Chapter 1. It is the initial proposal developed to meet the project purpose and need. Treatments are expected to begin no earlier than 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 approximately 5-year period beginning in 2005. Prescribed burning would also begin in 2005 and continue for an approximately 5-year period, again depending on availability of funding.

Alternative 1 includes two primary components, mechanical treatments and prescribed fire treatments, both described below. **Table 2-1** shows the types of treatments that would be used in each unit as well as the size of each unit. While every acre may be treated in some units, it is likely that parts of each unit would not be treated because of steep slopes, riparian areas, treatment feasibility, or other concerns. **Table 2-2** summarizes the extent of each combination of treatment types. Potential changes to the road system are also discussed below. Treatment units and the road system that are part of this alternative are shown in **Figure 2-1**.

Mechanical Treatments

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 density. Trees would be thinned in a manner that creates clumps of trees intermingled with small, irregular openings or areas of lower tree density. For example, a clump of three to ten trees that is three to twenty feet from the nearest neighboring tree could be left adjacent to an opening or area of low tree density, containing zero to three trees. These clumps and openings would generally be small, less than four acres. However, in some areas with bad infestations of mountain pine beetle, dwarf mistletoe, or other insects or disease infestations, larger openings up to ten acres may be created.

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 habitats. The openings would generally be located on south and west exposures where openings historically would have persisted for decades. The areas that would be targeted for openings are predominantly dense seedling and sapling stands or are adjacent to small openings that have shrunk from tree encroachment over the last century.

Approximately 9,073 acres of forested stands, on slopes of 35 percent or less, would be mechanically thinned to reduce stem density, basal area, and ladder fuels. Most of these stands are dominated by ponderosa pine, but Douglas-fir, aspen, and other species are also present. 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 effectively reduce canopy density. Ponderosa pine and aspen would be favored over Douglas-fir for retention in an effort to restore the pre-settlement condition of these stands.

The desired average canopy closure for the treated acres is 15 to 25 percent, with a high degree of variation. Variation would depend on many factors including retention of pockets of snags and down wood, treatment of pockets of dwarf mistletoe, mountain pine beetle or other pathogens, aspect, slope, and others. The 15 to 25 percent canopy closure level would adequately reduce crown fire hazard, improve forest health, and promote stand characteristics that resemble historic conditions for about 20 years following treatment.

Pockets of older, platy-barked trees would be targeted as leave clumps, and areas of younger trees, pockets of dwarf mistletoe-infected trees, or pockets of trees infected with insects or other pathogens would be targeted for removal to create openings. Actual clumps and openings would be dictated by stand structure and site characteristics. Overall, canopy cover may differ substantially from one point to another, but should average 15 to 25 percent across each stand.

Stand densities would also be variable, ranging from 10 to 15 square feet of basal area per acre on the low end to 80 square feet of basal area per acre on the high end. Low-density areas would be focused primarily near private lands, where risk to structures and private property is highest. They would also be focused on defensible locations for fire suppression and areas of insect or disease infestations.

Approximately 5,869 acres of the project area would not be treated by mechanical means. Examples of areas that would not be treated include non-forested (meadow) areas, a gravel pit, riparian areas (within 100 feet of streams), wetlands, forested stands with insufficient access, and forested stands that are too steep to effectively treat with mechanical methods.

A combination of commercial and non-commercial methods (including service contracts) would be used to dispose of cut trees and slash. In some areas, logs of commercial size would be produced, although production of commercial products is not the purpose of the project. Commercial removal of logs would only be done to help reduce treatment costs where, or if, feasible. Ground yarding would be used to move logs to landings. No helicopter or cable yarding is anticipated. Slash at landings would be chipped or piled and burned. In other areas, no commercial-sized logs would be produced.

Slash from all mechanical treatments may be treated by lopping and scattering, crushing, piling and burning, broadcast burning, chipping, or other methods. Piling would be done by tractors where feasible, and by hand on steeper slopes and other areas that are not accessible to tractors. Where slash is chipped, chips would generally be removed from the area, but may be spread across the treatment area to address certain resource concerns, such as soil erosion. Although non-commercial and commercial mechanical treatments would occur over the entire 9,073 acres, the level of treatment would range between no cutting in some areas to small patch cuts that remove all trees in other areas.

Table 2-1 Proposed Treatments by Unit – Alternative 1

		Treatments				
			Slash Treatment			
Unit	Acres	Mechanical Thinning	All Mechanical	Pile Burning	Broadcast Burning	Temporary Roads (miles)
Rocky Messenger						
1	76	Yes	Yes	Yes	No	0.0
2A	57	No	No	No	No	0.0
2B	44	No	No	No	Yes	0.0
2C	109	No	No	No	No	0.0
2D	22	Yes	Yes	Only landing piles	No	0.0

Table 2-1 Proposed Treatments by Unit – Alternative 1

Unit	Acres	Treatments				Temporary Roads (miles)
		Mechanical Thinning	Slash Treatment		Broadcast Burning	
			All Mechanical	Pile Burning		
3	73	Yes	Yes	Yes	Yes	0.0
4	320	Yes	Yes	Yes	Yes	0.0
5	48	Yes	Yes	Yes	No	0.0
6A	90	No	No	No	Yes	0.0
6B	7	No	No	No	No	0.0
7	82	Yes	Yes	Yes	Yes	0.6
8	96	Yes	Yes	Yes	Yes	0.2
9	80	Yes	Yes	Yes	Yes	0.3
10	67	Yes	Yes	Yes	Yes	0.3
11	18	No	No	No	Yes	0.0
12	56	Yes	Yes	Yes	Yes	0.5
13A	54	Yes	Yes	Yes	No	0.0
13B	13	No	No	No	Yes	0.0
13C	11	No	No	No	Yes	0.0
14A	12	Yes	Yes	Yes	No	0.0
14B	43	Yes	Yes	Yes	Yes	0.3
15	64	Yes	Yes	Yes	Yes	0.1
16	119	Yes	Yes	Yes	Yes	0.3
17	25	No	No	No	Yes	0.0
18A	27	Yes	Yes	Yes	Yes	0.0
18B	57	Yes	Yes	Yes	No	0.3
19	50	Yes	Yes	Yes	No	0.2
20A	59	Yes	Yes	Yes	No	0.1
20B	82	Yes	Yes	Yes	Yes	0.5
21A	27	Yes	Yes	Yes	No	0.0
21B	17	Yes	Yes	Yes	Yes	0.0
22A	368	No	No	No	Yes	0.0
22B	160	No	No	No	No	0.0
22C	21	No	No	No	No	0.0
22D	42	Yes	Yes	Only landing piles	No	0.0
23	116	Yes	Yes	Yes	No	0.9
24	143	Yes	Yes	Yes	No	1.0
25A	49	No	No	No	No	0.0
25B	12	Yes	Yes	Only landing piles	No	0.0
26A	58	No	No	No	No	0.0
26B	14	Yes	Yes	Only landing piles	No	0.0
26C	19	Yes	Yes	Only landing piles	No	0.0
27	18	No	No	No	No	0.0
28A	8	Yes	Yes	Only landing piles	No	0.0
28B	156	Yes	Yes	Yes	Yes	1.0
29A	32	No	No	No	No	0.0
29B	16	Yes	Yes	Only landing piles	No	0.0

Table 2-1 Proposed Treatments by Unit – Alternative 1

Unit	Acres	Treatments				Temporary Roads (miles)
		Mechanical Thinning	Slash Treatment		Broadcast Burning	
			All Mechanical	Pile Burning		
30A	15	Yes	Yes	Only landing piles	No	0.0
30B	209	Yes	Yes	Yes	Yes	0.4
30C	12	Yes	Yes	Yes	No	0.0
31	181	Yes	Yes	Yes	No	0.5
32A	67	Yes	Yes	Yes	No	0.3
32B	48	Yes	Yes	Only landing piles	No	0.5
33A	3	Yes	Yes	Only landing piles	No	0.0
33B	15	Yes	Yes	Yes	No	0.0
33C	6	Yes	Yes	Yes	No	0.0
33D	183	Yes	Yes	Yes	Yes	0.0
33E	13	Yes	Yes	Yes	No	0.0
34	36	Yes	Yes	Only landing piles	No	0.0
35A	127	Yes	Yes	Yes	Yes	0.2
35B	34	Yes	Yes	Yes	No	0.0
36A	47	Yes	Yes	Yes	No	0.0
36B	65	Yes	Yes	Yes	No	0.0
36C	144	Yes	Yes	Yes	Yes	0.4
36D	11	Yes	Yes	Only landing piles	No	0.0
36E	11	Yes	Yes	Only landing piles	No	0.0
36F	1	Yes	Yes	Only landing piles	No	0.0
37A	17	Yes	Yes	Yes	No	0.0
37B	133	Yes	Yes	Yes	Yes	0.6
38	141	Yes	Yes	Yes	Yes	0.7
39	422	Yes	Yes	Yes	Yes	0.0
40A	75	Yes	Yes	Yes	No	0.0
40B	23	Yes	Yes	Yes	Yes	0.0
41A	588	No	No	No	Yes	0.0
41B	56	No	No	No	No	0.0
41C	8	No	No	No	Yes	0.0
41D	41	No	No	No	No	0.0
41E	15	Yes	Yes	Only landing piles	No	0.0
42A	65	Yes	Yes	Yes	No	0.0
42B	189	Yes	Yes	Yes	Yes	1.0
42C	19	Yes	Yes	Only landing piles	No	0.0
42D	2	Yes	Yes	Only landing piles	No	0.0
42E	10	Yes	Yes	Only landing piles	No	0.0
43A	6	No	No	No	Yes	0.0
43B	367	No	No	No	Yes	0.0
44	143	Yes	Yes	Yes	Yes	0.0
45	183	Yes	Yes	Yes	Yes	0.6
46	135	Yes	Yes	Yes	Yes	0.0
47A	53	Yes	Yes	Yes	No	0.5

Table 2-1 Proposed Treatments by Unit – Alternative 1

Unit	Acres	Treatments				Temporary Roads (miles)
		Mechanical Thinning	Slash Treatment		Broadcast Burning	
			All Mechanical	Pile Burning		
47B	18	Yes	Yes	Only landing piles	No	0.0
48A	45	Yes	Yes	Yes	Yes	0.0
48B	3	Yes	Yes	Only landing piles	No	0.0
49	38	No	No	No	Yes	0.0
50A	70	Yes	Yes	Yes	Yes	0.4
50B	7	Yes	Yes	Only landing piles	No	0.0
51	176	Yes	Yes	Yes	Yes	0.4
52	48	Yes	Yes	Yes	No	0.0
53A	12	Yes	Yes	Only landing piles	No	0.0
53B	59	Yes	Yes	Yes	No	0.9
54A	27	No	No	No	No	0.0
54B	8	Yes	Yes	Only landing piles	No	0.0
55A	5	Yes	Yes	Only landing piles	No	0.0
55B	53	Yes	Yes	Yes	No	0.3
56A	60	Yes	Yes	Yes	No	0.3
56B	37	Yes	Yes	Only landing piles	No	0.5
57	37	Yes	Yes	Yes	Yes	0.0
58	47	Yes	Yes	Yes	No	0.3
59	68	Yes	Yes	Yes	No	0.6
60	134	No	No	No	No	0.0
61A	52	Yes	Yes	Yes	No	0.0
61B	33	Yes	Yes	Yes	Yes	0.0
62	59	Yes	Yes	Yes	Yes	0.0
63A	1,225	No	No	No	No	0.0
63B	1,238	No	No	No	Yes	0.0
63C	986	No	No	No	Yes	0.0
63D	164	Yes	Yes	Yes	Yes	0.4
Howard						
1	28	Yes	Yes	Only landing piles	No	0.0
2A	25	No	No	No	No	0.0
2B	4	No	No	No	No	0.0
2C	2	No	No	No	No	0.0
3A	19	Yes	Yes	Yes	No	0.0
3B	71	Yes	Yes	Yes	Yes	0.0
4A	8	Yes	Yes	Yes	No	0.0
4B	133	Yes	Yes	Yes	Yes	0.8
5A	125	Yes	Yes	Yes	Yes	0.7
5B	100	Yes	Yes	Yes	No	0.7
6	87	Yes	Yes	Yes	Yes	0.0
7	47	Yes	Yes	Yes	Yes	0.0
8A	34	Yes	Yes	Yes	No	0.2
8B	101	Yes	Yes	Yes	Yes	0.6

Table 2-1 Proposed Treatments by Unit – Alternative 1

Unit	Acres	Treatments				Temporary Roads (miles)
		Mechanical Thinning	Slash Treatment		Broadcast Burning	
			All Mechanical	Pile Burning		
9	192	Yes	Yes	Only landing piles	No	0.8
10	110	Yes	Yes	Only landing piles	No	0.5
11	126	Yes	Yes	Yes	Yes	0.0
12	56	Yes	Yes	Yes	Yes	0.0
13	11	No	No	No	Yes	0.0
14	3	No	No	No	No	0.0
15	136	Yes	Yes	Yes	Yes	0.0
16	152	Yes	Yes	Yes	Yes	0.5
17	133	Yes	Yes	Only landing piles	No	0.6
18A	156	Yes	Yes	Yes	Yes	0.5
18B	2	Yes	Yes	Only landing piles	No	0.0
19	111	Yes	Yes	Only landing piles	No	0.7
20A	15	Yes	Yes	Yes	Yes	0.0
20B	73	Yes	Yes	Only landing piles	No	0.6
21	118	Yes	Yes	Yes	Yes	0.0
22	61	Yes	Yes	Only landing piles	No	0.3
23	49	Yes	Yes	Only landing piles	No	0.3
24	41	Yes	Yes	Only landing piles	No	0.2
25	41	Yes	Yes	Only landing piles	No	0.4
26	91	Yes	Yes	Only landing piles	No	0.0
27A	182	Yes	Yes	Yes	Yes	1.4
27B	14	Yes	Yes	Yes	No	0.0
28	129	Yes	Yes	Yes	No	1.1
29	42	No	No	No	No	0.0
30	69	Yes	Yes	Yes	No	0.0
31	42	Yes	Yes	Yes	No	0.0
32	36	Yes	Yes	Yes	No	0.0
33	105	Yes	Yes	Yes	Yes	0.9
34	101	Yes	Yes	Only landing piles	No	1.1

Table 2-2 Summary of Treatments – Alternative 1

Treatment Type	Extent (acres)	Proportion of Project Area (percent)
Mechanical Thinning, All Mechanical Slash Treatments and Pile Burning, followed by Broadcast Burning	5,507	37
Mechanical Thinning, All Mechanical Slash Treatments and Pile Burning	2,132	14
Mechanical Thinning, All Mechanical Slash Treatments	1,434	10
Broadcast Burning Only	3,809	25
No Treatment	2,060	14
Total	14,942	100

Prescribed Fire Treatments

Prescribed fire would be used to reduce litter and duff layers, slash produced by mechanical treatment, surface fuels, regeneration, and ladder fuels and to create small openings on 11,448 acres throughout the project area, including many areas that have been mechanically treated. The exact treatments to be used and locations would be determined after mechanical treatments are completed. Before any prescribed burning takes place, detailed burn plans that address site-specific details would be completed and approved. The proposed activities shown in **Tables 2-1** and **2-2** and on **Figure 2-1** represent the maximum potential extent of prescribed fire treatments.

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 mechanical thinning may be lopped and scattered, then broadcast burning would be used to reduce fuels. In area 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 be implemented in mechanical treatment areas until after the completion of non-commercial thinning, commercial sales, service contracts, and public fuelwood use.

Prescribed burning would generally not be used in units directly adjacent to private property or other improvements, especially where private lands would be downwind of the prevailing winds or upslope of the area to be treated. Prescribed burning would be limited to pile burning in units that are farther from private property or other improvements, but where there is still some concern about escaped fires. A combination of pile burning and broadcast burning would be used where there is less concern for escaped fire. Broadcast burning alone would be used in areas that are not treated mechanically, but where some fuel reduction is desired.

Road System

Existing county roads and NFSRs would provide the primary access to the project area. Within the project area, there are 41.8 miles of NFSRs and county roads. NFSRs used for the project would be maintained as needed to accommodate safety or environmental considerations. No new NFSRs would be constructed. Approximately 4.0 miles of existing unclassified (non-system) roads would also be maintained and used for the project, then closed and obliterated once the project is complete. A maximum of 29.7 miles of new temporary roads would be constructed and then closed and obliterated. These 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. The distribution of temporary roads by treatment unit is shown in **Table 2-1**. Approximately 6.3 miles of overland travel routes with minimal clearing of vegetation and no earth movement would be used to access treatment areas. These roads would be covered with slash or other methods would be used to prevent their use once project activities are completed.

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 Forest Service Handbook [FSH] 2509.25, Watershed Conservation Practices Handbook – R2 Amendment 2509.25-96-1 (WCPH) (USFS 1999a) to minimize effects to riparian habitats.

Small Mammals

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

Snag Dependent Species

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

Treatment Operations

- The largest and oldest appearing ponderosa pine and Douglas-fir trees would be protected in burning and thinning operations except when severely infected with insects or diseases.

- South and west slopes would be favored for openings to increase the amount of shrublands. Openings would also be employed near private lands and other locations strategic to fire control to increase areas of aspen or shrublands and remove pockets of disease- or insect-infected trees. Most openings would not exceed ¼ acre and no openings greater than 10 acres would be created.

- 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. They serve no long-term need as roads; therefore, they would be closed and obliterated by the purchaser, contractor, or Forest Service after use.

- 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 P.M. on Friday until midnight on Sunday or 5 P.M. 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 adjacent to designated campgrounds and summer home groups would not occur between May 1 and Labor Day.

- The Fuels Management Specialist would coordinate with the Recreation Specialist as to the timing of activities adjacent to campgrounds, picnic areas, and private summer camps.

Wild and Scenic Rivers

- All project treatments would be designed to protect the qualities of the South Platte River in Elevenmile Canyon that led to its consideration as a Wild and Scenic River. Within this corridor, treatments would generally be limited to prescribed burning within ¼ mile of the river. An exception would be made for the area immediately surrounding the Sleeping Tom summer home group, where mechanical treatments would be used to reduce the risk of wildfire to these structures. Typical design and resource protection measures (such as Forest Plan standards and guidelines (USFS 1984a, USFS

2004a) and the WCPH would be used to protect the free-flowing character, water quality, visual resources, recreational opportunities, fish and wildlife habitats, and other values of the South Platte River.

Wildlife

- 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); 6186 (page III-119); 6261 (page III-137); and 6191, 6334, 6016PI, and 6259 (page III-138) would be followed during project design and implementation.

Mitigation

The following mitigation measures are an integral part of 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.

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 how the site would be protected.

Northern Goshawk

- A goshawk nest survey would be conducted before ground-disturbing activities are conducted.
- A 30-acre boundary surrounding active and historic nest sites would be created for all nests located in the project area.
- From March 1 to August 31, 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 within ¼ mile of all active goshawk nests.
- Management at goshawk nest sites would be designed to conserve or enhance site conditions (for example, thin regeneration).
- From March 1 through September 30, mechanical thinning schedules that cause simultaneous, widespread disturbance across active goshawk fledging habitat would be avoided. Fledging habitat would include areas without constant human disturbance.
- Design silvicultural prescriptions and manage activities to enhance prey species habitat by maintaining vegetative diversity and striving for a balance of structural stages, from stand initiation to late successional, within goshawk fledging habitat.

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 Park Ranger District seed mix for this elevation zone

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 at least two weeks before prescribed burning.
- Mechanical treatments would not be implemented within 200 yards of summer camps on private lands when children are present.
- Prescribed fire treatments, including pile burning and broadcast burning, would not be implemented within one mile of summer camps on private lands when children are present. In addition, prescribed fire treatments farther than one mile away would not be implemented when children are present if smoke would substantially affect the camps.

Watersheds

- Install sediment barriers (for example, silt fence, straw bales, water bars, downed logs, etc.) 50 to 100 feet below temporary road drainage structure outlets to minimize down gradient and downstream sediment transport.
- Ash piles at landings where large slash piles are burned would be ripped or otherwise scarified and seeded.

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.

Fuels/Fire Behavior

- Post-treatment fuel loads would be monitored to ensure that the fuel treatment prescriptions and purpose and need for the project have been met.
- When possible, observed actual fire behavior would be compared with predicted fire behavior to determine if the various treatments met their prescriptions and the purpose and need for the project.

Noxious Weeds

- Disturbed areas, such as roads, landings, and skid trails, would be monitored for at least two years for noxious weeds.

Vegetation

- Post-treatment stand characteristics, such as density, amount of ladder fuels, and crown base heights, would be monitored to ensure that the stand prescriptions and purpose and need for the project have been met.

Watersheds

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

Wild and Scenic Rivers

- Project activities near Elevenmile Canyon would be monitored throughout implementation to ensure that they protect the qualities of the South Platte River that led to its consideration as a Wild and Scenic River. These qualities include the free-flowing character, water quality, and the scenic, recreational, fish and wildlife, and other values that made the river eligible for designation. If adverse effects to any of these resources are noted, corrective actions would be taken to eliminate these effects and protect the characteristics of this area.

Wildlife

- Post-treatment use of habitats by Abert's squirrel would be monitored to better inform future management of this species.

- Post-treatment habitat use by goshawks (if any are found in pre-treatment surveys) would be monitored to determine effectiveness of mitigation measures and responses to the proposed treatments.

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, and changes to the road system would not occur. 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. On-going ecological processes, such as insect and disease infestations, would continue unchecked. The potential for high-intensity, 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. Public and firefighter safety remain similar to the current situation, but may worsen in the future as fuel loads continue to increase.

2.4 COMPARISON OF ALTERNATIVES

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

Table 2-3 Comparison of Effects to Substantial Issues, by Alternative

Issue and Indicator		Alternative 1	Alternative 2
Vegetation			
Mechanical Thinning (acres)		9,073	0
Prescribed Fire (acres)		11,448	0
Total Area Treated (acres)		12,882	0
Total Area Not Treated (acres)		2,060	14,942
Post Project Distribution of Habitat Structural Stages* (HSS) (acres)	HSS 1	1,408	1,408
	HSS 2	33	33
	HSS 3A	363	240
	HSS 3B	108	231
	HSS 3C	0	0
	HSS 4A	9,210	3,273
	HSS 4B	3,325	9,262
	HSS 4C	0	0
	HSS 5	0	0
Insect and Disease Risk		Reduced compared with the current condition for the short- and long-term.	Same as current condition in the short-term, likely to increase in the long-term.
Fuels / Fire Behavior			
Vegetation pattern		The proposed treatments would promote an open mosaic of trees and fuel types that appear similar to pre-settlement conditions.	Dense, homogenous forests, which are substantially different from pre-settlement forest conditions, would be maintained.
Fire regime		The potential for stand-replacing fires* would be reduced. Treatments would mimic the low-intensity* ground fires that were part of the historical mixed-severity fire regime*. Completion of these treatments would promote stand conditions typical of the historical mixed-severity fire regime*.	A large-scale wildfire would exhibit fire behavior that is typical of a stand-replacement fire regime*, rather than the mixed-severity fire regime* that was historically present.
Fuel loads*		Treatments would decrease fuel loads on 77 percent of the project area and increase fuel loads on 10 percent of the project area. Fuel loads would increase on the 13 percent of the project area that is not treated.	Fuel loads would increase on 100 percent of the project area.
Fireline intensity*		The project area is expected to meet Forest Plan standard 6056.	The project area is not expected to meet Forest Plan standard 6056.

Table 2-3 Comparison of Effects to Substantial Issues, by Alternative

Issue and Indicator		Alternative 1	Alternative 2
Fire intensity level* in the year 2009 (percent of ponderosa pine and Douglas-fir stands) under extreme fire weather conditions.	FIL 1 + 2	77	0
	FIL 3 + 4	10	0
	FIL 5 + 6	13	100
Fire type* in the year 2009 (percent of ponderosa pine and Douglas-fir stands) under extreme fire weather conditions.	Surface Fire*	96	0
	Passive Crown Fire*	4	0
	Active Crown Fire*	0	100
Fire Hazard Rating* in the year 2009 (percent of ponderosa pine and Douglas-fir stands) under extreme fire weather conditions.	Low	57	0
	Moderate	13	0
	High	23	78
	Severe	6	22
Predicted burn area between 2004 and 2024 (acres).		473	1,157
Change in predicted burn area from current condition (percent).		-60	-2
Predicted extent of moderate and high intensity wildfires in the project area between 2004 and 2024 (acres).		149	1,117
Watersheds			
Road length in Water Influence Zone* (miles)	Proposed temporary	1.8	0.0
	Total during project life	4.6	2.8
	Obliterated at end of project	1.8	0.0
	Total after project completion	2.8	2.8
Road length on sensitive soils (miles)	Proposed temporary	36.0	0.0
	Total during project life	81.8	45.8
	Obliterated at end of project	36.0	0.0
	Total after project completion	45.8	45.8
Management Indicator Species*			
HABCAP* score[1]	Mule Deer Summer	0.89	0.82
	Mule Deer Winter	0.60	0.60
	Abert's Squirrel Summer	0.35	0.53
	Abert's Squirrel Winter	0.35	0.53
	Mountain Bluebird	0.82	0.62
	Red-naped Sapsucker	0.36	0.43
	Green-tailed Towhee	0.36	0.24

Table 2-3 Comparison of Effects to Substantial Issues, by Alternative

Issue and Indicator		Alternative 1	Alternative 2
Habitat Trend	Mule Deer	Increase	Stable[2]
	Abert's Squirrel	Slight decrease	Stable[3]
	Mountain Bluebird	Increase	Stable[3]
	Red-naped Sapsucker	Slight decrease[5]	Stable[3]
	Green-tailed Towhee	Increase	Stable[2]
Population Trend	Mule Deer	Increase	Stable[2]
	Abert's Squirrel	Slight decrease[4]	Stable[3]
	Mountain Bluebird	Increase	Stable[3]
	Red-naped Sapsucker	Slight decrease[5]	Stable[3]
	Green-tailed Towhee	Increase	Stable[2]
Special Status Species*			
Threatened and endangered species determinations		"Not likely to adversely affect" for bald eagle and Mexican spotted owl	"No effect" for bald eagle and Mexican spotted owl
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 northern goshawk, olive-sided flycatcher, flammulated owl, and American three-toed woodpecker. "No impact" for peregrine falcon, narrow-leaf moonwort, yellow lady's slipper, Colorado tansy-aster, white adder's mouth, Weber's monkey-flower, and Rocky Mountain cinquefoil.	"No impact" for northern goshawk, olive-sided flycatcher, peregrine falcon, flammulated owl, American three-toed woodpecker, narrow-leaf moonwort, yellow lady's slipper, Colorado tansy-aster, white adder's mouth, Weber's monkey-flower, and Rocky Mountain cinquefoil.
Transportation			
Road system length (miles)	Proposed temporary	36.0	0.0
	Total during project life	81.8	45.8
	Obliterated at end of project	36.0	0.0
	Total after project completion	45.8	45.8
Road density (miles per square mile)	Proposed temporary	1.5	0.0
	Total during project life	3.5	2.0
	Obliterated at end of project	1.5	0.0

Table 2-3 Comparison of Effects to Substantial Issues, by Alternative

Issue and Indicator		Alternative 1	Alternative 2
	Total after project completion	2.0	2.0
Recreation			
Quality of recreational experience		Temporary disruption of activities adjacent to treatment areas.	Existing condition unchanged, but higher potential for negative effects to recreational use from large, high-intensity wildfires.
Visual Resources			
Visual quality		Short-term degradation of foreground views adjacent to treatment units. Forest Plan VQOs would be met for all MAs.	Existing condition unchanged, but higher potential for negative effects to visual quality from large, high-intensity wildfires.
Economics			
Present net value		-$4,309,000	-$1,287,000
Net cost		$4,309,000	n/a
Non-price values	Fire size	Reduced in the short-term and long-term.	Maintained in the short-term, likely to increase in the long-term.
	Forest health	Improved in the short-term and long-term.	Maintained in the short-term, likely to decrease in the long-term.
	Wildlife habitats	Some increased, others decreased in the short-term and long-term.	Maintained in the short-term, some increased, others decreased in the long-term as stands age, ecological processes continue, and fires occur.
	Recreational opportunities	Maintained in the short-term and long-term.	Maintained in the short-term, but may decrease over time from poor forest health or large fire occurrence.

*This term is defined in the glossary (Section 4.2).
[1] HABCAP values predict the potential use of an area by MIS. Higher values equal higher potential use. HABCAP modeling is discussed in more detail in Section 3.5.2.
[2] Substantial long-term increases in habitat and population may be caused by wildfire, but the potential for such an event is low.
[3] 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.
[4] But likely indistinguishable from normal population fluctuations.
[5] A slight increase in habitat and population caused by increased density of aspen is anticipated in the long-term.

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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 would occur in the future in or near the 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 its 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 dominated the landscape before European settlement.

Ongoing and future activities may contribute to effects to resources that would 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 described in this section are not part of the decision to be made for this EA. Most would require separate environmental analysis and public involvement. 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 on federal lands and an increase in the number of primary and secondary residences on nearby private lands. Future activities are also likely to be similar, again with an increased emphasis on fuel treatment on federal lands and increased residential use on private lands. The extent of each type of activity is detailed below.

3.1.1 Fuels Treatment

Relatively little fuels treatment has been conducted in the past. Approximately 50 acres of federal land adjacent to the community of Lake George were recently treated to reduce fuels adjacent to private lands.

Extensive mechanical and prescribed fire fuel treatments are ongoing in the Sledgehammer project area, which is located between the Rocky Messenger and Howard portions of the proposed project. **Table 3-1** shows the types and extents of the various treatments that are occurring under the Sledgehammer project. The types of activities that are being conducted under the Sledgehammer project are similar to those proposed for the Rocky Messenger-Howard Project. These two projects would work together to create a 30,000-acre landscape where the potential for extreme fire behavior, the threat of a large-scale wildfire, and the fire risk to surrounding private lands would be substantially reduced.

No future fuel treatment activities are planned on federal lands, although some maintenance treatments are likely in the long-term (15 to 20 years) in both the Sledgehammer and Rocky Messenger-Howard project areas. Some private landowners in the surrounding area have also undertaken fuels reduction on their properties; however, these activities tend to be small in scale and limited to defensible space around structures and other improvements.

Table 3-1 Sledgehammer Project Activities

Category	Extent
Project area size (acres)	12,300
Noncommercial thinning (acres)	950
Commercial or public fuelwood thinning (acres)	3,100
Patch clear cut (noncommercial) (acres)	25
Patch clear cut (commercial) (acres)	125
Douglas-fir salvage (acres)	200
Prescribed fire (acres)	8,000
New road construction (miles)	0.0
Temporary road construction (miles)	2.2
Estimated volume of forest products removed (thousand board feet)	2,500

3.1.2 Grazing

Livestock grazing allotments on federal lands in the project area have been vacant for many years and are expected to stay vacant into the future. Livestock grazing occurs in the Sledgehammer area to the south and west of the Howard portion of the proposed project. Larger nearby parcels of private land are grazed. Levels of livestock grazing on private lands may stay similar into the future or may decrease gradually as larger parcels are divided for residential and recreational use.

3.1.3 Land Exchanges

The USFS is currently working on a 40-acre land exchange with Denver Water. This exchange is located in the southwest corner of the Rocky Messenger-Howard project area near the Elevenmile Reservoir dam. Other possible future land exchanges include isolated 40-acre parcels south of the Howard portion of the project area.

3.1.4 Mining

There has been no mining in the project area, nor is any expected in the future. Extensive small mining has occurred to the north of the project area. The Crystal Creek area, which is north and east of Lake George, has many unpatented mining claims on NFS lands.

3.1.5 Noxious Weeds

Herbicides have been applied to existing noxious weed infestations, but specific records are not available. Continued treatment of known infestations and continued survey for new infestations of noxious weeds is anticipated. Similar or perhaps slightly increased levels of weed control are expected in the future, but specific plans are not available.

3.1.6 Recreation

The project area has been and is currently used for camping, hiking, hunting, OHV 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. Future recreational use is expected to be similar to current uses, with increasing numbers of people participating in these activities. The increased use of OHVs is also a possibility. Future recreation planning is occurring in the Elevenmile Canyon area.

3.1.7 Residential Use

Past residential use was limited to several small towns, such as Lake George, and a limited number of primarily rural residences and summer cabins. In the recent past, there has been an increase in the number of primary residences as well as secondary residences. This trend is expected to continue into the future, with increasing development of residences on private lands adjacent to NFS lands.

3.1.8 Roads

Many of the main access routes through the 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. Future projects may provide the opportunity to close user-created (non-system) roads that have increased in recent years, but no specific proposals are currently being planned. Sediment produced along Park County Road 96 in Elevenmile Canyon has been an ongoing concern and is being addressed in a planning effort specific to this road and other recreational use in Elevenmile Canyon.

3.1.9 Timber Harvest

Approximately 200 acres of timber stands near NFSR 271 were treated in 1985 and 1986. Ponderosa pine stands were cut using a shelterwood prescription and Douglas-fir killed by a spruce budworm outbreak was salvaged. Dead Douglas-fir was also salvaged along NFSR 251 at the same time. The Sledgehammer project is the only recent timber sale activity in the general area. It can be assumed that other timber harvest occurred in the past, but specific records are not available. No future timber harvests are currently planned on NFS lands or known on private lands. Any future timber harvests would likely be secondary to fuel treatments projects, as is the case with the Sledgehammer and Rocky Messenger-Howard projects.

3.1.10 Timber Stand Improvement

Minimal precommercial thinning has taken place on NFS lands. Future precommercial thinning is not anticipated.

3.1.11 Wildfire

Numerous small wildfires, but no recent large fires, have occurred in the project area. The south edge of the Hayman Fire burned to within one mile of Lake George in 2002. An analysis of past fire events across the PSICC suggests that slightly more than one ignition 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 19 percent chance of a fire exceeding 1,000 acres in any 20-year period and a seven percent chance of a fire exceeding 10,000 acres in any 20-year period.

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 found in the project area are ponderosa pine and Douglas-fir (**Figure 3-1**). These two types combined cover more than 80 percent of the area. Ponderosa pine is the most common cover type, occupying 63 percent of the project area. It is found between 8,200 and 9,900 feet in elevation, often as pure stands or with Douglas-fir encroachment in some areas. Most stands are characterized by trees greater than nine inches diameter at breast height (dbh), with roughly half in stands ranging from 11 to 40 percent canopy cover and half in stands with 41 to 70 percent canopy cover. Inventory data from 22 ponderosa pine stands in the western portion of the project area show an average density of 256 trees per acre with a basal area of 64 square feet per acre. Quaking aspen and Douglas-fir occur as minor components in the overstory.

The Douglas-fir cover type is less common than ponderosa pine, occupying 18 percent of the project area. This cover type typically occurs at 8,000 feet to 9,900 feet in elevation and is concentrated in the southwest portion of the project area on steeper north- and east-facing slopes. Douglas-fir stands are generally characterized by trees greater than nine inches dbh with 41 to 70 percent canopy cover. Two inventoried Douglas-fir stands had an average density of 480 trees per acre and 80 square feet of basal area per acre. Regeneration of Douglas-fir, ponderosa pine, quaking aspen, and other conifers contribute to the dense stocking.

Other cover types occupy small portions of the project area. Together, the grass and aspen cover types occupy 14 percent of the project area. Small inclusions of limber and bristlecone pines, riparian vegetation, and shrubs occupy three percent of the project area. The remaining three percent of the project area is barren or covered primarily by rock or water. Each of these cover types is shown in **Figure 3-1**.

3.2.2 Habitat Structural Stages

Habitat structural stages (HSS) describe the current successional stages of the vegetation, corresponding primarily to stand age and tree size. Mature forests (HSSs 4A and 4B), primarily ponderosa pine, cover 84 percent of the project area. Nine percent is occupied by the open grass/forb (HSS 1M) and seedling/shrub (HSS 2S), and just 3 percent is young sapling/pole stands (HSS 3A, 3B, and 3C). The distribution of cover types and HSSs in the project area is shown in **Table 3-2**.

Table 3-2 Current HSS Distribution

Cover Type	HSS (acres) [1]										
	n/a	1M	2S	3A	3B	3C	4A	4B	4C	5	Total
Aspen	0	0	0	67	162	0	52	407	0	0	688
Barren	3	0	0	0	0	0	0	0	0	0	3
Bristlecone Pine	0	0	0	0	0	0	38	0	0	0	38
Douglas-fir	0	0	0	0	35	0	58	2,550	0	0	2,643
Grass	0	1,395	0	0	0	0	0	0	0	0	1,395
Limber Pine	0	0	0	56	0	0	103	138	0	0	297
Ponderosa Pine	0	0	0	117	34	0	3,022	6,167	0	0	9,340
Rock	469	0	0	0	0	0	0	0	0	0	469
True Mountain Mahogany	0	0	17	0	0	0	0	0	0	0	17
Tufted Hairgrass-Sedge	0	13	0	0	0	0	0	0	0	0	13
Water	23	0	0	0	0	0	0	0	0	0	23
Willow	0	0	16	0	0	0	0	0	0	0	16
Total	495	1,408	33	240	231	0	3,273	9,262	0	0	14,942

[1] HSS categories are defined in the glossary (Section 4.2)

Figure 3-1 Vegetation Cover Type

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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 one to 30-year age group. The areas in the grass-forb stage are areas where there has not been any recruitment of tree species. In addition to the species composition and successional stages, stand canopy closure is a useful attribute describing the current condition. Currently, 62 percent of the project area has a canopy closure of 40 percent or greater.

In the forests of Colorado's Front Range, the combination of logging, grazing, and fire suppression have altered the distribution, ages, and types of trees and associated plants and contributed to the dominance of mature HSSs (Foster Wheeler 1999). Timber harvest removed a large portion of the old-growth ponderosa pine and Douglas-fir forests. Trees growing in the openings created by logging did not have to compete with larger trees, and fire suppression kept wildfires from reducing their growth or eliminating them. Grazing reduced the amount of competing grass in the area, which may have aided the survival of the trees that developed during this time. Grazing may also have helped to reduce the number of wildfires by reducing the amount of surface fuel needed to carry a fire. These land use practices created conditions where a larger proportion of the new trees reached maturity than would have under historical disturbance regimes while at the same time eliminating some of the oldest stands in the area (Foster Wheeler 1999).

3.2.3 Vegetation Patterns and Historical Range of Variability

Ponderosa pine is well adapted to fire and possesses fire resistant bark. Following a surface fire, exposed mineral soil is the ideal seedbed for ponderosa pine seedlings. Natural regeneration requires conditions that coincide rather infrequently in the project area, including a good seed crop, ample moisture the spring following seed fall, and favorable seedbed conditions (Foster Wheeler 1999). Areas of past, high-intensity wildfire may remain as grasslands or shrublands for long periods, but eventually ponderosa pine is able to seed in and become established. Without large-scale disturbance, ponderosa pine matures to become the climax species on many sites in the project area. Portions of the project area were heavily logged in the late 1800s and early 1900s. Most mature trees post-date the beginning of European settlement in the 1850s. Current regeneration and pole-sized trees are mostly the product of the fire suppression era, starting about 80 years ago (USFS 2000a).

Douglas-fir is a long-lived climax species found on moister sites in the project area and it will continue to be a dominant component of these stands in the absence of a major disturbance. Mature Douglas-fir trees are relatively fire-resistant with thick bark that provides protection from ground fires (USFS 1965). Dense sapling thickets can form a continuous layer of ladder fuels that enable surface fires to reach the canopy. Before the modern practice of fire suppression, historical fire patterns typically kept the percentage of Douglas-fir at a lower level. Douglas-fir has since encroached into many sites historically dominated by ponderosa pine. Douglas-fir regeneration is often heavy, even in mixed stands of ponderosa pine and Douglas-fir, and when combined with pole-sized trees, is creating a substantial ladder fuel component in many stands (USFS 2000a). The current period between large-scale fires is the longest documented fire-free period since before European settlement (Brown et al. 1999). Historical fires probably limited the success of Douglas-fir reaching larger sizes by clearing understory regeneration. Today, closed ponderosa pine canopies sustain regeneration of shade-tolerant Douglas-fir. The open forest conditions that were more typical pre-settlement would have been less favorable to development of this kind of understory (Graham et al. 2004).

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 a group of insects that feed upon the tree foliage. Damage caused by endemic populations is minor; however, under epidemic populations, heavy defoliation causes tree mortality. Outbreaks of defoliators are characteristically sporadic. During the peak of the outbreak, defoliation can be extensive and may cause large-scale host mortality. An outbreak of spruce budworm occurred in the project area in the mid-1980s. This caused mortality of 60 percent of the pole-sized and larger Douglas-fir in the project area and surrounding portions of the PSICC. 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 load. An outbreak of Douglas-fir tussock moth occurred in 1993 and 1994 in the neighboring South Platte Ranger District of the PSICC. This outbreak was one of the largest recorded for Douglas-fir tussock moth in Colorado (USFS 2000a). Other important defoliators that are endemic to the coniferous forests within the project area include the western spruce budworm and the Pandora moth. Currently, defoliation by these two 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. In forests of the western United States, several species of bark beetles have caused the greatest amount of mortality. These include the western pine beetle, mountain pine beetle, Douglas-fir beetle, and the spruce beetle. Ongoing outbreaks of mountain pine beetle (MPB) are killing large areas of ponderosa pine and lodgepole pine in Colorado, and threaten un-infested areas. In addition, several species of beetle within 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.

A common sign of bark beetle attack are the 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 the trees within dense stands 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 and disease. While MPB occurrence in the project area would be described as endemic, ponderosa pine stands are approaching the stage where the MPB population may increase and cause widespread mortality. The abundance of MPB and subsequent mortality of ponderosa pine 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 other insects, accelerating the death of the tree. Suppression of wildfire 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). Areas of mistletoe-infected trees are present in the ponderosa pine and Douglas-fir stands in the project area.

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 not appreciably change the current species composition in the project area. No stands would be converted from their current dominant vegetation type. However, preferential removal of Douglas-fir during mechanical thinning of ponderosa pine stands would reduce the amount of this species in many stands. Likewise, young Douglas-fir regeneration would be reduced by broadcast burns. Aspen would increase in frequency because it would be favored for retention and because it tends to regenerate when stands of conifers are thinned. **Table 3-3** displays the acres of each cover type in the project area to receive each type of treatment.

Table 3-3 Cover Types Treated – Alternative 1

Cover Type	Treatment (acres)					
	Broadcast Burning Only	Mechanical Thinning, All Mechanical Fuel Treatments	Mechanical Thinning, Pile and Burn, Broadcast Burn	Mechanical Thinning, Pile and Burn	No Treatment	Total
Aspen	239	43	197	146	64	689
Barren	0	0	0	0	3	3
Bristlecone Pine	3	0	0	0	36	38
Douglas Fir	757	34	611	375	865	2,642
Grass	209	158	606	239	183	1,395
Limber Pine	177	0	55	0	66	298
Ponderosa Pine	2,177	1,178	3,919	1,358	708	9,338
Rock	235	14	100	15	106	469
True Mountain Mahogany	7	0	11	0	0	17
Tufted Hairgrass Sedge	0	3	9	0	1	13
Water	5	1	0	0	17	22
Willow	0	4	0	0	12	16
Total	3,809	1,434	5,507	2,132	2,060	14,942

Habitat Structural Stages

Alternative 1 would alter the distribution of HSS in the project area through the mechanical thinning of ponderosa pine and Douglas-fir stands. The treatment is designed to thin from below to a target basal area of 30 to 50 square feet per acre. This would reduce canopy closure, open up stands, and potentially alter HSSs. Within any stand, there may be some areas that would receive little treatment, while small openings may be created in other parts of the same stand. The overall effect would be to move 5,937 acres of HSS 4B to 4A and 123 acres of HSS 3B to 3A in ponderosa pine, Douglas-fir, aspen, and limber pine

stands. Openings that are created within stands would be small enough that no substantial effect of converting forested HSSs to open (grass or shrub) HSSs 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 – Alternative 1

Cover Type	HSS (acres)										
	n/a	1M	2S	3A	3B	3C	4A	4B	4C	5	Total
Aspen	0	0	0	166	63	0	277	182	0	0	688
Barren	3	0	0	0	0	0	0	0	0	0	3
Bristlecone Pine	0	0	0	0	0	0	38	0	0	0	38
Douglas-fir	0	0	0	0	35	0	1,065	1,543	0	0	2,643
Grass	0	1,395	0	0	0	0	0	0	0	0	1,395
Limber Pine	0	0	0	56	0	0	157	84	0	0	297
Ponderosa Pine	0	0	0	141	10	0	7,673	1,516	0	0	9,340
Rock	469	0	0	0	0	0	0	0	0	0	469
True Mountain Mahogany	0	0	17	0	0	0	0	0	0	0	17
Tufted Hairgrass-Sedge	0	13	0	0	0	0	0	0	0	0	13
Water	23	0	0	0	0	0	0	0	0	0	23
Willow	0	0	16	0	0	0	0	0	0	0	16
Total	495	1,408	33	363	108	0	9,210	3,325	0	0	14,942

Table 3-5 Change in HSS Distribution – Alternative 1

Cover Type	HSS (acres)										
	n/a	1M	2S	3A	3B	3C	4A	4B	4C	5	Total
Aspen	0	0	0	99	-99	0	225	-225	0	0	0
Barren	0	0	0	0	0	0	0	0	0	0	0
Bristlecone Pine	0	0	0	0	0	0	0	0	0	0	0
Douglas-fir	0	0	0	0	0	0	1,007	-1,007	0	0	0
Grass	0	0	0	0	0	0	0	0	0	0	0
Limber Pine	0	0	0	0	0	0	54	-54	0	0	0
Ponderosa Pine	0	0	0	24	-24	0	4,651	-4,651	0	0	0
Rock	0	0	0	0	0	0	0	0	0	0	0
True Mountain Mahogany	0	0	0	0	0	0	0	0	0	0	0
Tufted Hairgrass-Sedge	0	0	0	0	0	0	0	0	0	0	0
Water	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	0	123	-123	0	5,937	-5,937	0	0	0

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. Douglas-fir regeneration, a product

of fire suppression, would be largely removed. Aspen, a minor component of the forest, would be retained, and post-treatment conditions would favor its ability to persist. No seeding or planting is planned, and natural regeneration would occur. Treated areas would be returned to conditions more closely resembling the historic range of variability.

The Stand Visualization System (SVS), a component of the Forest Vegetation Simulator (FVS) (Reinhardt and Crookston 2003) was used to produce before and after images of a selected treatment unit. Inventory data from a stand near the western edge of the project area was used to visually represent a typical ponderosa pine stand in the project area. In 2004, the basal area is 79 square feet per acre with 251 trees per acre. Ponderosa pine regeneration has formed ladder fuels beneath large patches of continuous canopy (**Figure 3-2**). This stand was then treated with a simulated thinning from below to 40 square feet per acre followed by pile burning of the slash. Following these treatments, a broadcast burn was simulated using typical weather parameters for this type of prescribed fire. The lower tree density and the absence of ladder fuels resulted in a light surface fire. One overstory tree was killed by the simulated burn, and can be seen in the center of the overhead view of the lower image in **Figure 3-2**, showing the stand in 2009. This simulation demonstrates the success of the proposed treatments in the removal of fuel accumulations and the creation of a more open canopy structure.

Insects and Disease

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

Cumulative Effects

There have been few silvicultural activities in the project area; therefore, active fire suppression has been the primary factor driving forest succession. The Sledgehammer Project is an ongoing fuels reduction project located between the Rocky Messenger and Howard portions of the project area. Combined with the Sledgehammer project, the proposed project would have the cumulative effect of creating a contiguous area of treated land, increasing overall ecosystem health of the larger landscape.

The proposed project would begin to reverse the effects of fire suppression and other activities by restoring ponderosa pine as the dominant overstory species. Douglas-fir encroachment into ponderosa pine stands and adjacent grasslands would be removed, leaving a structure and composition more similar to historic conditions. Once implemented, the use of prescribed fire or other fuel-reducing methods would be necessary to maintain desired forest conditions.

In addition to altering forest composition and structure, overall forest health would be improved by the reduction of forest pests, primarily dwarf mistletoe and MPB. Lower stand densities would restrain the natural, endemic populations of forest pests from reaching epidemic proportions and causing widespread mortality. A secondary benefit to lower forest pest populations would be the reduction in fuels accumulation by deadfall.

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Figure 3-2 Current Condition and 5 Years Post-Treatment

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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, Douglas-fir would continue to increase in frequency in ponderosa pine stands, and the current extent of Douglas-fir stands would expand.

Habitat Structural Stage

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 regenerating Douglas-fir, causing a decline in ponderosa pine and aspen. This pattern would continue until a landscape-level disturbance, such as wildfire 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 within 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 populations 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. The positive cumulative effects of the Sledgehammer and Rocky Messenger-Howard project described in Alternative 1 would not be realized, and the current condition in the project area would remain. Treatments designed and analyzed for the proposed project 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.

3.3 FUELS/FIRE BEHAVIOR

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

3.3.1 Vegetation Patterns

The pre-settlement ponderosa pine forest was an open mosaic with fewer trees, greater age diversity, and more openings across the landscape than the area displays today. Ponderosa pine forests today tend to be denser, more even-aged, younger, and more homogeneous than the pre-settlement condition (Foster Wheeler 1999). Ladder fuels and accumulations of ground fuels are much more common than they would have been historically.

Fire suppression, early 20th century timber harvest, and other land use practices in the last century have allowed Douglas-fir to expand into areas formerly dominated by ponderosa pine. Douglas-fir is not as tolerant of fire as ponderosa pine. Frequent fires in the past probably reduced the proportion of Douglas-fir compared to ponderosa pine (Foster Wheeler 1999).

3.3.2 Fire Regimes

Historic fire patterns varied both in size and intensity across the landscape. Fires in open ponderosa pine woodlands of the lower montane zone where grass and other herbaceous fuel types are well developed tend to be surface fires of relatively low intensity and high frequency. These fires generally killed only smaller trees, while clearing surface fuels. Lower montane ponderosa pine forests generally were characterized by a frequent, low-severity fire regime before the mid-1800s. Surface fires were sufficiently frequent to prevent open woodlands from developing into dense stands (Romme et al. 2003).

Most of the ponderosa pine and Douglas-fir forests within the montane and mixed conifer zones of the Front Range were characterized by a mixed-severity fire regime. Fires recurred at variable intervals, ranging from a decade to a century, and varied in size from very small (less than one acre) to very large (tens of thousands of acres) (Romme et al. 2003). Large-scale fires occurred on an average 50-year cycle and were often a combination of surface and crown fires (Kauffman et al. 2000). In these types of events, the fire would burn intensely in some locations, killing all of the trees. In other areas of the same fire event, the fire would remain at the surface, killing only some smaller trees (Foster Wheeler 1999). The mosaic created by this burn pattern was maintained by the more frequent, low-intensity fires.

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 Buffalo Creek, Hi Meadow, Schoonover, and Hayman fires. The density of ponderosa pine and Douglas-fir 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).

3.3.3 Values at Risk

One reason the proposed project area was selected was the numerous values at risk on both NFS lands and surrounding private lands. These values include:

- The presence of numerous primary and secondary residences in communities surrounding the project area. Substantial areas of wildland-urban interface exist around the project area. Wildfires 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. The portion of the watershed in the project area also has areas of highly erosive soils.
- A large wildfire in the project area would have substantial negative effects to air quality, not just in surrounding communities, but also potentially in Colorado Springs, Denver, and other Front Range cities with existing air quality concerns.
- The economy of Lake George and Park County 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 and Park County.

3.3.4 Fire Frequency

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 over one ignition can be expected in the project area each year. Additional details of the fire frequency analysis can be found in the project record.

3.3.5 Fire Risk

Fire frequency data show that several small fires can be expected in the project area over a 20-year period, but that the probability of having a larger fire is relatively low. For example, there is a 19 percent probability of a fire exceeding 1,000 acres during the next 20 years. 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, the 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 in the project area during the next 20 years would be 1,175 acres. Additional details of the fire risk analysis can be found in the project record.

3.3.6 Fuel Load

The Fire and Fuels Extension of the Forest Vegetation Simulator (FVS-FFE) (Reinhardt and Crookston 2003) was used to develop predictions of fuel load (**Table 3-6**) for typical ponderosa pine and Douglas-fir stands. Stand exam data were not available for the entire project area; however, a representative sample of stands was surveyed to develop input data for FVS-FFE.

Table 3-6 Fuel Load (tons per acre)

Year	No Treatment (Alternative 1 and Alternative 2)	Alternative 1 Only			
		Mechanical Thinning, All Mechanical Fuel Treatments	Mechanical Thinning, Pile and Burn	Mechanical Thinning, Pile and Burn, Broadcast Burn	Broadcast Burning Only
Ponderosa Pine					
2004	13.3	13.3	13.3	13.3	13.3
2009	15.1	17.6	12.1	3.3	8.3
2024	17.9	14.4	11.6	5.3	11.3
Douglas-fir					
2004	13.9	13.9	13.9	13.9	13.9
2009	19.5	19.6	12.4	3.8	10.3
2024	32.5	38.5	34.6	37.9	29.9

3.3.7 Potential Fire Behavior

This section discusses several aspects of fire behavior, including fireline intensity, fire intensity level, fire type, and fire hazard rating. Several modeling programs, including FVS-FFE, FlamMap (Finney et al. 2003), and FARSITE (Finney 1998), were used to predict potential fire behavior. Model runs used both the 90th and 97th percentile weather. 90th percentile weather is a set of conditions (temperature, humidity, wind, fuel moisture, and others) that equate to periods of high fire danger. 97th percentile weather equates to periods of extreme fire danger.

Fireline Intensity

Fireline intensity (FLI) is commonly used to describe the "power" of wildland fires. Forest Plan standard 6056 (page III-81) pertains to FLI. FLAMMAP modeling estimates that 90 percent of the project area meets this Forest Plan standard. However, FLAMMAP may not adequately represent FLI in areas of passive or active crown fire behavior. FVS-FFE modeling has shown that crown fire can currently be expected under both high and extreme fire weather conditions. For this reason, it is likely that much of the project area does not currently meet Forest Plan standard 6056.

Fire Intensity Level

Fire intensity level (FIL) is based on predicted flame length. FIL is used as an indicator of fire danger for dispatch purposes, to categorize rate of spread, and in the assessment of fire effects. Each FIL has an associated suppression cost. Fires with FILs of 1 and 2 can generally be fought using direct attack with hand crews, while those with FILs of 3 and above require direct attack with engines, dozers, and aircraft, or indirect attack. Fires with FILs of 5 and 6 can be particularly difficult to control.

The current condition for representative ponderosa pine and Douglas-fir stands is FIL 2, which shows that direct attack with hand crews, engines, and dozers would be possible. However, these values are for surface fire only and do not consider crown fire. While only surface fire is predicted at 90th percentile weather, active crown fire is predicted for both stand types at 97th percentile weather. Under these conditions, no means of direct attack would be possible and an indirect method of attack would be required. Other fuel types in the project area were not modeled. However, FILs of 3 and 4 are expected in

areas with grass and open forest. Fire suppression in these areas would require the use of engines, dozers, or aircraft for direct attack.

Fire Type

Fire type indicates the type of fire activity that is expected. Surface fires are relatively easy to control compared with crown fires. Passive crown fires may not spread extensively, but cannot be directly attacked and contribute greatly to spotting. They also have the potential to transition to active crown fires under windy conditions or on steep slopes. Active crown fires cannot be directly attacked, contribute to extensive spotting, and may spread independently of surface fire. Surface fire is expected in both ponderosa pine and Douglas-fir stands under 90th percentile weather, but active crowning is expected under more extreme (97th percentile) weather in both stand types.

Fire Hazard Rating

Fire hazard rating is based on the potential for torching and crowning fire behavior to occur in a particular stand. **Table 3-7** shows the fire hazard ratings for representative ponderosa pine and Douglas-fir stands at 90th and 97th percentile weather conditions. The current fire hazard ratings for both stands under both weather conditions are high, reflecting stand conditions where the potential for torching and crowning are high.

Table 3-7 Fire Hazard Rating

Year	No Treatment (Alternative 1 and Alternative 2)	Alternative 1 Only			
		Mechanical Thinning, All Mechanical Fuel Treatments	Mechanical Thinning, Pile and Burn	Mechanical Thinning, Pile and Burn, Broadcast Burn	Broadcast Burning Only
Ponderosa Pine, 90th Percentile Weather					
2004	High	High	High	High	High
2009	High	Low	Low	Low	Moderate
2024	Moderate	Low	Low	Low	Moderate
Ponderosa Pine, 97th Percentile Weather					
2004	High	High	High	High	High
2009	High	Low	Low	Low	Moderate
2024	High	Low	Low	Low	High
Douglas-fir, 90th Percentile Weather					
2004	High	High	High	High	High
2009	Severe	High	High	Low	Moderate
2024	Severe	Severe	Severe	Low	High
Douglas-fir, 97th Percentile Weather					
2004	High	High	High	High	High
2009	Severe	High	High	Low	Moderate
2024	Severe	Severe	Severe	Low	High

3.3.8 Fire Size

Three ignitions were simulated using FARSITE. Details and results of these modeling runs are contained in the project record. FARSITE modeling of simulated ignitions was not meant to predict the actual extent or behavior of current and future fires. These runs represent a worst-case scenario where firefighting resources are not available and probably over-predict actual fire spread. However, the modeling runs provide a useful comparison between pre- and post-treatment conditions and alternatives because model parameters other than those affected by the treatments were held constant for all runs.

3.3.9 Analysis of Effects

This section describes the anticipated direct, indirect, and cumulative effects of implementing each of the alternatives on vegetation patterns, fire regimes, fuel load, potential fire behavior, and fire size, and compares and contrasts these effects between alternatives.

Alternative 1

This alternative would have beneficial long-term effects on fuels and potential fire behavior in the project area. Nearly 13,000 acres (86 percent of the project area) would be treated to reduce fuels. The extent of future fires would be reduced. Firefighter and public safety would be improved because the potential for extreme fire behavior would be reduced. Combined with the adjacent Sledgehammer project treatments, an area of approximately 20,000 acres would be cumulatively treated across a 30,000-acre landscape.

Vegetation Patterns

The proposed treatments would, to varying degrees, reverse the trend towards dense, homogenous forests in the project area. An open mosaic of trees that appears similar to pre-settlement conditions would be created across the landscape. In some areas, denser clumps of trees would be retained, while in other areas, openings would be created. Ladder and ground fuels would be removed by mechanical methods or prescribed fire. Treatments would favor retention of ponderosa pine and aspen over Douglas-fir. Trees heavily damaged by dwarf mistletoe would be removed, improving forest health.

As stands in the treatment unit continue to grow into the future, stand densities would again increase and fuels would accumulate. This would, over time, diminish the effects of the treatments unless fire or silvicultural methods are used to maintain desired stand conditions.

Many of the treatment units would be located to provide strategic protection of important values. During extreme weather conditions, prevailing winds tend to blow from the south and west. For this reason, more intense treatments would be focused on areas south and west of wildland-urban interface zones and communities. Treatments would be less intense in the southwest part of the project area because fires starting here would still have to burn through large treated zones before reaching high value areas.

Fire Regimes

Accumulation of ground, ladder, and canopy fuels has caused a shift away from a mixed severity fire regime to an infrequent, high-severity fire regime. The potential for stand-replacing fires would be reduced under this alternative by creating lower density stands and reducing ground, ladder, and canopy fuels. Treatments that use prescribed fire would mimic the low-intensity ground fires that were part of the historical mixed-severity fire regime. Completion of these treatments would allow for future maintenance

actions that promote stand conditions that were found in the project area under the historical mixed-severity fire regime.

Fuel Load

The estimated fuel loads in representative stands after each treatment type are shown in **Table 3-6**. Slash created by mechanical thinning would increase ground fuels after treatment. However, a combination of slash treatments would be used in each of these areas. Thinning would be scheduled over several years so that large, contiguous blocks of slash and high fuel loads would not be created.

The fuel loads shown in **Table 3-6** for 2009 assume all slash treatments have been completed. In each case where prescribed fire is used, post-treatment fuel loads would be lower than the current condition and untreated areas by 2009. Treatments that involve broadcast burning would reduce fuel loads the most, because litter and duff would be consumed. Where only piling and burning is used, larger fuels would be reduced, but litter and duff would be little affected.

Where only mechanical slash treatments are used, the fuel loads would be higher than the current condition and untreated areas by 2009 (**Table 3-6**). Although fuel loads would increase with this treatment, crushing, roller-chopping, and trampling would decrease the depth of the fuel bed. Some fuel would be made unavailable because it would be mixed with soil during the mechanical slash treatments. This treatment would be limited to areas near homes, steep slopes, or other locations where the use of prescribed fire would be inappropriate or difficult.

By 2024, fuel loads in ponderosa pine stands treated by broadcast burning would increase because of fuel accumulation and regeneration of understory trees. Fuel loads in ponderosa pine stands with mechanical or pile and burn fuel treatments would decrease because activity fuels created by the mechanical treatments would decompose. In all treated stands, fuel loads would remain below the level of untreated stands (**Table 3-6**).

Fuel loads in 2024 in treated Douglas-fir stands would increase to levels similar to untreated stands (**Table 3-6**). A substantial part of the increased fuel loads can be attributed to regeneration of trees following treatments. Any future maintenance that removes regeneration, such as mechanical thinning or prescribed fire, would help maintain low fuel loads.

Potential Fire Behavior

Treatment activities would reduce stem density, basal area, canopy cover, crown bulk density, and ladder fuels, while raising crown base height in treated stands. After treatment, the understory would re-grow, and tree regeneration would occur. Untreated stands would continue to grow and mature, with increases in stem density, basal area, canopy cover, crown bulk density, crown base height, and ladder fuels. Each of these factors, along with the fuel loads discussed above, would influence potential fire behavior. In the short-term (by 2009), potential fire behavior would be improved across 86 percent of the project area. Long-term improvements in potential fire behavior would still be present in 69 percent of the project area in 2024 in the absence of maintenance treatments.

Fireline Intensity

FLAMMAP estimates that FLI would remain constant over time. This indicates that the proposed treatments would not affect the amount of heat output by the flaming front of potential fires. However, FLAMMAP may not adequately represent FLI in areas of passive or active crown fire behavior. FVS-FFE modeling has shown a clear reduction in the extent of predicted passive and active crown fire behavior

under this alternative. Areas with passive or active crown fire would generally be limited to patches of untreated Douglas-fir and steep slopes. These areas would be relatively small and isolated from one another by areas where only surface fire is predicted. The FLI and crown fire estimates indicate that Forest Plan standard 6056 would likely be met under this alternative.

Fire Intensity Level

Predicted FILs, based on flame lengths, would decrease for most treated ponderosa pine stands in both the short-term and long-term for both 90th and 97th percentile weather conditions because much of the surface fuels would be removed. There would, however, be several exceptions to this general change. By 2024, the predicted FIL in the broadcast burn only treatment would again be similar to the untreated condition because of regeneration of understory trees. Where only mechanical slash treatments are used, the predicted FIL would be similar to the untreated condition in 2009 for 90th percentile weather and higher than the untreated condition for 97th percentile weather because fuel loads would be higher than in untreated areas (**Table 3-6**). By 2024, decomposition of activity fuels would occur and predicted FILs would be the same as in untreated stands.

For treated Douglas-fir stands, predicted FILs would remain the same as the current condition in the short-term (by 2009), except that in stands with the most intense treatment – mechanical thinning, pile burning, and broadcast burning – the predicted FIL would be reduced. However, the predicted FIL of untreated stands would increase during this same period, meaning that predicted FILs in treated stands would be lower than in untreated stands. In the long-term (by 2024), predicted FILs would increase because of understory regeneration and fuel accumulation, and would be similar to untreated stands.

Predicted values for FILs do not take the potential for crown fire into account. At 97th percentile weather, active crown fire is predicted for all untreated stands and an FIL of 6 would occur. However, only surface fire would occur in most treated stands, and FILs of 1 and 2 would be most common. Fire suppression would not be safe or effective in untreated stands with active crown fire, but all available firefighting resources could be used in areas of surface fire in treated stands. Therefore, the proposed treatments under this alternative would improve the potential for effective suppression of fires in treated stands.

Fire Type

The expected fire types would change substantially over time, especially under 97th percentile weather conditions. At present, active crown fire is predicted in 100 percent of ponderosa pine and Douglas-fir stands, while after treatment, surface fire is predicted in 96 percent and passive crown fire is predicted in 4 percent of treated stands at 97th percentile weather. Active crown fire is predicted for all untreated stands under current conditions and into the future.

At 90th percentile weather, the current condition of surface fire in ponderosa pine stands would be maintained over time in both treated and untreated stands. In Douglas-fir stands, the current condition of surface fire would be maintained in 85 percent of the treated stands into the future, while the remaining 15 percent would experience passive crown fire at 90th percentile weather conditions. However, passive crown fire is predicted for all untreated Douglas-fir stands in the future, showing that the 85 percent of stands with surface fire would be an improvement over future conditions. When the predicted fire types in all treated ponderosa pine and Douglas-fir stands are compared with the predicted fire types of untreated stands, conditions would be maintained in 87 percent and improved in 13 percent of treated stands at 90th percentile weather.

Each of these changes to expected fire type 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 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 have 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.

Fire Hazard Rating

Predicted fire hazard ratings would improve for treated ponderosa pine stands in both the short-term and long-term for both 90th and 97th percentile weather conditions (**Table 3-7**) because much of the understory and ground fuels would be removed. There would, however, be one exception to this general change. By 2024, the predicted fire hazard rating in the broadcast burn only treatment would again be similar to the untreated condition (**Table 3-7**) because of the regeneration of understory trees.

In 85 percent of treated Douglas-fir stands, predicted fire hazard ratings would be improved by 2009 compared with the current condition. In the remaining 15 percent, fire hazard ratings would stay the same as current conditions (**Table 3-7**). However, the fire hazard ratings of untreated stands would worsen over this period, meaning that all treated stands would have better fire hazard ratings than untreated stands in 2009 under both 90th and 97th percentile weather conditions (**Table 3-7**). By 2024, fire hazard ratings would worsen in all treated Douglas-fir stands, assuming no maintenance treatments occur (**Table 3-7**). Of the treated stands, 15 percent would have the same fire hazard rating as untreated stands, while the remaining 85 percent would have better fire hazard ratings than untreated stands. No differences in fire hazard ratings were predicted between 90th and 97th percentile weather for Douglas-fir stands (**Table 3-7**).

Fire Size

FARSITE modeling results showed a 60 percent reduction in fire size because of the treatments under Alternative 1. After applying this reduction to the historical data, it is expected that 473 acres would burn in the project area over the next 20 years.

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, combined with the adjacent Sledgehammer project, would begin to reverse the cumulative effects of these past activities and create a more natural pattern of vegetation across the landscape.

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

This alternative would have no direct effect on fuels and potential fire behavior in the project area, because no new treatments would occur. The extent of future fires would not be reduced, in contrast with Alternative 1. Firefighter and public safety would not be improved because the potential for extreme fire behavior, including active crown fire, would not be reduced, again in contrast with Alternative 1. The lack of treatments in the project area would not cumulatively interact with the adjacent Sledgehammer project treatments to improve fuels and fire behavior concerns across the landscape.

Vegetation Patterns

The dense, homogenous forests in the project area, which are substantially different from pre-settlement forest conditions, would be maintained. Douglas-fir would continue to increase in pine and aspen stands. The risk of a large-scale wildfire or insect or disease outbreak would remain high. An event of this type could dramatically alter the pattern of vegetation across the landscape, as seen in the area of the recent Hayman fire.

Fire Regimes

The current, infrequent, high-severity fire regime and the potential for stand-replacing fires would be maintained. A large-scale wildfire in the project area would likely exhibit fire behavior that is typical of a stand-replacement fire regime, rather than the mixed-severity fire regime that was historically present in this area.

Fuel Load

With no treatments, surface and ladder fuels would continue to accumulate over time (**Table 3-6**) although, unlike Alternative 1, no activity fuels would be generated. The risk of a large-scale insect or disease outbreak would increase. An event of this type would dramatically increase fuel loads in affected stands. Although no recent history of stand-replacing crown fire is evident in the project area, the continued accumulation of fuels would increase the potential for a large fire event.

Potential Fire Behavior

Basal area, canopy closure, crown bulk density, crown base height, and stand height would increase. Stem density would decrease slightly. Each of these factors, along with the fuel loads discussed above, would influence potential fire behavior.

Fireline Intensity

FLAMMAP estimates that FLI would remain constant over time. However, FLAMMAP may not adequately represent FLI in areas of passive or active crown fire behavior. FVS-FFE modeling has shown that passive or active crown fire would be expected under both high and extreme fire weather conditions under this alternative. For this reason, it is likely that much of the project area would not meet Forest Plan standard 6056 in the future under Alternative 2.

Fire Intensity Level

No changes to FILs in ponderosa pine stands are predicted, but a shift is predicted from lower to higher FILs over time for Douglas-fir stands for this alternative, particularly by 2024. This shift would be caused by increased density of understory trees and higher fuel loads. FILs for Alternative 2 would be higher than for Alternative 1 for most combinations of treatments and weather conditions. These predictions do not take into account the high and increasing potential for passive or active crown fire in these dense stands. Fire suppression forces would need to be cautious to avoid areas of potential crown fire activity, which is likely to decrease the effectiveness of suppression actions while increasing suppression cost. Firefighter and public safety would also be more at risk from difficult-to-control wildfires.

Fire Type

The expected fire types would change slightly over time from the current condition. Surface fire is still predicted for ponderosa pine stands under 90th percentile weather conditions. Active crown fire is still predicted for both ponderosa pine and Douglas-fir stands under 97th percentile weather. However, the current prediction of surface fire in Douglas-fir stands under 90th percentile weather would change to passive crown fire under this alternative because of increasing fuel loads and stand density. Regardless of weather conditions, suppression of the predicted fire types under Alternative 2 would be more difficult than suppression of the predicted fire types under Alternative 1.

Fire Hazard Rating

Fire hazard ratings would generally remain high in ponderosa pine stands and increase from high to severe in Douglas-fir stands (**Table 3-7**) under Alternative 2, in contrast with Alternative 1, where fire hazard ratings would be reduced in many stands.

Fire Size

FARSITE modeling results showed a two percent reduction in fire size over time under Alternative 2. After applying this reduction to the historical data, it is expected that 1,157 acres would burn in the project area over the next 20 years.

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. The adjacent Sledgehammer project has 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. The Rocky Messenger-Howard 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 WATERSHEDS

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

3.4.1 Regulatory Framework and Analysis Methods

Standards for the management and protection of water, soil, wetland, and riparian resources on the PSICC are identified in the Forest Plan (USFS 1984a). This document, as well as FSM and FSH direction (the WCPH), Executive Orders 11988 and 11990, state water quality regulations and the Wild and Scenic Rivers Act, guided this analysis

3.4.2 Soil Resources

Soil map units (SMUs) in the project area have been described and mapped by the USFS (2004b). The sensitivity of soils to erosion and compaction, and their limiting factors in relationship to the proposed treatments were developed based on the SMU descriptions (USFS 2004b). There are 22 SMUs in the project area. All soils in the project area are derived from non-calcareous granite. Non-calcareous granite

is relatively unconsolidated and highly erosive, which contributes to naturally high soil erosion rates (USFS 2003b), especially when these soils are exposed to raindrop impact and concentrated overland flow. Soil development tends to be limited because of the mineralogy of this type of parent material.

All soils in the project area are well to excessively drained. Surface runoff is moderate to rapid in most of the project area soils. The permeability of the majority of these soils is rapid or very rapid, and none are rated as low. The potential for landslides is low. The potential for debris flows is low or moderate. The sediment delivery potential for the majority of these soils is high.

One SMU has a depth to seasonal high water table of one foot or less and is located in willow, riparian, and wetland areas. Four SMUs have severe cut and fill slope stability ratings. Nineteen SMUs have severe ratings for roads or trails. Fourteen SMUs have severe revegetation ratings. Additional details on these soil ratings and hazards are contained in the project file.

Soil erodibility factors are not available for the SMUs in the project area. Therefore, an SMU was classified as sensitive (highly erodible or compactable) if it met one or more of the following criteria: (1) the natural drainage class is poor; (2) the permeability is low; (3) the depth to seasonal high water table is less than one foot; (4) the cut and fill slope stability rating is severe because of a high water table or erosion hazard; (5) the unsurfaced, improved roads and off-road vehicle traffic and trail rating is severe because of erosion hazard or surface compaction and rutting; or (6) the revegetation limitation rating is severe because of slope or erosion hazard. Based on these ratings, 12,751 acres (85 percent of the project area) were rated as sensitive to soil erosion and 1,076 acres (7 percent of the project area) were rated as sensitive to compaction. The soils that are sensitive to compaction are limited to grassland, wetland, and riparian areas. Soils that are sensitive to erosion are widespread in all cover types across the project area.

3.4.3 Water Resources

This section discusses watersheds, riparian areas, wetlands, floodplains, stream conditions, and beneficial uses in the project area

Watersheds

Six intermittent streams drain the Rocky Messenger portion of the project area and are part of the Elevenmile Canyon 6th level watershed. These intermittent streams drain directly into the South Platte River. One intermittent stream that drains directly into Elevenmile Reservoir is also part of the Elevenmile Reservoir 6th level watershed. Two 6th level watersheds, Twin Creek and Fish Creek, drain the Howard portion of the project area. Fish Creek drains into Twin Creek, which drains directly into Lake George on the South Platte River (**Figure 3-3**).

Watershed boundaries were developed from the PSICC's watershed Geographical Information Systems (GIS) layer based on Hydrologic Unit Code 6th level watersheds. These watersheds range in size from 10,000 to 52,000 acres. The size of each 6th level watershed and the extent of each watershed within the project area are shown in **Table 3-8**. For the cumulative effects analysis, the entire watershed area of each 6th level watershed was considered.

Table 3-8 Sixth Level Watersheds

Watershed Name	Total Acres	Acres in the Project Area
Elevenmile Canyon	33,871	10,756
Elevenmile Reservoir	52,305	1,206
Fish Creek	10,748	2,041
Twin Creek	29,437	940
Total	126,361	14,942

The total length of streams within the project area according to stream type and watershed is provided in **Table 3-9**. Within the project area, the Elevenmile Canyon watershed contains the greatest length of perennial and intermittent streams. The South Platte River represents all of the perennial stream length in this watershed. The lengths of perennial streams bordering the project area are not fully represented by **Table 3-9** because the project boundary crosses the South Platte River several times. Approximately nine miles of the South Platte River lie within or immediately adjacent to the project area. Twin and Fish Creeks also cross the project boundary several times. Approximately three miles of Twin Creek and four miles of Fish Creek lie within or close to the project area.

Table 3-9 Perennial and Intermittent Streams

Watershed	Stream Type		Total (miles)
	Perennial (miles)	Intermittent (miles)	
Elevenmile Canyon	3.9	10.1	14.0
Elevenmile Reservoir	0.0	0.4	0.4
Fish Creek	0.4	0.0	0.4
Twin Creek	1.8	0.0	1.8
Total	6.1	10.5	16.6

Riparian Areas

Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to aquatic ecosystems. They also provide key wildlife habitat, migration corridors, sediment storage and release, and surface-ground water interactions. Development of riparian vegetation is generally limited to areas where surface or near-surface water is available through most of the year. In the project area, riparian vegetation is generally limited to the South Platte River, Twin Creek, and Fish Creek, although small pockets of this vegetation have developed along intermittent streams or at seeps and springs where water is present for most of the year. There are 29 acres of tufted hairgrass-sedge and willow vegetation types in the project area. Both of these cover types are characteristic of riparian areas. A USFS assessment of grazing allotments located along the South Platte River indicated that the riparian areas are at Proper Functioning Condition (Colorado Department of Public Health and Environment [CDPHE] 2002a).

Wetlands

Wetlands control runoff and water quality, recharge ground water, and provide habitat for wildlife. In addition to providing important ecosystem functions, effects to wetlands are regulated by the U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency under the Section 404 of the

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Figure 3-3 Sixth Level Watersheds and Water Resources

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Clean Water Act. According to PSICC inventory data, there are 52 acres of willow, tufted hairgrass-sedge, and open water cover types in the project area. The extent of jurisdictional wetlands in the project area is unknown; however, most of these 52 acres may meet the USACE definition of wetlands.

Floodplains

Floodplains provide benefits similar to riparian areas and wetlands, such as control of runoff and water quality, ground water recharge, and habitat for wildlife. All riparian areas and most wetlands in the project area are located within floodplains. Floodplains in the project area are generally constrained by topography to narrow bands along streams, such as the South Platte River, Fish Creek, and Twin Creek. Noticeable floodplains have generally not developed along intermittent or ephemeral streams in the project area.

Stream Conditions

Rivers and streams are complex and dynamic natural systems. Stream systems can best be understood by subdividing them into three attributes: flow regime, channel morphology, and water quality.

Flow Regime

Extensive studies of flow regime in the Upper South Platte watershed have shown that, above an elevation of 7,500 feet, peak flows are dominated by snowmelt. 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 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).

Stream flows in the project area are primarily in the South Platte River, which is partially controlled by releases from Elevenmile Reservoir. Peak flows typically occur in late June or July. Between 1930 and 1998, the monthly mean flow in July in the South Platte River immediately below Elevenmile Reservoir was 190 cubic feet per second (cfs) (U.S. Geological Survey [USGS] 2004). The monthly mean flow in January at this location was 28 cfs (USGS 2004). A peak flow at this location of 3,000 cfs was recorded on April 28, 1970. Stream flow data for Twin and Fish Creeks were not available but are thought to be a small fraction of the flows in the South Platte River. No data for other streams in the project area are available. Flows in these streams are primarily in response to peak snowmelt periods.

Channel Morphology

The stream channel characteristics of the South Platte River from Elevenmile Reservoir to Lake George are dominated by canyon morphology and a one percent gradient. The river flows through cascades and boulder rapids. Deep pools form where the river has scoured the streambed adjacent to bedrock cliffs (USFS 2004c). Different stream channel characteristics are exhibited where the valley is wider. These portions have a more depositional nature from sediment that has been eroded upstream. They have wide and shallow riffles and erosion is more prevalent because of unconsolidated banks. The stream morphology is slightly altered by the augmentations of base flows from Elevenmile Reservoir. The longer

duration of high flows and bankfull conditions increases erosion in some areas and the absence of flood flows prevents sediment from being flushed regularly. However, the South Platte is generally stable and diversion of water has not substantially affected channel morphology.

Water Quality

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

The greatest threat to water quality in the project area and the focus of most regulatory efforts is Total Suspended Sediment (TSS). 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. One segment of the South Platte River, from Elevenmile Dam to Cheesman Reservoir, was included on the 1998 CDPHE 303(d) List of Impaired Waters after it was determined that it did not attain its Class 1 Cold (water) aquatic life use designation because of excessive sediment deposition (CDPHE 2002a). Habitat assessments developed by the USFS indicate that pool to riffle ratios throughout the impaired segment exceed the MIS optimum of 1:1. These assessments also documented exceedences of USFS criteria addressing bank erosion in Elevenmile Canyon (CDPHE 2003). Roads are most likely the current sources of upstream erosion and sediment deposition.

Beneficial Uses

Colorado's Front Range communities rely heavily upon the South Platte River for drinking water supply and other municipal and industrial uses. Agriculture throughout northeastern Colorado also relies heavily on South Platte River flows (USFS 2004c). The Upper South Platte watershed above Chatfield Reservoir serves as the primary source water area for the greater Denver metropolitan region. This reach has been affected by historic mining districts (such as Mosquito Creek), water resource development (such as Elevenmile Reservoir), severe sediment deposition from forest fires (such as Buffalo Creek, Hi Meadows, Schoonover, and Hayman), and elevated nutrients in groundwater from local population growth. The protection of water quality is a high priority for this area (CDPHE 2002b). At present, stream erosion and sedimentation are the only substantial water quality problems in the upper South Platte River basin (CDPHE 2002b).

The State of Colorado does not consider the flows near springs located in the project area as waters of the U.S., and as such, these flows have no associated beneficial use (CDPHE 2001). Therefore, there is no requirement that they meet State-designated beneficial uses.

3.4.4 Watershed Conditions

Roads within 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. The lengths of existing and proposed roads in project area watersheds are provided in **Table 3-10**.

Table 3-10 Roads by Watershed

Watershed	Road Type (miles)			
	Existing		Proposed Temporary	Total
	System	Non-System		
Elevenmile Canyon	25.8	4.0	21.7	51.5
Elevenmile Reservoir	3.2	0.0	0.9	4.1
Fish Creek	7.7	0.0	9.4	17.1
Twin Creek	5.2	0.0	4.0	9.2
Total	41.8	4.0	36.0	81.8

The water influence zone (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 1999a). 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 1999a). 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 3-11**). A 100-foot buffer was used because the height of the dominant vegetation is generally less than 100 feet. Approximately four percent of the roads in the project area fall within the WIZ. County Road 96 through Elevenmile Canyon accounts for a large portion of the length of roads in the WIZ.

Table 3-11 Roads Within the WIZ

Watershed	Road Type (miles)			
	Existing		Proposed Temporary	Total
	System	Non-System		
Elevenmile Canyon	1.3	1.2	1.8	4.3
Elevenmile Reservoir	<0.1	0.0	0.0	<0.1
Fish Creek	0.2	0.0	0.0	0.2
Twin Creek	0.1	0.0	0.0	0.1
Total	1.6	1.2	1.8	4.6

Existing and proposed roads in the project area related to SMU sensitivity to soil erosion and compaction are shown in **Table 3-12**. Seventy-one percent of the existing roads in the project area cross SMUs that are sensitive to erosion and 25 percent of the existing roads cross SMUs that are sensitive to compaction.

Table 3-12 Roads on Sensitive Soils

Sensitivity	Road Type (miles)			
	Existing		Proposed Temporary	Total
	System	Non-System		
Sensitive to Erosion	28.5	3.8	32.9	65.1
Sensitive to Compaction	11.2	0.2	2.0	13.6
Not Sensitive	2.1	0.0	1.1	3.2
Total	41.8	4.0	36.0	81.8

3.4.5 Analysis of Effects

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

Alternative 1

Soils

The type and magnitude of erosion from forest management activities depends on the amount of soil exposed by these activities. Erosion could be caused by soil exposure to rain drop impact; reduced infiltration and permeability caused by compaction; modification of surface drainage patterns; and disruption of vegetation, surface litter, and soil organic matter. Studies in Colorado have suggested that erosion rates are acceptably low when there is less than 30 percent bare soil (Gary 1975, Benavides-Solorio 2003). A study of the mechanical thinning effects near Trumbull, Colorado found that the percent litter and downed wood increased by over 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, the Forest Service regional standards 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 prescribed fire, but because they are designed to burn at lower intensities, 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. Scarification and seeding of piles after burning would reduce hydrophobic soils and minimize the potential for soil erosion. Broadcast burning would remove most 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.

Riparian Areas, Wetlands, and Floodplains

Actions that may alter riparian area, wetland, and floodplain ground cover, soil structure, water budgets, drainage patterns, and long-term plant composition can impair these areas. Riparian areas, wetlands, and floodplains would not be adversely affected under Alternative 1. The proposed treatments would avoid disturbance to riparian areas, wetlands, and floodplains to the extent possible. Only 0.8 miles of new temporary roads would be built in floodplains. The amount of riparian areas and wetlands crossed is expected to be less than 0.8 miles because wetlands or riparian areas do not typically occupy the entire extent of a floodplain. If these areas are encountered in treatment units, they would be protected through application of design criteria and mitigation measures listed in Chapter 2. Implementation of this alternative would comply with 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 Clean Water Act and appropriate permits.

Stream Conditions

Where the annual precipitation exceeds 18 to 20 inches, a change in vegetation density can have a detectable effect on water yield. Removal of live trees is generally thought to increase water yield through reduced interception and transpiration. An increase or decrease in the density of vegetative cover will have a corresponding effect on runoff (MacDonald and Stednick 2004). However, in dry areas such as 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. Average annual precipitation for the Lake George area is only 12.1 inches. Nearby weather stations also show low annual rainfall levels, averaging about 16.2 inches. Therefore, the proposed thinning would not cause a measurable change in water yield or peak flows.

The construction and use of roads during forest management activities can affect runoff. Roads can alter the hydrology of a forest by decreasing the infiltration rate and subsequently increasing overland flow, and by creating a pathway to deliver runoff to streams. The extent of the effect that roads have on runoff depends on the percentage of the watershed that is affected. Existing roads make up 0.3 percent of the project area, and the addition of 36 miles of new temporary roads would increase the percentage to 0.5 percent. A paired-basin experiment showed that when the road network occupied less than two percent of the watershed, no detectable changes in runoff were caused by road construction (Troendle et al. 2001); therefore, no changes in runoff are expected from this alternative.

New temporary roads may cause increased sediment yield. Depending on the relationship between road location and the WIZ, some of this sediment may enter stream channels and be transported downstream. Only 1.8 miles of new temporary road (five percent of the total length) would be constructed in the WIZ (**Table 3-11**). Most of this length represents perpendicular crossings of the WIZ and associated streams, rather than roads running parallel to the stream within the WIZ for long distances. The potential for sediment from treatment areas to enter streams would be minimized by avoiding operations in the WIZ to the extent possible. Sediment loads would decrease to background levels in the long-term as vegetation becomes established on temporary roads once they are closed and obliterated after project completion.

Water quality parameters that could be affected include turbidity, total suspended solids, temperature, nutrients, and bed load. This alternative is expected to have minimal effect on water quality. Sediment is the only parameter of water quality that may be affected. Sediment transport to water bodies would depend on the location of the sediment source zone and the sediment transport efficiency in the watershed. The use of Best Management Practices (BMPs), such as minimizing soil disturbance in the WIZ and rehabilitation of all temporary roads after the project is complete, would generally prevent sediment from reaching stream channels.

Beneficial Uses

Downstream beneficial uses of water from the project area would not be affected by this alternative. The use of BMPs and other mitigation measures would ensure that downstream water quality and associated beneficial uses are not impaired.

Watershed Conditions

Soils would be displaced by the operation of equipment along roads that are constructed, re-constructed, or maintained. The total length of proposed roads that cross SMUs that are sensitive to soil erosion or compaction is shown in **Table 3-12**. Approximately 36 miles of new temporary roads are proposed in the project area. Ninety-one percent of these roads would be located on SMUs that are sensitive to soil erosion, while six percent would be located on soils sensitive to compaction (**Table 3-12**). Temporary roads would meet the design standards and mitigation measures described in Chapter 2, which would minimize long-term effects on soil erosion and compaction, sedimentation, and water yield.

Another effect of this alternative would be a reduction in the potential for large-scale wildfire in the project area. As discussed in the fuels and fire behavior section, a 60 percent reduction in fire size is predicted once treatments are complete. The fuels analysis also predicted that 473 acres of the project area would burn over the next 20 years. Of this area, 68 percent (324 acres) would be low intensity burns, 21 percent (100 acres) would be moderate intensity burns, and 11 percent (50 acres) would be high intensity burns. Therefore, 149 acres of moderate and high intensity burns would contribute to adverse effects to watersheds over the next 20 years. This represents an 87 percent reduction compared with the extent of moderate and high intensity burns under Alternative 2.

The models used to predict fire effects do not distinguish between the types of communities affected by each burn intensity. For example, a high burn intensity in a grassland community is not distinguishable from one in a ponderosa pine community. However, the effects to watersheds from a grass fire can be substantially different than the effects of a crown fire in ponderosa pine. In grasslands, rapidly moving fire typically does not kill grass roots, which resprout and quickly provide ground cover and soil stability. The intense burning of a crown fire in ponderosa pine, however, tends to kill not just the overstory, but also heats the soil sufficiently to kill plant roots, remove soil organic matter, and possibly create hydrophobic soils (Graham et al. 2004). Once these elements are removed, recovery of ground cover is slow and excessive soil loss may occur. Most of the moderate and high intensity burn areas predicted for Alternative 1 would occur in grasslands where recovery would be quick and watershed effects minimal, compared with Alternative 2, where many of the areas of moderate and high intensity burning would occur in forested areas, recovery would be slower, and watershed effects more intense.

WEPP Modeling

The Water Erosion Prediction Project (WEPP) was used to estimate the potential sediment delivery that would be caused by the proposed treatments. The WEPP model is a complex computer simulation that predicts soil loss and sediment deposition. In addition to erosion components, it includes a climate component that uses a stochastic generator to provide daily weather information, a hydrology component, a daily water balance component, a plant growth and residue decomposition component, and an irrigation component. The WEPP model provides explicit estimates of when and where in a watershed or on a hillslope erosion is occurring so that conservation measures can be selected to most effectively control soil loss and sediment yield (USFS 2000b).

Forest condition assumptions were put into the WEPP model to simulate the proposed treatments. The 5-Year-Old Forest condition is considered a reasonable condition to describe a forest that has been logged, leaving some trees and groundcover, or to describe a forest one to two years after a prescribed fire. The Skid Trail condition describes a compacted road or trail with very little cover, and any site that is mechanically disturbed. 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 Cheesman, Colorado (15 miles north of the project area and at the same elevation) were used for the modeling. A slope of 35 percent was used in the WEPP model because the proposed mechanical thinning

would take place on slopes of 35 percent or less. Model predictions therefore represent that maximum expected sediment production because most treatments would occur on slopes of less than 35 percent.

Results of the modeling showed that the annual sediment leaving the treatment area is estimated to be 272 tons. This number is relatively small compared to the 90,000 tons of sediment that is annually loaded into the South Platte River. WEPP results also showed very low probabilities of runoff, erosion, and sediment delivery after treatments (seven, three, and seven percent, respectively). It should be noted that the accuracy of the predicted runoff or erosion rate is at best, plus or minus 50 percent, because of the high variability and complexity of soil properties and erosional processes. Based on these predictions, Alternative 1 is expected to have negligible effects on sediment production.

Cumulative Effects

Various activities in and near the project area have affected, and would continue to affect, soils and watershed resources. The majority of these activities occurred throughout the 19th and 20th century. The activities that are generally declining or have ceased to exist include livestock grazing and mining. Other activities within the project area that are on the rise may have offset the decline in mining and grazing effects and subsequently increased effects on watersheds. This includes recreational use in the project area and nearby residential development. Local residential development and an increase in road construction may have increased sediment loads in streams. A substantial increase in recreational use may, in some instances, have caused more disturbance to streams from bank erosion, off-road trails, and roads. These effects may have contributed to further reductions in watershed health.

In recent years, there has been an increased focus on mechanical and prescribed fire fuel treatments on federal lands. Future activities on federal land would likely continue to emphasize fuel treatments. Soil erosion from soils in treatment areas may have increased sediment inputs to streams, rivers, and lakes and may have cumulatively affected water quality and aquatic habitats. The use of BMPs, mitigation measures, and careful design of treatments would minimize the risk of additional cumulative effects to watersheds from the proposed project.

Large-scale wildfires can also have important cumulative effects to watershed resources. Soil erosion and sedimentation rates may initially be very high following wildfire in areas that have experienced severe burning, such as the Buffalo Creek, Hi Meadow, Schoonover, and Hayman Fires. These types of events can lead to soil erosion on a landscape scale, dramatically increase sediment input to streams and rivers, adversely affect water quality, and degrade 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 trees 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 watershed resources if such an event were to occur.

Large-scale wildfires often require very extensive and expensive Burned Area Emergency Rehabilitation (BAER) treatments. In the aftermath of the Hayman fire, BAER teams were spending more than $100,000 a week for restoration activities at Cheesman Reservoir, and it is estimated that rehabilitation costs will exceed $61 million (Kent et al. 2003) over the next decade.

Alternative 2

Soils

Soil erosion in undisturbed areas and along existing roads would continue at or near current levels under Alternative 2. Soil compaction on existing roads would remain unchanged or increase if recreational use of the project area increases. Soil productivity would remain similar to current conditions.

Riparian Areas, Wetlands, and Floodplains

Riparian areas, wetlands, and floodplains in the project area would remain unchanged. Existing effects from road/stream crossings and other factors would remain similar to the current condition.

Stream Conditions

Stream flow regimes would remain unaltered from the current condition, channel morphology would not change, and water quality would be similar to current conditions. Stream channels that are currently unstable would remain unstable, but gradually stabilize over the next several decades. Existing road/ stream crossings would continue to affect channel morphology.

Beneficial Uses

Existing downstream beneficial uses of water would remain unchanged. Factors that are currently of concern for beneficial uses, such as sediment, would remain unchanged.

Watershed Conditions

Existing watershed conditions, such as the number of roads located in the WIZ (**Table 3-11**) and on sensitive soils (**Table 3-12**) would remain unchanged. This alternative would also maintain the current level of large-scale wildfire potential. As discussed in the fuels and fire behavior section, only a two percent reduction in fire size is predicted. The fuels analysis also predicted that 1,157 acres of the project area would burn over the next 20 years. Of this area, three percent (40 acres) would be low intensity burns, 16 percent (189 acres) would be moderate intensity burns, and 80 percent (928 acres) would be high intensity burns. Therefore, 1,117 acres of moderate and high intensity burns would contribute to adverse effects to watersheds over the next 20 years. This represents a 750 percent higher rate of potentially adverse watershed effects compared with Alternative 1.

Cumulative Effects

In the absence of proposed treatments in the project area, other surrounding land uses and effects to watersheds may change. Livestock grazing and mining uses may decline. Recreational use of the project area and nearby residential development may increase. Each of these uses would have cumulative effects on watersheds that are the same as those described for Alternative 1. Past and future fuel treatment activities would continue to present a risk of adverse watershed effects, but no new effects from the proposed project, as presented under Alternative 1, would occur. Future projects would use similar BMPs and mitigation measures, so any cumulative effects from these projects would be minimal. The potential for cumulative effects to watersheds from large-scale wildfires would not be reduced under this alternative. If such an event were to occur, severe damage to the project area and surrounding watersheds is likely.

3.5 MANAGEMENT INDICATOR SPECIES

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. Species associated with the diversity of vegetation communities found within the project area were selected for analysis. Species information was compiled from the South Park Ranger District wildlife database, Colorado Natural Heritage Program database records, the Colorado Breeding Bird Atlas (Kingery 1998), Mammals of Colorado (Fitzgerald et al. 1997), Colorado Vertebrate Ranking System (COVERS) data (COVERS 2001) Breeding Bird Survey (BBS) data (BBS 2004), personal communications with Colorado Division of Wildlife (CDOW) personnel, and field reconnaissance.

3.5.1 Management Indicator Species Selection

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. Habitats and reasons for exclusion for each eliminated species are discussed in the wildlife specialist report in the project record. Species selected for analysis as MIS are: mule deer, Abert's squirrel, mountain bluebird, red-naped sapsucker, and green-tailed towhee. An explanation why each of these species was selected is located in the project record. Several other MIS species were addressed in the Biological Assessment (BA) or Biological Evaluation (BE) and the Special Status Species section of this EA because they are special status species.

3.5.2 Habitat Modeling

The Habitat Capability (HABCAP) model was used to assess the effects of the alternatives on wildlife resources. HABCAP rates habitat conditions on a scale of 0 to 1 (0 to 100 percent) to indicate the relative potential value of the habitat for MIS. Habitat capability goals for each MA on the PSICC are listed in the Forest Plan (USFS 1984a). Two MAs (2B and 7D) do not have a specific habitat capability standard; therefore, the Forest Plan standard (40 percent) was applied. One MA (4B) has a habitat capability standard of 80 percent.

The Forest's Common Vegetation Unit (CVU) database was used to establish the amount of suitable habitat available as cover and forage for MIS. HABCAP modeling results were used to establish existing quantitative habitat values, compare changes in habitat capability by alternative and species, compare model outputs to Forest Plan standards, and identify trends in relation to Forest Plan standards.

3.5.3 Species Discussion and Analysis

The species selected for analysis as MIS include: mule deer, Abert's squirrel, mountain bluebird, red-naped sapsucker, and green-tailed towhee. 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).

Mountain mahogany is the most important food plant for mule deer in the project area. Other important food and cover plants for mule deer include sagebrush, rabbitbrush, sumac, snowberry, chokecherry, willow, ponderosa pine, cottonwood, and Rocky Mountain juniper. Habitat suitability depends on both the presence of food and cover plant species and their arrangement across the landscape.

Global and Colorado mule deer populations are known to be increasing (COVERS 2001). There was a population decline at the turn of the century, but the mule deer now has an unprecedented distribution (Mackie et al. 1987). Mule deer population estimates in Colorado show a decrease in populations from 1989 to 1995. From 1995 to 2000, mule deer population estimates show the population stabilizing (CDOW 2001). Recent CDOW data show an increasing trend for Data Analysis Unit (DAU) 16, which includes the project area. The 2002 and 2003 post-hunt populations were estimated at 12,190 and 19,800 deer, respectively (Myers 2004). The 2004 post-hunt target population is 21,670 with an anticipated harvest of 700 (Myers 2004). The population objective for DAU 16 is 30,000 (Myers 2004), showing that the deer population has not yet met this objective, despite a recent substantial upward trend.

HABCAP Analysis

The HABCAP model was used to analyze the potential changes to mule deer habitat effectiveness. Several components make up the habitat effectiveness index for mule deer, including forage value, cover value, and road effects. Preferred mule deer habitats include essentially all available vegetation cover types and HSSs (other than water/rock), which occupy 14,447 acres of the project area (**Table 3-2**).

The HABCAP evaluation considered summer and winter forage values for both alternatives. For the current condition (and Alternative 2), values of 0.69 for summer forage and 0.44 for winter forage were calculated. The cover value was 1.00 for summer habitat and 0.82 for winter habitat, reflecting the abundance of available cover, such as mature Douglas-fir and ponderosa pine forests. For Alternative 1, values of 0.89 for summer forage and 0.60 for winter forage were calculated, showing an improvement in foraging opportunities. The cover value was 1.00 for summer habitat and 0.81 for winter habitat, similar to the current condition and Alternative 2. The current road effects value of 0.99 for summer habitat and 1.00 for winter habitat remained the same for both alternatives because no new permanent roads would be constructed.

The HABCAP evaluation of existing conditions (and future conditions under Alternative 2) within the project area predicted a habitat effectiveness index of 0.82 for mule deer summer habitat and 0.60 for mule deer winter habitat, showing that the Forest Plan standards for MA 4B (0.80) are not currently being met for mule deer winter habitat. The results of the HABCAP analysis for Alternative 1 predict a post-project habitat effectiveness index of 0.93 for mule deer summer habitat and 0.70 for mule deer winter habitat, indicating improved conditions for mule deer and a trend towards meeting Forest Plan standards.
The HABCAP analysis predicts that Alternative 1 would increase the effectiveness of mule deer summer habitat by 11 percent and mule deer winter habitat by 10 percent. These effectiveness values meet Forest Plan standards for all MAs with the exception of winter habitat in MA 4B. However, Alternative 1 would increase winter habitat effectiveness and come closer to meeting the goal of 80 percent, compared with the current condition and Alternative 2.

Analysis of Effects

Direct: 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. Implementation of the proposed treatments is not expected to limit the availability or suitability of habitats throughout the project area. As discussed for the HABCAP analysis, Alternative 1 would maintain or improve the availability of different mule deer habitats in the project area. Alternative 2 would not cause any new direct effects to mule deer because current habitat availability would be maintained.

Indirect: 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 within the project area. Implementation of the proposed treatments is expected to maintain and create new mule deer habitats over the long-term. Foraging habitat would benefit from thinning and prescribed burning because stand density would be reduced and cover by grasses, forbs, and shrubs is expected to increase.

Implementation of Alternative 1 would decrease the availability of cover in the project area and may increase the susceptibility of deer to predators and hunters. Construction of temporary roads may also decrease cover. However, decommissioning of these temporary roads following project completion would decrease disturbance and reduce negative effects during high stress seasons. Over time, the availability and condition of cover in the project area would increase because of increased diversity and aspen and pine regeneration in treated stands.

Availability of cover is likely to remain below current conditions under Alternative 1. However, untreated stands, riparian areas, topography, and other features would provide adequate deer cover into the future. The HABCAP results show no decrease for summer cover and only a slight decrease for winter cover after treatment. The HABCAP results also show that forage is more limiting than cover, so that any negative effects from decreased cover are likely to be offset be increased foraging opportunities.

Cover would be maintained and may increase over time, but forage may decrease as stands become denser under Alternative 2. In addition, this alternative would not increase diversity or decrease the risk of large-scale crown fire and disease or insect outbreak as would Alternative 1. While the risk of large-scale wildfire is relatively low (19 percent for a 1,000-acre fire) over the next 20 years, such an event would dramatically reduce cover in the burned area. Over time, both cover and forage would recover as shrubs and young trees become established and these areas would provide high-quality deer habitats.

Cumulative: Previous management actions in the analysis area, including timber harvest, fire suppression, maintenance of roads and utility lines, water diversion projects, housing development, livestock grazing, and recreational use, may have contributed to decreased habitat effectiveness. Future management actions, including forest thinning, and prescribed burning are expected to benefit 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. Before logging, grazing, and fire suppression, ponderosa pine stands along the Front Range were less dense, more open, and less vulnerable to diseases, insects, and large intense wildfires (Foster Wheeler 1999). Habitat effectiveness has decreased. Current forest and mule deer habitat conditions are not sustainable. Future Forest Service projects are likely to create more heterogeneous natural landscapes with diverse habitats that benefit mule deer. Alternative 1 would

promote this change, improving mule deer habitat effectiveness by substantially increasing foraging opportunities, while minimally affecting cover availability. Alternative 2 would maintain current mule deer habitat effectiveness. However, in the long-term, the potential for large-scale habitat changes from insect outbreak 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.

Colorado mule deer populations are known to be increasing (COVERS 2001), as are populations in and near the project area (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 is expected to contribute to the current trend of increasing deer populations because mule deer habitat conditions would improve. Current upward trends are likely to be maintained in the short-term under Alternative 2. In the long-term, the risk of insect outbreaks and wildfire may increase; however, the effects of these events on deer populations are difficult to predict.

Abert's Squirrel

Abert's squirrel is limited to ponderosa pine forests and appears ecologically dependent on ponderosa pine for food, cover, and nest sites (Keith 1965). This squirrel is unique because its life necessities are almost entirely furnished by a single tree species, the ponderosa pine. Preferred habitats include mid- and late-successional ponderosa pine (HSS 4A, 4B, 4C, and 5) (Patton 1975). Home ranges vary from 12 to 50 acres, depending on season and sex of animal (Fitzgerald et al. 1994). 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).

The state population trend is suspected to be stable or increasing (COVERS 2001). The species is known or is likely to occur within Park County and the vicinity of the project area where habitat is suitable (CDOW 2004). Stand exams conducted for this project documented Abert's squirrels in the project area. Extensions of the known range have occurred in recent years in southwest and western Colorado. Population dynamics are poorly known. Population estimates range from 12 to 30 animals per km^2 in the Black Forest of El Paso, 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 2004). 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).

HABCAP Analysis

The HABCAP model was used to analyze the potential effects to Abert's squirrel habitat. Preferred Abert's squirrel habitats that are present in the project area include ponderosa pine HSSs 4A and 4B, which occupy 9,189 acres (**Table 3-2**).

The HABCAP evaluation considered summer and winter forage and cover values for both alternatives. For the current condition (and Alternative 2), values of 0.53 for summer and winter forage and 0.52 for summer and winter cover were predicted. For Alternative 1, values of 0.37 for summer and winter forage and 0.32 for summer and winter cover were predicted, showing a decrease in both forage and cover value. The HABCAP evaluation of existing conditions (and Alternative 2) predicted a habitat capability index of 0.53 for Abert's squirrel summer and winter habitats, showing that the Forest Plan standards for MA 4B (0.80) are not currently being met. The HABCAP analysis for Alternative 1 predict a post-project habitat capability index of 0.35 for Abert's squirrel summer and winter habitat, showing a decrease from the

current condition. Under Alternative 1, the Forest Plan standards for Abert's squirrel habitat capability for all MAs would not be met.

The HABCAP analysis predicts that Alternative 1 would decrease habitat capability of Abert's squirrel summer and winter habitats by 18 percent. Habitat capability values would not meet Forest Plan standards for all MAs. Forage and cover values for Abert's squirrel summer and winter habitats would decrease under Alternative 1.

The HABCAP model ranks the forage and cover values for ponderosa pine HSS 4B higher than 4A. Alternative 1 would convert 4,156 acres of ponderosa pine HSS 4B to HSS 4A (**Table 3-5**). This shift in ponderosa pine habitat structural stages would decrease habitat capability values for Abert's squirrel for Alternative 1. However, this model only accounts for the overall shift in structural stages 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. For example, where Abert's squirrel sign (feed trees or nests) is present, a clump of three to ten trees that is three to twenty feet from the nearest neighboring tree could be left adjacent to an opening or area of low tree density, containing zero to three trees. These clumps would generally be small (less than four acres) and would provide Abert's squirrel habitat that may not be fully accounted for in the model. Leaving clumps of trees would likely provide appropriate habitat for Abert's squirrels; therefore, the decrease in habitat capability would be less than that 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.

The Forest Plan (1984a) provides a standard of 80 percent for habitat capability of MIS in MA 4B. Management practices, such as timber harvest, tree planting, grazing, and fire suppression, have contributed to high tree recruitment and the creation of a dense, homogeneous forest landscape. The current availability of suitable habitat for Abert's squirrel across the landscape is probably higher than historical levels because of these practices, which have also increased the risk of stand-replacing fire and insect or disease outbreaks. These events are likely to occur before the 80 percent habitat capability standard is attained, because ponderosa pine forests in and near the project area are probably not capable of producing and sustaining tree densities that would support this level of habitat suitability. Forest thinning would decrease the risk of these events.

Analysis of Effects

Direct: 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 Abert's squirrels from otherwise suitable habitats. Although the distribution of ponderosa pine is not expected to change, the shift from HSS 4B to HSS 4A would decrease the suitability of habitats throughout the project area. However, the retention of a clumpy forest structure would minimize the loss of suitable habitats. Alternative 2 would not cause any new effects to Abert's squirrel. Current habitat availability would be maintained.

Indirect: Foraging and cover habitats would decrease because of the thinning and prescribed burning treatments. 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 within the project area. In addition, a clumpy structure would be retained that would provide pockets of suitable cover and forage habitats across the landscape. Alternative 1 would increase diversity and decrease the risk of large-scale crown fire and disease or insect outbreak compared with Alternative 2. Thinning may also enhance cone production in ponderosa pine, which can translate to high squirrel densities during periods of high cone availability (Dodd et al. 1998).

Cumulative: Previous management actions in the analysis area, including timber harvest, tree planting, fire suppression, and livestock grazing may have contributed to increased habitat capability in some areas because of increased forest density, while decreasing capability on other areas because of decreased tree vigor and cone production. Alternative 1 would reduce the capability of some parts of some stands to support Abert's squirrel, while improving forest health in the project area in general. Combined with the potential future actions of forest thinning and prescribed fire in other parts of the analysis area, this action is likely to promote Abert's squirrel population levels that are similar to those that occurred before European settlement. Alternative 2 would maintain the current conditions and population levels in the short-term, but increase the risk of large-scale habitat loss in the long-term. Large-scale habitat loss could cause substantial population declines in the affected area.

Habitat and Population Trend

Abert's squirrel habitat on the PSICC has probably increased compared with historic conditions, but is currently declining from the effects of insect outbreaks and wildfire (Ryke and Wagner 2002). The effects of recent management actions have been minor compared to recent wildfires and insect activity (Ryke and Wagner 2002). Alternative 1 may reduce the suitability of Abert's squirrel habitats in the project area, primarily because of the shift from HSS 4B to HSS 4A. However, this reduction would be mitigated by retention of a clumpy forest structure and portions of suitable habitat that are not treated. In addition, forest health would be improved and the risk of insect outbreaks or wildfire would be reduced. Habitat suitability would not be reduced below historical levels, because the treatments are designed to mimic historical vegetation and habitat patterns. Alternative 2 would maintain current habitat suitability. However, in the long-term, the potential for large-scale habitat loss from insect outbreak 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 (Ryke and Wagner 2002). 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). Alternative 1 may slightly decrease Abert's squirrel populations in treated parts of the project area because of a decline in habitat suitability. Population levels are not likely to be reduced below historical levels because post-treatment habitat suitability would be similar to historic forest conditions. In addition, any population declines caused by the project may be difficult to distinguish from normal population fluctuations of this species, which are based on cone crop availability (Ryke and Wagner 2002). Alternative 2 would likely 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 substantial decreases in Abert's squirrel populations.

Mountain Bluebird

Mountain bluebirds are secondary cavity nesters that occupy open woodland or edge habitats. 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). Although they need trees for nesting, mountain bluebirds do not breed in heavily forested habitats. They prefer forest edges and mixtures of woodland and open habitats. As cavity nesters, they find their habitat choices restricted by the availability of nest sites (Barrett 1998a).

Increasing forest density can lead to a reduction in habitat capability for mountain bluebird. Hejl (1994) hypothesized that species associated with burned areas or snags, such as the mountain bluebird, are less abundant than they were 100 years ago. Population trend estimates generated from data collected from 1966 to 2004 in Colorado indicate an increasing but non-significant trend (BBS 2004). BBS data on

PSICC routes have not been collected long enough to produce accurate trend data. The Monitoring Colorado Birds program is monitoring populations of the mountain bluebird; however, trend data are not yet available. Mountain bluebirds are common and well distributed in the mountains of Colorado (Barrett 1998a) and were documented in the project area during breeding bird surveys (USFS 2001a). The Forest Plan does not provide specific population objectives; however, the general direction is to provide for the habitat needs of MIS on the Forest and maintain that habitat at 40 percent or more of potential (USFS 1984a).

HABCAP Analysis

The HABCAP model was used to analyze the potential effects to mountain bluebird habitat capability. Preferred mountain bluebird habitats include essentially all available vegetation cover types and structural stages (other than water/rock), which occupy 14,447 acres of the project area (**Table 3-2**).

The HABCAP evaluation considered summer forage and cover values for both alternatives. For the current condition (and Alternative 2), values of 0.67 for summer forage and 0.57 for summer cover were predicted. For Alternative 1, values of 0.88 for summer forage and 0.77 for summer cover were predicted, showing a clear increase in both of these values after the proposed treatments.

The HABCAP evaluation of existing conditions (and Alternative 2) within the project area predicted a habitat capability index of 0.62 for bluebird summer habitat, showing that the Forest Plan standard for MA 4B (0.80) is not currently being met for this habitat. The HABCAP analysis for Alternative 1 predicts a post-project habitat capability index of 0.82 for bluebird summer habitat, which would meet the Forest Plan standard for all MAs within the project area.

The HABCAP analysis predicts that Alternative 1 would increase the capability of bluebird summer habitats by 20 percent. Under Alternative 1, forage and cover values for summer bluebird habitat are expected to increase by 21 percent and 20 percent, respectively. These increases are a result of the treatments creating more forest edge habitat that is more suitable for mountain bluebird nesting and foraging than the current condition or the conditions expected under Alternative 2. 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.

Analysis of Effects

Direct: Implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing occupied nest trees. Although implementation of the proposed treatments may damage or remove snags, standards included in the Forest Plan would preserve minimum densities of snags. Alternative 2 would not cause any new effects to the mountain bluebird. Current habitat availability would be maintained.

Indirect: Implementation of the proposed treatments is expected to create new suitable mountain bluebird habitats over the long-term. Foraging and cover habitats would benefit from thinning and prescribed burning. Forest Plan standards would ensure that minimum numbers of snags are maintained. Habitat diversity and capability would increase under Alternative 1 based on the distribution of post-treatment HSSs shown in **Table 3-4** and HABCAP modeling, compared with the current condition and Alternative 2. Proposed treatments under Alternative 1 would also decrease the potential for a large-scale crown fire and disease or insect outbreak, which could cause widespread habitat loss.

Cumulative: Previous management actions in the analysis area, including timber harvest, fire suppression, maintenance of roads and utility lines, and water diversion projects may have contributed to decreased habitat capability for mountain bluebirds in the analysis area. The previous 100 years of fire suppression have created dense, closed-canopy conifer stands that are not preferred by this species. Current and future management activities, particularly timber management and fuels treatments, could change these conditions by reducing forest canopy and increasing the diversity and density of understory vegetation. These effects may increase the availability and suitability of nesting and foraging habitats for the mountain bluebird.

Habitat and Population Trend

The open woodland habitat composed of ponderosa pine and Douglas-fir that is preferred by the mountain bluebird has decreased Forest-wide because of succession (Ryke and Wagner 2002). The Forest Plan (USFS 1984a, 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). 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. While low-intensity wildfire may improve mountain bluebird habitat by decreasing tree density and creating edge habitats, high-intensity wildfire would destroy the overstory and potential mountain bluebird nest sites.

Population trend data for the mountain bluebird show an increasing, but non-significant trend. This suggests that populations are relatively stable and increasing in some areas (at least not increasing or decreasing dramatically), but that the variance across the state is high. 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. However, under Alternative 2, habitat conditions would not be improved, and the future population is likely to remain similar to the current level.

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). They reject aspen groves that lack nearby willow habitat (Barrett 1998b). Sap wells are an important food source for sapsuckers. Ponderosa pine and Douglas-fir also provide cover and foraging habitat to a lesser extent than aspen. Available nesting, foraging, and cover habitats within the project area account for 12,687 acres (**Table 3-2**). A decline in aspen because of conifer encroachment and lack of disturbance to regenerate existing aspen stands is leading toward a reduction in habitat capability for sapsuckers on the PSICC.

BBS and Christmas Bird Count (CBC) data within the United States does not specifically address red-naped sapsuckers. Data on a group of three sapsucker species indicate sapsucker populations in general are stable in Colorado (BBS 2004). BBS data on routes within the PSICC have not been collected long enough to produce accurate trend data. No red-naped sapsuckers were found in the project area during breeding bird surveys (USFS 2001a). There are no specific management directions for the red-naped sapsucker in the Forest Plan; however, standards and guidelines are present for management of its preferred habitats, old-growth and mature aspen stands (USFS 1984a). In addition, Forest Plan general direction is to provide for the habitat needs of MIS on the Forest and maintain that habitat at 40 percent or more of potential (USFS 1984a).

HABCAP Analysis

The HABCAP model was used to analyze the potential effects to sapsucker habitat capability. Preferred sapsucker habitats include all HSSs of aspen, willow, Douglas-fir, and ponderosa pine stands, which account for 12,687 acres of the analysis area (**Table 3-2**).

The HABCAP evaluation considered summer forage and cover values for both alternatives. For the current condition (and Alternative 2), values of 0.47 for summer forage and 0.39 for summer cover were predicted. For Alternative 1, values of 0.47 for summer forage and 0.28 for summer cover were predicted. The HABCAP evaluation of existing conditions (and Alternative 2) within the project area predicted a habitat capability index of 0.43 for red-naped sapsucker summer habitat. The HABCAP analysis for Alternative 1 predicts a post-project habitat capability index of 0.36 for summer habitat.

The HABCAP analysis predicts that implementation of Alternative 1 would cause a seven percent decrease in habitat capability of red-naped sapsucker summer habitat. Under Alternative 1, forage values for red-naped sapsucker habitat are the same as for Alternative 2. Alternative 1 would cause a shift in 4,156 acres of ponderosa pine and 1,007 acres of Douglas-fir from HSS 4B to HSS 4A (**Table 3-5**). This shift in HSSs decreases habitat capability and summer cover values for the red-naped sapsucker. However, the HABCAP model only accounts for the overall shift in structural stages and does not account for variability within each treatment unit. For example, in aspen stands, treatment would focus on removing 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. In the long-term, aspen is expected to increase across the project area.

The Forest Plan (1984a) provides a standard of 80 percent for habitat capability of MIS in MA 4B. Management practices, such as logging, livestock grazing, and fire suppression, have contributed to conifer encroachment and lack of disturbance in existing aspen stands. It is unlikely that an 80 percent habitat capability standard would be attained for this species in the project area because of the limited extent of the aspen cover type (five percent of the project area). Forest thinning and prescribed burning would increase regeneration of aspen stands by removing encroaching conifers and stimulating sucker production, which may increase the availability of sapsucker habitats in the long-term.

Analysis of Effects

Direct: It is expected that few red-naped sapsuckers actually occupy the project area because older aspen stands near willow patches are limited in the project area. For example, there are only 15 acres of willow in the project area and several of these patches do not occur near aspen stands. However, implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing occupied nest trees. In general, removal of the large aspen that are preferentially used for nesting would be avoided. Alternative 2 would not cause any new effects to the red-naped sapsucker. Current habitat availability would be maintained.

Indirect: Cover habitats would decrease because of the thinning and prescribed burning treatments under Alternative 1. This effect is expected to be temporary. Eventually, the availability and condition of nest sites and cover in the project area is expected to be higher than before project implementation because of aspen regeneration. Proposed treatments under Alternative 1 would also decrease the potential for a large-scale crown fire, which could cause widespread habitat loss. Alternative 2 would maintain current levels of habitat capability and availability; however, conifer encroachment of aspen stands and the risk of large-scale wildfire or insect outbreaks would continue to increase. Over the long-term, these effects are likely

to reduce the capability and availability of sapsucker habitats. The lack of appropriate willow habitats would likely continue to limit the habitat potential for the species under both alternatives.

Cumulative: Previous management actions in the analysis area, including timber harvest, fire suppression, and livestock grazing may have contributed to decreased habitat capability in the project area. The previous 100 years of fire suppression have contributed to conifer encroachment and a lack of disturbance necessary to regenerate existing aspen stands. Current and future management activities, particularly timber management and fuels treatments, would change these conditions by reducing forest canopy, removing encroaching conifers, and increasing the diversity and density of understory vegetation. These effects would reduce habitat capability in the short-term, but should increase capability of nesting habitats in the long-term.

Habitat and Population Trend

The Forest Plan (USFS 1984a) describes the structure of aspen stands on the PSICC as dominated by pole-sized trees with approximately 50 percent of the aspen stands in a mature or old-growth seral stage. A decline in aspen is projected because of conifer encroachment and lack of disturbance to regenerate existing aspen clones. Aspen represents less than ten percent of the PSICC, and only five percent of the project area. A short-term decrease in cover is predicted by HABCAP under Alternative 1. However, long-term increases in aspen are expected because conifers would be thinned from existing aspen stands and new suckering of aspens is expected following both mechanical thinning and prescribed burning. Under Alternative 2, existing habitats would not be altered in the short-term. However, continued encroachment of conifers into aspen stands, along with the potential for large-scale wildfire or insect outbreaks, suggests that sapsucker habitats would decline in the long-term under this alternative.

Data on a group of three sapsucker species indicate sapsucker populations in general are stable in Colorado (BBS 2004). Population levels in the project area are probably low because of the limited amount of available 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 cause a decrease in the population in the long-term because of habitat loss to large-scale wildfires, insect outbreaks, or conifer encroachment.

Green-tailed Towhee

The green-tailed towhee breeds in shrubby hillsides dominated by Gambel oak and associated shrub species (for example, mountain mahogany, serviceberry, chokecherry, and snowberry), primarily within an elevation range of 5,000 to 8,000 feet, but occasionally as high as 10,000 feet (Andrews and Righter 1992). They also breed in sagebrush flats, ponderosa pine savannah with shrub understory, scattered aspen with intermixed shrubs, and pinyon-juniper hillsides (Righter 1998). Green-tailed towhees avoid dense forests except in openings and where conditions allow shrubs to grow (Righter 1998). Towhees typically feed on insects and seeds.

Large-scale crown fires that eliminate the shrub component altogether would be detrimental to this species. However, shrubs would re-grow quickly and may increase substantially compared to pre-burn conditions. For example, some forested areas burned during the Buffalo Creek fire in 1996 now support dense shrublands. Hiking trails, urbanization, mining, and road construction may also adversely affect towhee habitat. Forest management that strives to produce mosaics of burned/unburned shrub habitat on a landscape-scale is beneficial for this species.

Colorado contains between 20 to 40 percent of the entire breeding population of green-tailed towhees. This species ranks as the thirteenth most numerous species in Colorado with almost one million breeding pairs (BBS 2004). Colorado BBS routes have not produced statistically valid trend estimates and BBS data on routes within the Pike National Forest have not been collected long enough to produce accurate trend data. The Monitoring Colorado Birds program is monitoring populations of the green-tailed towhee; however, trend data are not yet available. Green-tailed towhees were documented in the project area during breeding bird surveys (USFS 2001a). The Forest Plan does not provide specific population objectives; however, the general direction is to provide for the habitat needs of MIS on the Forest and maintain that habitat at 40 percent or more of potential (USFS 1984a).

HABCAP Analysis

The HABCAP model was used to analyze the potential effects to green-tailed towhee habitat capability. The project area contains 3,559 acres of potential nesting and foraging habitats consisting of aspen, bristlecone pine, Douglas-fir, limber pine, and ponderosa pine in HSSs 3A and 4A, and all HSSs of true mountain mahogany, tufted hairgrass-sedge, and willow (**Table 3-2**).

The HABCAP evaluation considered summer forage and cover values for both alternatives. For the current condition (and Alternative 2), values of 0.24 were predicted for summer forage and cover. For Alternative 1, values of 0.36 were predicted for summer forage and cover value.

The HABCAP evaluation of existing conditions (and Alternative 2) within the analysis area predicted a habitat capability index of 0.24 for green-tailed towhee summer habitat, showing that the Forest Plan standard for all MAs is not currently being met. The HABCAP analysis for Alternative 1 predicts a post-project habitat capability index of 0.36 for green-tailed towhee summer habitat. This habitat capability does not meet the Forest Plan standard for all MAs, but shows an upward trend towards meeting the standard. This increase is a result of the treatments creating more forest edge habitat and openings that are more suitable for green-tailed towhee nesting and foraging.

The Forest Plan (USFS 1984a) provides a habitat capability standard of 80 percent for MA 4B. Management practices, such as fire suppression, have contributed to an increase in forest canopy and a reduction in shrubs, along with an increase in the risk of large-scale fire. It is unlikely that an 80 percent habitat capability standard could ever be attained for this species in the project area because of the relatively low percentage of shrub habitat. Thinning and prescribed burning treatments would improve habitat diversity and availability for the green-tailed towhee and would decrease the risk of a stand-replacing fire. Over the long term, this would improve habitat capability for the green-tailed towhee, even though Forest Plan standards would not be met.

Analysis of Effects

Direct: Implementation of Alternative 1 may cause direct injury or mortality to this species by disturbing or removing occupied nests. Most (85 percent) of the suitable towhee habitats in the project area would be treated. However, treatments would occur over five or more years and during different seasons. It is expected that a relatively small amount of towhee habitat would be affected each breeding season during project implementation. Alternative 2 would not cause any new effects to the green tailed towhee. Current habitat availability would be maintained.

Indirect: Approximately 85 percent of suitable towhee habitats would be treated under Alternative 1. The various treatments may remove understory shrubs and other structural components that are important to towhees. Most of these shrubs are expected to re-grow and would provide towhee habitats in the future. Alternative 1 is expected to create new green-tailed towhee habitats over the long-term. Nesting and

foraging habitats would benefit from thinning and prescribed burning. Habitat diversity and capability would increase under Alternative 1 based on HABCAP modeling and the distribution of post-treatment HSSs shown in **Table 3-4**. Proposed treatments under Alternative 1 would also decrease the potential for a large-scale crown fire, which could cause widespread habitat loss. Alternative 2 would maintain current levels of habitat capability and availability; however, the risk of large-scale wildfire and insect or disease outbreaks would continue to increase. Over the long-term, these effects would continue to reduce the capability and availability of towhee habitats.

Cumulative: Previous management actions in the analysis area, including timber harvest, fire suppression, maintenance of roads and utility lines, water diversion projects, housing development, livestock grazing, and recreational use, may have contributed to decreased habitat capability in the project area. The previous 100 years of fire suppression have created dense, closed-canopy conifer stands that are not suitable to this species. Current and future management activities, particularly timber management and fuels treatments, would change these conditions by reducing forest canopy, removing timber, and increasing the diversity and density of understory vegetation. These management activities would increase the availability and suitability of nesting and foraging habitats for the green-tailed towhee.

Habitat and Population Trend

Green-tailed towhee habitat on the PSICC has probably decreased compared with historical conditions because of fire suppression and increases in forest cover; however, recent, large-scale fires may have reversed this trend. Alternative 1 would treat large portions of green-tailed towhee habitat, but post-treatment conditions would generally be improved, especially once shrubs re-grow in burned and thinned areas. Forest thinning may also increase the suitability of treated habitat for the green-tailed towhee by increasing the availability of nutrients, water, and sunlight to the understory shrub layer. This alternative would contribute to an ongoing increase of towhee habitats on the PSICC. Alternative 2 would not treat any current towhee habitat, nor would it increase the suitability of this habitat. This alternative would cause increased long-term risk of large-scale wildfires, which could create large patches of suitable towhee habitat if they were to occur.

Statewide and on the PSICC, trend data for the green-tailed towhee are not statistically valid. This suggests that populations are relatively stable (at least not increasing or decreasing dramatically), but that the variance across the state is high. Recent habitat increases on the PSICC may be supporting population increases; however, no data are available to support this assertion. The expected increase in habitat suitability under Alternative 1 suggests that the project area may be able to support more towhees in the future. However, under Alternative 2, habitat conditions would not be improved, and the future population is likely to remain similar to the current level. If a large-scale fire were to occur, populations may increase in any shrublands that were to develop.

3.6 SPECIAL-STATUS SPECIES

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 (PET) 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 PET and sensitive species.

Complete lists of PET and sensitive species located on the PSICC and any species located downstream that could potentially be affected by the project can be found in the BA (for PET species) and BE (for sensitive species). The BA concluded that only two PET species, the bald eagle and the Mexican spotted

owl, may occur in the project area. The BE concluded that five sensitive wildlife species (northern goshawk, olive-sided flycatcher, peregrine falcon, flammulated owl, and American three-toed woodpecker) and six sensitive plant species (narrow-leaf moonwort, yellow lady's slipper, Colorado tansy-aster, white adder's mouth, Weber's monkey-flower, and Rocky Mountain cinquefoil) may occur in the project area.

This section evaluates the potential effects of implementing the proposed action 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.

3.6.1 Bald Eagle

Bald eagles live throughout North America from Alaska to Newfoundland, and from southern Florida to southern California. During winter months in Colorado, bald eagles are known to roost along lakes, streams, and rivers that support large, mature trees and that are isolated from human disturbance (Winternitz 1998). Wintering populations of bald eagles in Colorado number between 400 and 700 (Andrews and Righter 1992). There are no known bald eagle nests in the project area (CDOW 1997, Leutzinger 2004). Suitable winter roosting habitat occurs along the South Platte River within Elevenmile Canyon in the project area. No concentrated winter roosting bald eagles have been documented by Forest Service employees, but individual eagles are frequently found roosting near Elevenmile Reservoir and throughout Elevenmile Canyon during the winter (USFS 1999b, Leutzinger 2004).

These birds are most frequently seen near larger streams, rivers, lakes, and reservoirs. Although proximity to water is typical, roosting at some distance from water is known to occur in Colorado. The primary characteristic of winter habitat is an abundant and available food supply in conjunction with one or more suitable night roost sites. While a roost site may be used regularly during the winter season, repetitive use in subsequent winters does not necessarily occur. Cottonwoods are the preferred tree species for roosting in Colorado. In wintering areas, bald eagles commonly roost in large groups, and up to 200 birds may use a communal roost (Towry 1984). The predominant cover type is ponderosa pine, mixed conifer, or cottonwood. Locations protected from the wind by vegetation or terrain are typically preferred because they provide a more favorable thermal environment. In addition to the natural features, roost sites are generally isolated from human disturbances.

Several factors are considered threats to the bald eagle. Loss of winter roost sites and disturbance of roosting eagles can have negative effects on winter survival. Additional threats include disease, predation, and incidental or illegal shooting and trapping (United States Department of Interior, Fish and Wildlife Service [USFWS] 1995a).

Analysis of Effects

Direct: A small amount (150 acres) of mechanical treatment is proposed within ¼-mile of the South Platte River under Alternative 1. This treatment area is north of County Road 96 and is not expected to alter habitat adjacent to the river. Mechanical treatments within this area include mechanical thinning with all slash treatments except pile burning (seven acres), mechanical thinning with all slash treatments including pile burning followed by broadcast burning (127 acres), and mechanical thinning with all slash treatments including pile burning (16 acres). Broadcast burning only is proposed on 915 acres within ¼-mile of the South Platte River. However, the majority of burning would occur north of County Road 96 and would not occur in areas such as extremely steep slopes or areas where access is not sufficient to allow adequate control of fire. No treatments would occur on the remaining 326 acres of the project area that are within ¼-mile of the South Platte River. No direct injury, mortality, or disturbance of individual

bald eagles is expected for any of these treatments. Snags that are determined to be safety hazards would be removed. Removal of snags may reduce the availability and suitability of potential roosting habitat in the project area. Standards included under the Forest Plan would preserve minimum densities of snags. Large, live trees located along the river, which can provide winter roosting opportunities, would be protected by the use of a minimum 100-foot buffer along the river and associated riparian areas. Alternative 2 would have no direct effect on bald eagles because no activities would occur and current habitat conditions would be maintained.

Indirect: Implementation of Alternative 1 would not lead to a shortage of roosting or foraging habitats because Forest Plan standards require maintaining minimum densities of snags for the benefit of bald eagles and other wildlife. Alternative 1 would not affect shoreline trees that may be used for roosting and foraging because riparian areas would be protected from direct effects by 100-foot buffers. Snag recruitment would continue to occur through natural processes, providing roosting sites into the future. Many of the larger-diameter, open-branched live trees would be retained and provide potential roosting sites. Alternative 2 would maintain the current availability of habitats, but the potential for large-scale crown fire or insect outbreak would remain high.

Cumulative: Specific future actions on private, state, and tribal lands in and near the project area are likely to be similar to past and current activities. Recreational use and residential development near the South Platte River are likely to increase in the future as the area's population increases. Both of these activities are unlikely to have additional effects on wintering bald eagles. While the number of people participating in recreational activities may increase, this use is likely to be concentrated in areas where disturbance from similar uses is already occurring. Eagles that winter along Elevenmile Canyon are most likely accustomed to the current level of recreational activities and are expected to become accustomed to higher levels in the future. In addition, the proposed federal action would not promote or restrict recreational activities in Elevenmile Canyon or elsewhere in the project area and, therefore, would not cumulatively affect the bald eagle through increasing recreational use.

Residential development is expected to occur in areas that are already developed, but density of structures is likely to increase. Most residential development is concentrated near Lake George, to the east of the project area, and along Park County Road 92, and very little is located in Elevenmile Canyon. The proposed federal action would not change the location of future residential development, nor would it influence the rate of development. In addition, while some habitats on private lands that are suitable for bald eagle roosting may be altered or removed, habitats in commonly used roosting areas, such as Elevenmile Canyon, would not be affected by residential development.

3.6.2 Mexican Spotted Owl

The Mexican spotted owl (MSO) ranges from the Colorado Rockies and southern Utah to central Mexico. Records for the MSO in Colorado are very rare, and the historical distribution is difficult to infer. There are two known breeding populations of MSOs 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 occurs on the southern massif of Pikes Peak and smaller numbers 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 2000c).

There are no known MSO nests or occurrence records within the project area (USFS 1999b). The Forest Service conducted MSO surveys in 1993, 1994, and 2004. These surveys did not find any MSO occurrences within the project area. The nearest MSO occurrence has been documented near Thunder Butte, approximately 20 miles northeast of the project area in Douglas County (Leutzinger 2004).

Although no MSO occurrences have been documented within the project area, potential habitat exists within Elevenmile Canyon along the South Platte River (Leutzinger 2004).

The MSO is typically found in steep-sided canyons with old growth mixed conifer forests in Colorado. It may also be found in the shady, cool canyons of the pinyon-juniper zone. All known nests in Colorado occur on cliff ledges or in caves along canyon walls (USFS 2000c). These include both sheer, slick rock canyons with scattered patches of Douglas-fir and steep canyons with exposed bedrock cliffs and tiers of exposed rock at various heights.

In 2001, the USFWS designated 4.6 million acres of critical habitat for the MSO on federal lands in Arizona, New Mexico, Colorado, and Utah (USFWS 2001a). Critical habitat mapping is currently being refined. Existing maps do not identify any critical habitat within the project area (USFWS 2001a). The nearest critical habitat designation (SRM-C-2) occurs within the Pike National Forest in Jefferson and Douglas Counties, approximately 20 miles northeast of the project area.

The major concern for the MSO is the loss of mature and old-growth mixed conifer habitats in steep, rock-walled canyons. The threat of large-scale wildfire and subsequent loss of habitats for the MSO and its prey species is also a major concern (USFWS 1995b).

Analysis of Effects

Direct: Because of its habitat preference and the lack of known MSO occurrences within the project area, no direct injury, mortality, or disturbance of individual MSOs is expected from Alternative 1. No suitable habitats would be lost or degraded by project activities because slope restrictions and the proximity of potential MSO habitat to the South Platte River preclude treatments. Alternative 2 would have no direct effect on MSOs because no activities would occur and current habitat conditions would be maintained.

Indirect: Implementation of the proposed action would not lead to a shortage of habitats because of the lack of known MSO occurrences within the project area and slope restrictions that would prohibit project activities within potential MSO habitats. The proposed action may benefit the MSO by reducing the potential for a large-scale crown fire or insect outbreak. Such a large-scale event would cause widespread alteration of vegetation and may cause loss of potential MSO habitat along Elevenmile Canyon. Alternative 2 would maintain the current availability of habitats, but the potential for large-scale crown fire or insect outbreak would remain high.

Cumulative: Specific future actions on private, state, and tribal lands in and near the project area are likely to be similar to past and current activities as described in the Environmental Baseline section above. Recreational use and residential development near the South Platte River are likely to increase in the future as the area's population increases. Both of these activities are unlikely to have additional effects on MSOs or their habitat. Consequently, these activities, combined with the anticipated effects of the proposed federal action are unlikely to affect the MSO.

3.6.3 Northern Goshawk

The distribution of the northern goshawk is widespread. It breeds in coniferous, deciduous, and mixed forests throughout much of North America. In Colorado, the goshawk is considered a rare to uncommon year-round resident of coniferous forests (USFS 2001b). Active goshawk nests and incidental goshawk observations have been documented within the project area (USFS 2001b).

Goshawks generally occur in mature or old growth aspen, conifer, or mixed aspen/conifer forests. Nesting in primarily mature and old growth forest with large trees and high canopy closure (HSS 4B, 4C, and dense 5) suggests that these areas are particularly important to northern goshawks in the western United States (Reynolds et al. 1992, Squires and Reynolds 1997). Preferred nesting habitat for the goshawk in the project area consists of mature ponderosa pine and Douglas-fir (HSS 4B) (USFS 2001c). Based on published information regarding habitat preferences for nesting and foraging, the project area contains 9,262 acres of potential nesting habitat. In addition, the project area contains 3,455 acres of potential foraging habitat.

The major concern for the northern goshawk is the loss of mature and old-growth aspen, conifer, or mixed aspen/conifer forests where they breed and forage. The threat of a large-scale wildfire and subsequent loss of habitats for the northern goshawk and its prey species is also a major concern.

Analysis of Effects

Direct: Proposed mitigation measures that restrict activities during the nesting period and limitation of activities in known nest stands and post-fledging areas (PFAs) would minimize direct effects to goshawks. Project activities may disturb or displace goshawks from otherwise suitable habitats outside of nesting areas. Alternative 2 would have no direct effect on goshawks because no activities would occur and current habitat conditions would be maintained.

Indirect: Mechanical treatment in Alternative 1 would cause a shift from the current HSS 4B to HSS 4A, decreasing the availability of goshawk nesting habitat. Potential nesting habitat would decrease from 9,262 acres to 3,325 acres (**Tables 3-2, 3-4, and 3-5**). However, habitat diversity and goshawk foraging areas would increase under Alternative 1 from 3,455 acres to 8,351 acres (**Tables 3-2, 3-4, and 3-5**). Additionally, 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. Alternative 2 would maintain the current availability of nesting and foraging habitats, but the potential for large-scale crown fire or insect outbreak would remain high.

Cumulative: The past 100 years of fire suppression have likely caused an increase in the availability and suitability of goshawk nesting habitats in the project area as late successional stands of aspen, Douglas-fir, limber pine, and ponderosa pine became denser. Conversely, fire suppression has likely caused a decline in the availability and suitability of goshawk foraging habitats in the project area as these same late successional stands become denser. Implementation of current and future timber management projects may decrease the availability and suitability of goshawk nesting habitat but would also increase the availability and suitability of goshawk foraging habitat. There are no specific management standards for the northern goshawk in the Forest Plan (USFS 1984a). Mitigation measures that would provide for nest protection and a balance of HSSs within PFAs and foraging areas have been developed as part of the proposed project. These measures would minimize the potential for effects to known goshawk habitats within the project area under Alternative 1. Alternative 2 would not contribute to new cumulative effects to the goshawk, but ongoing effects, such as loss of foraging habitat caused by fire suppression, would continue.

3.6.4 Olive-Sided Flycatcher

The olive-sided flycatcher breeds in boreal forests from Alaska to Newfoundland and in the mountains of the western United States (Jones 1998). They winter from Mexico to south Peru. In Colorado, the olive-sided flycatcher is a montane summer resident nesting at elevations between 7,000 to 11,000 feet (Andrews and Righter 1992). There is evidence that this species breeds near the project area in Park

County (Jones 1998). Forest Service employees documented three olive-sided flycatchers during bird surveys in 2001 (USFS 2001a). These observations were recorded in Springer Gulch, Grove Drainage, and Messenger Gulch within the Rocky Messenger portion of the project area (USFS 2001a).

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). Tall trees, trees with spiked tops, or high conspicuous dead branches and dead snags, as well as adequate live trees for nesting sites, are important components of all nesting habitats. Based on published information about habitat preferences, the project area contains 12,687 acres of potential nesting and foraging habitat.

Interpretation of population trends is hampered by a lack of natural history information and an absence of data detailing specific factors that adversely affect the species. It is believed that forest management practices that increase forest openings and edge habitats may increase the amount of suitable breeding habitat (Jones 1998).

Analysis of Effects

Direct: Individual flycatchers may be disturbed by operation of equipment in occupied habitat. Potential effects include the removal or alteration of nest trees. Although implementation of the treatments may remove snags and larger trees, Forest Plan standards (USFS 1984a) and mitigation measures would preserve minimum densities of snags within the project area. In addition, treatments under Alternative 1 that increase forest openings and edge habitats may increase the amount of suitable breeding habitat. Alternative 2 would have no direct effect on olive-sided flycatchers because no activities would occur and current habitat conditions would be maintained.

Indirect: Alternative 1 would not change the overall amount of available aspen, ponderosa pine, Douglas-fir, and willow for flycatcher nesting and foraging (**Tables 3-2, 3-4, and 3-5**). Habitat diversity would increase under Alternative 1, based on the distribution of post-treatment HSSs shown in **Table 3-4**. Treatment activities would improve existing habitats within the treatment units by creating new or larger forest canopy openings that may be suitable as foraging areas. Alternative 1 would reduce the potential for a large-scale crown fire or insect outbreak compared with Alternative 2. These events could lead to a substantial loss of suitable flycatcher habitat

Cumulative: The current habitat condition in the project area has been strongly dictated by the forest management actions and fire suppression over the previous 100 years. These actions have increased forest density and the potential for large-scale crown fires or insect outbreaks. No specific management standards for the olive-sided flycatcher are included in the Forest Plan (USFS 1984a). In the long-term, fuels treatment projects may benefit this species by increasing habitat diversity and reducing the potential for habitat loss from large-scale crown fires. Continued prescribed burning would begin to restore natural fire regimes to the project area.

3.6.5 Peregrine Falcon

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). Although habitats that are potentially suitable for nesting and foraging exist in the project area, the occurrence of peregrines in the project area has not been documented. In the project area, suitable nesting and foraging habitats occur along the South Platte River within Elevenmile Canyon. However, no peregrine falcons have been documented in the project area during bird surveys or incidentally by Forest Service employees (USFS 2001a).

Peregrines usually nest on ledges of high cliffs or tall man-made structures. Peregrines 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 is known to hunt in pinyon-juniper, ponderosa pine, and spruce-fir habitats, which are the same habitats that tend to occur near the best nesting areas (Levad 1998).

Several factors threaten the peregrine falcon. Because falcons rarely nest far from water, the loss or modification of these nesting habitats can have detrimental effects on the current population. Contamination of prey, particularly waterfowl, may seriously affect the availability and quality of prey. Effects to the prey base may in turn detrimentally affect the viability and survivability of reproducing peregrine falcons. Additional threats include disease, predation, and incidental or illegal shooting and trapping (USFWS 1999).

Analysis of Effects

Direct: No direct injury or mortality to individual falcons is expected under either alternative because of their habitat preferences and the lack of known peregrine falcon occurrences within the project area. No suitable nesting habitats would be lost or degraded by project activities because of slope restrictions and the proximity of potential peregrine falcon habitats to the South Platte River.

Indirect: Neither Alternative 1 nor Alternative 2 would lead to a long-term shortage of nesting or foraging habitats because of the lack of known peregrine falcon occurrences within the project area and slope restrictions that would prohibit project-related activities within potential peregrine falcon nesting habitat.

Cumulative: Current habitat conditions in the project area have been strongly dictated by the forest management actions and fire suppression over the previous 100 years. No previous, current, or reasonably foreseeable future activities under either Alternative 1 or Alternative 2 are likely to affect peregrine falcons or their habitats in the project area because of their habitat preferences, the habitats that would likely be affected by known projects, and the lack of known peregrine falcon occurrences within the project area.

3.6.6 Flammulated Owl

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. No flammulated owl surveys have been conducted in the project area. No known flammulated owl nesting occurrences have been documented within the project area (USFS 2001a), but one owl was heard on May 17, 1994 by a biologist during a MSO survey (USFS 1999b). This observation suggests that flammulated owls use the area.

This species primarily depends on cavities for nesting, open forests for catching insects, and brush or dense foliage for roosting (Winn 1998). Researchers have identified old-growth ponderosa pine and aspen as key habitats (Winn 1998). 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). Based on published information regarding habitat preferences for nesting, roosting, and foraging, the project area contains 12,671 acres of potential nesting and foraging habitat.

The major concern for the flammulated owl is the loss of mature and old-growth ponderosa pine, conifer, or mixed aspen/conifer forests where they breed and forage. The threat of a large-scale wildfire and subsequent loss of habitats for the flammulated owl and its prey species are also major concerns.

Analysis of Effects

Direct: Individual owls may be disturbed if occupied snags are removed. Implementation of Alternative 1 is likely to remove or damage trees that are suitable for nesting. Although implementation of the treatments may remove snags and larger trees, 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. Alternative 2 would have no direct effect on flammulated owls because no activities would occur and current habitat conditions would be maintained.

Indirect: Alternative 1 would not change the overall amount of available aspen, ponderosa pine, and Douglas-fir for owl nesting, roosting, and foraging (**Tables 3-2, 3-4, and 3-5**) but it would decrease forest density and eventually increase average tree size, which would increase nesting habitat suitability. Alternative 1 would benefit the flammulated owl by reducing the potential for a large-scale crown fire or insect outbreak, which could cause widespread habitat loss. The potential for a large-scale crown fire or insect outbreak would be higher under Alternative 2.

Cumulative: The current habitat condition in the project area has been dictated by the forest management actions and fire suppression of the past 100 years. These actions have increased forest density and decreased average tree size, reducing habitat suitability for the flammulated owl. There are no specific management standards for the flammulated owl within the Forest Plan (USFS 1984a), but it does contain measures that provide for snag protection that would be incorporated into the project design. These measures would minimize the potential for effects to flammulated owls and their habitats in the project area. Alternative 2 would not contribute to new cumulative effects to the flammulated owl.

3.6.7 American Three-Toed Woodpecker

The American three-toed woodpecker occurs throughout the boreal forests of North America. Colorado represents the southern extent of this species' range. The woodpeckers are scattered throughout the mountains in Colorado, and known breeding occurrences have been documented within Park County (Versaw 1998). Breeding bird surveys have been conducted throughout portions of the project area, but no three-toed woodpeckers were found (USFS 2001a). This species is generally quiet and easily overlooked, especially if population levels are low. Although lacking in spruce-fir habitats, the project area does contain aspen, ponderosa pine, and Douglas-fir that may be used for nesting and foraging when insect populations are high. Based on published information regarding habitat preferences for nesting and foraging, the project area contains 12,671 acres of potential nesting and foraging habitat (**Table 3-2**).

In Colorado, this species occurs almost exclusively in spruce-fir habitats. This species forages for tree-boring insects and is commonly associated with burned, diseased, or logged forests (Versaw 1998). Where insect populations are high, it may also occur in ponderosa pine, Douglas-fir, and lodgepole pine forests (USFS 2000c). The three-toed woodpecker uses both open and closed canopy forests for nesting and foraging (Versaw 1998). Nest sites have been found in ponderosa pine and aspen trees (Versaw

1998). The typical range of the woodpeckers in Colorado ranges from 7,000 to 12,000 feet in elevation, with most above 9,000 feet (Versaw 1998).

Loss of spruce-fir habitats is a concern for this species. In addition, fire suppression has led to reduced foraging habitat in burned-over areas.

Analysis of Effects

Direct: Individual woodpeckers may be disturbed by operation of equipment in occupied habitats. Nest trees may be removed or altered. Although the treatments may remove snags, Forest Plan standards (USFS 1984a) would preserve minimum densities of snags within the project area. In addition, anecdotal evidence suggests that there are areas in the project area of high snag density associated with insect and disease infestations. Alternative 2 would have no direct effect on three-toed woodpeckers because no activities would occur and current habitat conditions would be maintained.

Indirect: Implementation of Alternative 1 would reduce the potential for a large-scale crown fire or insect outbreak. Because the woodpecker forages for tree-boring insects and is commonly associated with burned, diseased, or logged forests, Alternative 1 may cause a reduction in foraging habitat. However, over the long-term, the proposed treatments would help to restore natural fire regimes to the project area and increase foraging habitat. Alternative 2 would increase the long-term potential for large-scale wildfire or insect outbreak, which would benefit this species if one of these events were to occur.

Cumulative: The current habitat condition in the project area has been strongly dictated by the forest management actions and fire suppression over the previous 100 years. These actions have increased forest density and decreased forest health. Because the woodpecker forages for tree-boring insects and is commonly associated with burned, diseased, or logged forests, these management actions have increased existing foraging habitat suitability for the three-toed woodpecker, while also increasing the potential for a large-scale event that could dramatically increase foraging habitat suitability. Implementation of Alternative 1 may benefit this species over the long-term by increasing diversity and reducing the risk of large-scale wildfires or insect outbreaks. Continued prescribed burning would begin to restore natural fire regimes to the project area. In the short-term, there would be a reduction in preferred foraging habitat (snags) in the project area; however, snags would continue to be available in sufficient numbers across the greater landscape. Under Alternative 2, the current conditions would continue, which would benefit this species if a large-scale wildfire or insect outbreak were to occur. However, the chances of this occurring are relatively small (19 percent over 20 years), so that any short-term benefit of Alternative 2 is unlikely.

3.6.8 Narrow-leaf Moonwort

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. 2003, Reyher 2004). There are nine confirmed, occupied sites for this species in the entire United States (Beatty et al. 2003). In Colorado, there are between one and four extant sites and one to four historic sites (Popovich 2004) in Boulder, El Paso, Grand, and Lake Counties (Beatty et al. 2003). There are no documented occurrences in the project area or Park County.

Typical habitat for the 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. Open habitats and microsites with slight to moderate disturbance appear to be typical habitat for a number of *Botrychium* species, including the

narrowleaf moonwort (Beatty et al. 2003). Potential habitat may be present within the project area in grassy or lightly disturbed areas along edges of streamside forests.

Threats to the narrowleaf moonwort are not generally know because of a lack of occurrence data; however, the small size of most populations makes them vulnerable to localized, catastrophic events. Possible threats to this species include: changes to natural disturbance regimes (for example, fire suppression), road and trail construction and maintenance, structure construction, herbicide application, recreational activities, grazing and trampling by livestock and wildlife, non-native species competition, habitat fragmentation, timber harvest, and climate change (USFWS 2001b). However, since Euro-American settlement, light to moderate disturbance of soils may have actually increased the extent or suitability of some habitats (USFS 1997). Nevertheless, the USFWS (2001b) considers this species to be a candidate for federal listing as threatened because of its rarity and potential threats.

Analysis of Effects

Direct: Because of the lack of known occurrences and high-quality habitat within the project area, direct effects to this species are not expected and 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. However, prescribed burns would be done outside of the season when aboveground parts of this plant are present. In addition, 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 within the treatment units 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 activities would occur and existing habitat conditions would be maintained.

Indirect: Because of the lack of known occurrences within the project area, no indirect effects to plants are expected under Alternatives 1 or 2. Implementation of prescribed treatments, including mechanical thinning and broadcast burning, may improve long-term habitat conditions for this species.

Cumulative: Because of the lack of high-quality habitat and known occurrences within the project area, no previous, current, or reasonably foreseeable future activities are likely to affect the narrow-leafed moonwort or its potential habitat. 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.

3.6.9 Yellow Lady's Slipper

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. It is generally absent in the lower Midwest and Southwestern states. Occurrences have been documented in Clear Creek, Custer, Douglas, El Paso, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Montrose, Park, and Pueblo counties in Colorado. Although not found within the project area, it has been located within Pike National Forest near the headwaters of the South Platte River (USFS 2004c).

Typical habitat for the yellow lady's slipper includes subalpine wetlands, moist forests, and open aspen groves (USFS 2004c). It is frequently associated with aspen, ponderosa pine, Douglas-fir, or less frequently spruce/fir forests, between 7,400 to 8,500 feet in elevation (USFS 2004c). The project area contains minimal wetland habitat. Potential habitat may occur within aspen and ponderosa pine stands along drainages.

Threats include road construction, trampling by hikers, over-collection, and changes in local soil moisture regimes.

Analysis of Effects

Direct: Because of the lack of known occurrences within the project area, no direct loss of individuals or populations is expected under Alternatives 1 or 2. Because of the lack of known occurrences and high-quality habitat within the project area, surveys for this plant would not be conducted before project implementation. Treatment activities conducted under Alternative 1, such as mechanical thinning and broadcast burning, would not occur within wetland habitats potentially occupied by the yellow lady's slipper, but would occur in moist forests.

Indirect: Because of the lack of known occurrences within the project area, indirect effects to plants are not expected under Alternatives 1 or 2. Implementation of prescribed treatments under Alternative 1, including mechanical thinning and broadcast burning, 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 up the forest canopy and dry the forest floor, which could reduce the suitability of moist areas for this plant.

Cumulative: Current habitat conditions in the project area have been strongly dictated by forest management actions and fire suppression over the previous 100 years. Other activities within the project area include maintenance of roads and utility lines, water diversion projects, and recreational use. Housing development and livestock grazing has occurred on private land in and adjacent to the project area. Because of the lack of high-quality habitat and lack of known occurrences within the project area, no previous, current, or reasonably foreseeable future activities are likely to affect the yellow lady's slipper.

3.6.10 Colorado Tansy-Aster

The Colorado tansy-aster is endemic to south-central Wyoming and Colorado. Within Colorado, it has been located in Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Saguache, and San Juan 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 the Colorado tansy-aster in the project area.

The Colorado tansy-aster is typically found in gravelly areas on high mountain slopes, rock outcrops, scree, and dry tundra between 8,500 to 12,500 feet in elevation (Spackman et al. 1997). Potential habitat may be present along high mountain slopes and rock outcrops above 8,500 feet in the project area.

Threats include road construction, trampling by hikers, and over-collection.

Analysis of Effects

Direct: No direct loss of individual plants or populations is expected under Alternatives 1 or 2 because of the lack of known occurrences within the project area. Surveys for this plant would not be conducted before project implementation because of the lack of known occurrences and high-quality habitat within 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.

Indirect: Indirect effects to this species from potential changes to soils and habitat are not expected because no treatments would occur in potential habitats for this species.

Cumulative: Habitat 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.

3.6.11 White Adder's Mouth

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. It is known to occur along the Front Range in Boulder, Jefferson, and El Paso Counties (Spackman et al. 1997). There are no documented occurrences in the project area, although it has been located within Pike National Forest near the lower north fork of the South Platte River (USFS 2004c).

This plant grows in calcareous fens and along streams in mosses where it is kept wet by water spray between 7,200 to 8,000 feet in elevation (Spackman et al. 1997). Potential habitat within the project area may exist along the South Platte River and drainages containing flowing water. However, it seems unlikely that this plant would occur along a stream as large as the South Platte River because known locations are along small, high gradient streams. For this reason, it is unlikely that this species occurs in the project area.

Threats include road construction, trampling by hikers, over-collection, and changes in local soil moisture regimes.

Analysis of Effects

Direct: No loss of individual plants or populations is expected under Alternatives 1 or 2 because of the lack of known occurrences within the project area. Surveys for this plant would not be conducted before project implementation because of the lack of known occurrences and high-quality habitat within the project area. Treatment activities conducted under Alternative 1 would not occur within habitats potentially occupied by the white adder's mouth.

Indirect: Indirect effects to plants are not expected under Alternatives 1 or 2 because of the lack of known occurrences within the project area. 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 up the forest canopy and dry the environment along streams, which could reduce suitability for this plant.

Cumulative: No previous, current, or reasonably foreseeable future activities are likely to affect the white adder's mouth because of the lack of high-quality habitat and lack of known occurrences within the project area.

3.6.12 Weber's Monkey-Flower

Weber's monkey flower is endemic to Colorado and has been located in Grand, Jefferson, Larimer, and Park Counties (Spackman et al. 1997). Weber's monkey flower has been located near the project area within the Pike National Forest along the north and south forks of the South Platte River (USFS 2004c).

Preferred habitat for Weber's monkey flower 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 8,400 and 10,500 feet in elevation (Spackman et al. 1997). Potential habitat may be present within the project area, within aspen forests along drainages.

Threats include road construction, trampling by hikers, over-collection (although this seems unlikely because this plant is small, requires very specific conditions, and rarely produces flowers), and changes in local soil moisture regimes.

Analysis of Effects

Direct: 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. Surveys for this plant would not be conducted before project implementation because of the lack of known occurrences and high-quality habitat within the project area. Treatment activities conducted under Alternative 1 would not occur within wetland habitats potentially occupied by Weber's monkey flower.

Indirect: Indirect effects to plants are not expected under Alternatives 1 or 2 because of the lack of known occurrences within the project area. 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 up the forest canopy and dry the environment along streams, which could reduce suitability for this plant. However, the habitat occupied by this plant is shady and moist, making severe fire conditions and subsequent effects to this species unlikely, even during a large-scale wildfire.

Cumulative: No previous, current, or reasonably foreseeable future activities are likely to affect Weber's monkey flower or its potential habitat because of the lack of high-quality habitat and known occurrences in the project area.

3.6.13 Rocky Mountain Cinquefoil

Rocky Mountain cinquefoil is endemic to Colorado and has been located in Boulder, Clear Creek, Larimer, and Park Counties (Spackman et al. 1997). Because of the rarity of this species, no information is available on population trends. No occurrences for Rocky Mountain cinquefoil have been documented within the project area.

This species occurs on open, granitic outcrops or thin, gravelly-granitic soils with west or north exposures. These open habitats are often associated with open stands of ponderosa pine, limber pine, and Douglas-fir between 6,900 and 10,500 feet in elevation (Spackman et al. 1997). Granitic outcrops with ponderosa pine, limber pine, and Douglas-fir are found throughout the project area and may be suitable habitat for this species.

Threats include road construction, trampling by hikers, and over-collection.

Analysis of Effects

Direct: No direct injury or mortality to individual plants or populations is expected under Alternatives 1 or 2 because of the lack of known occurrences within the project area. Surveys for this plant would not be conducted before project implementation. Treatment activities conducted under Alternative 1, such as mechanical thinning and broadcast burning, would not occur within the open, rock outcrop habitat potentially occupied by the Rocky Mountain cinquefoil.

Indirect: Indirect effects to this plant species from potential changes to soils and habitat are not expected because it occurs in open areas that would not be affected by the proposed treatments.

Cumulative: Current habitat conditions in the project area have likely been unchanged because of the preference of this species for open, granitic outcrops that contain little vegetation. Hiking and plant collection may continue to cause direct disturbance over time, but implementation of the project would not contribute to these cumulative effects.

3.7 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. No new system roads would be constructed. Minor 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. New temporary roads would be needed to access some areas; however, these roads would be closed and obliterated after treatments are complete. Overall, there would be no long-term change in the road system in the project area.

3.7.1 Management Direction

The general direction and the standards and guidelines that implement the general direction for transportation system management; arterial, collector, and local road construction and reconstruction; and road maintenance for the PSICC are defined in the Forest Plan (USFS 1984a). These standards and guidelines apply to all areas of the forest. When forest-wide standards and guidelines conflict with MA standards and guidelines, those that are more restrictive are applied.

There are no MA-specific prescriptions for transportation management, road construction, and road maintenance for MA 7D. For MA 2B, the general direction for transportation system management is to manage public use of roads with techniques such as seasonal closure, time of day closures, and others. The forest-wide direction is followed for road construction, reconstruction, and maintenance. For MA 4B, the general direction for transportation system management is to manage road use to provide for habitat needs of MIS, including road closures and area closures, and to maintain habitat effectiveness. The forest-wide direction is followed for road construction, reconstruction, and maintenance.

3.7.2 Current Transportation System

The project area is served by a well-developed regional road system that provides ready access from several population centers (**Figure 2-1**). The primary transportation route to the project area from communities outside of the Lake George area is State Highway (SH) 24, a two-lane paved road that connects the community of Lake George with Woodland Park and Colorado Springs to the east. It connects to Interstate 25 in Colorado Springs, which provides access to other Front Range cities to the north and Pueblo to the south. SH 24 accesses the project area by way of County Road (CR) 92 (NFSR 247), along the west side of the Rocky Messenger portion of the project area, and CR 96 (NFSR 275), which is along the east boundary of the Rocky Messenger area. The Annual Average Daily Traffic (AADT) volume on a three-mile segment ending on SH 24 at CR 96 in Lake George was 4,010 in 2003. Of the total AADT, 437 vehicles (11 percent) were single or combined trucks.

CRs 92 and 96 connect with NFSRs that provide internal access to the project area. NFSR 271 traverses the north part of the Rocky Messenger area from its junction with CR 92 to the west. The Howard portion of the project area is accessed from NFSR 241 along the west side, which connects with NFSR 96 and

then to NFSRs 875, 876, 877, and 878, which traverse the Howard area. These NFSRs connect with several smaller roads to form a network that provides access to most of the project area. CRs 92 and 96 are jointly administered by the USFS and Park County, but are maintained by Park County.

The NFSRs and CRs are used primarily by recreationists and seasonal residents. CR 92 provides access the Elevenmile Reservoir. CR 96 follows the South Platte River, and provides access to campsites and picnic areas along Elevenmile Canyon. These CRs are accessible by passenger vehicles.

Motorized access opportunities include improved dirt and gravel roads, two-track roads, primitive four-wheel drive roads, and motorized trails. All NFSRs in the project area are open to motorized use. These roads include NFSRs 239, 245, 246, 247, 250, 250A, 251-1B, 251, 271, 298, 875, 876, 877, and 878. There are also approximately four miles of non-system roads in the project area. These consist primarily of user-created roads or temporary roads that were not adequately closed and are now used by the public.

There are no traffic data for NFSRs in the project area. A few roads are gravel-surfaced, and accommodate passenger cars during snow-free months. NFSRs within the project area are partially or completely closed during the winter months. No NFSRs in the project area are maintained for winter use.

There are numerous residences along the CRs and on private land inholdings within and adjacent to project area boundaries. The majority of residences in the area are seasonal. Recreation is the primary use of the project area, and is evaluated in Section 3.8 (Recreation).

The Howard section of the project area contains a slightly higher density of roads than the Rocky Messenger section, which includes an unroaded area in MA 4B. The Rocky Messenger section contains MAs 2B and 4B. The Howard section contains MA 7D and a small portion of MA 4B in the northwest corner. The Forest Plan standards and guidelines specify an open local road density of 4.0 miles/square mile that should not be exceeded for MA 2B. The existing road density for MA 2B is considerably less than the prescribed maximum road density, as shown in **Table 3-13**. MAs 4B and 7D do not have guidelines for road density.

Table 3-13 Existing Local Road Density for Management Areas in Project Area

Management Area	Existing Road Length (miles)	Existing Road Density (miles/square mile)
2B	28.7	2.0
4B	3.8	0.9
7D	13.3	2.8
Total	45.8	2.0

3.7.3 Analysis of Effects

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

Alternative 1

Existing CRs and NFSRs would provide the primary access to the project area. Within the project area, there are 41.3 miles of NFSRs and CRs. NFSRs used for the project would be maintained as needed to accommodate safety or environmental considerations. No new NFSRs would be constructed.

Approximately 4.0 miles of existing non-system roads would also be maintained and used for the project. Approximately 29.7 miles of new temporary roads would be constructed and then closed and obliterated once the project is complete. These 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, including the creation of small cut and fill slopes. No large areas of cut or fill are anticipated. In addition to the temporary roads, overland travel routes with minimal clearing of vegetation and no earth movement would be used to access some treatment units. Approximately 6.3 miles of these routes would be used. These roads would be covered with slash or otherwise closed to prevent their use once project activities are completed. The distribution of temporary roads by treatment unit is shown in **Table 2-1** and **Figure 2-1**.

CR 96 is the primary access route for numerous developed recreational facilities and dispersed activities in the Rocky Messenger area and along Elevenmile Canyon. Almost all of the proposed treatments units along CR 96 would be treated with broadcast burning. Only one unit along the road would be mechanically treated. For this reason, there would be minimal use of CR 96 for project implementation. A new temporary road would extend from an existing FS road to access this unit. No proposed temporary roads would access other units from CR 96. This unit is not expected to produce substantial amounts of commercial logs; therefore, few, if any, log trucks would be required to haul commercial size logs from this unit and along CR 96. The level of traffic generated by fuels treatment in units along CR 96 would be limited to trucks hauling equipment and personnel to treatment units. There would be no noticeable increase in traffic levels. No substantial conflicts are expected between public and project traffic.

All other treatment units in the Rocky Messenger area would be accessed from existing roads and new temporary roads that connect with CR 92. Visitors to Elevenmile Reservoir and residents of the numerous seasonal and permanent homes along the road and near the reservoir make up the existing use of CR 92. Units along the Messenger Gulch Road (NFSR 251) and other roads in the Rocky Messenger portion of the project area may produce commercial timber. Log truck traffic would be present on CR 92. The increase in traffic levels occurring at any one time is expected to fall within the capacity of the roads. Project-related traffic over the life of the project would be noticeable on FS roads only during periods when logging trucks haul commercial timber from the project area, which is expected to be sporadic.

The main access route to the Howard portion of the project area would be on the existing NFSR 240 on the west side of the area. The construction of new temporary roads would be needed to access portions of fuel treatment units in most of the Howard area, although existing roads would also be used as available. All proposed new temporary roads would be closed and obliterated following completion of treatment activities.

The addition of trucks hauling equipment over NFSRs and local highways that connect with proposed haul roads could cause deterioration of road conditions, as heavy trucks and heavy equipment have a disproportionate effect on road conditions relative to smaller and lighter passenger vehicles. There would also be potential for conflict at road intersections where project-related traffic turns onto NFSRs used by the public and onto SH 24 from CRs 92 and 96. Log hauling traffic may affect access roads by degrading the surface of the road through repeated truck trips.

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. Traffic control devices would include permanent devices for the duration of project activities and temporary construction warning signs.

There would be project-related traffic hauling equipment and logs on SH 24. Trucks would enter onto the highway from CRs 92 and 96 at Lake George. The addition of project related traffic would not noticeably increase the 2003 AADT level of 4,010. The anticipated number of logging trucks is unknown, but

because commercial logging is not a substantial component of project activities, the addition of logging and other project-related trucks to the highway would not noticeably increase the current (2003) truck AADT of 437 vehicles.

A summary of Alternative 1 roadwork for all MAs in the project area is shown in **Table 3-14**. There would be no permanent increase in the local road densities of any MA in the project area, because all temporary roads constructed for the project would be obliterated once treatment activities have been completed. The road density for MA 2B would temporarily increase to 3.5 miles per square mile, which is below the standard of 4.0 miles per square mile. MAs 4B and 7D do not have guidelines for road density.

Table 3-14 Proposed Temporary Roads

Road Type	Length of Road by Management Area (miles)			Total Length of Road (miles)
	2B	4B	7D	
Temporary Roads	16.2	0.4	13.0	29.6
Overland Travel Routes	5.6	0.5	0.3	6.3
Total	21.8	0.8	13.3	36.0

There would be no long-term cumulative effect to the number of road miles and road densities within the analysis area from any alternative, because proposed temporary access roads would be obliterated. Where existing roads are maintained for use in this project, some current resource concerns, such as soil erosion or water quality, may be improved, leading to better overall watershed health. No increased use of project area roads by OHVs would be caused by the project, although use of the OHVs may increase because of the overall trend across the state towards increased OHV use.

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, and no costs would be incurred from road construction and closure. This alternative would not contribute to cumulative effects to the transportation system.

3.8 RECREATION

The project area provides regional recreational opportunities for communities along the Front Range. Important recreational resources in the project area include South Platte River corridor and Elevenmile Reservoir (**Figure 3-4**). The project area is heavily used for recreation because of these resources and the area's proximity to Denver and Colorado Springs. The potential effects of the proposed treatment activities on the recreational use of the project area and adjacent lands are the primary concern related to recreation.

3.8.1 Management Direction

The general direction and the standards and guidelines that implement this direction for recreation for the PSICC are defined in the Forest Plan (USFS 1984a). Forest-wide general direction for developed recreation is to construct, reconstruct, and maintain developed sites in accordance with the existing Recreation Opportunity Spectrum (ROS) inventory for the MA (Forest Plan III-19). The general direction for dispersed recreation is to provide a broad spectrum of dispersed recreational opportunities in accordance with the established ROS for the MA (Forest Plan III-21).

Forest lands are inventoried using the ROS classification to define the types of outdoor recreational opportunities the public desires and to determine the opportunities the Forest can provide. The project area has four ROS classes: semi-primitive non-motorized, semi-primitive motorized, roaded natural, and rural. **Figure 3-4** shows the ROS classifications and the recreational facilities in the project area. Roaded natural is the most prevalent ROS classification in the project area with 8,122 acres (54 percent of the project area). This is followed by the semi-primitive motorized with 4,432 acres (30 percent of the project area). There are 2,044 acres (14 percent of the project area) of the semi-primitive non-motorized classification. The last class, rural, covers only a small amount of the project area, 343 acres (2 percent of project area).

The ROD for the Wild and Scenic River Study of the South Platte River and North Fork of the South Platte River (USFS 2004a) amended the Forest Plan and established a new management area along the study corridor. This amendment also set goals, standards, and guidelines for this management area, which includes Elevenmile Canyon in the project area. The Elevenmile Canyon segment of the study area has been designated as Recreational and has been given a ROS classification of roaded natural.

3.8.2 Recreational Resources

Recreation in the project area includes a variety of activities such as driving for pleasure (sightseeing), fishing, camping, hunting, picnicking, hiking, boating (canoeing, tubing, and kayaking in the South Platte River), horseback riding, and OHV use. Driving for pleasure and sightseeing are popular activities because of the scenic nature of the area and its proximity to Colorado Springs. A quick one-day trip for sightseeing with other activities, such as picnicking, can be done easily by Front Range residents. There are no designated trails in the project area.

Elevenmile Reservoir is owned and operated by Denver Water and the Colorado Division of Parks and Recreation and is a popular destination for boating, fishing, and camping. The South Platte River corridor below Elevenmile is the eastern border of the Rocky Messenger portion of the project area. Recreational use of the river corridor is heavy, primarily because of its easy access from the heavily populated Front Range. There are a number of developed recreational facilities along the river corridor that are listed in **Table 3-15** and shown in **Figure 3-4**. Some of these facilities are on the west side of the river in the Rocky Messenger portion of the project area and others are outside of the project area. However, they are immediately adjacent to the river and contribute to recreational use in both areas. During summer months, camping and picnicking areas are full and informal pullovers along the road corridor are used for parking to access the river.

In addition to the activity in developed sites along the river corridor, dispersed recreational activities occur primarily from spring through fall, both along the river and across the project area. Summer activities include sightseeing, hiking, picnicking, dispersed camping, fishing, OHV use, horseback riding, and hunting. 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 with a moderate degree of natural integrity and apparent naturalness.

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Figure 3-4 Recreational Facilities and ROS Classification

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Table 3-15 Developed Recreational Facilities in the Project Area

Picnic Areas	Campgrounds	Other Facilities
South Platte River Corridor		
Elevenmile Idlewilde Messenger Gulch O'Brien	Cove Riverside Spillway Springer Gulch	
Outside the South Platte River Corridor		
	Blue Mountain	Sleeping Tom Summer Homes

3.8.3 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.

Alternative 1

The proposed management activities associated with 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. Temporary restrictions to protect public safety, such as prohibiting public access, may be placed in some areas while treatments are conducted. The concern for scenery is high for recreationists at developed sites and for those engaged in dispersed activities such as hiking or sightseeing. In general, the quality of the recreational experience would remain high. Potential short-term effects include noise, visual activity, smells, and smoke. For mechanically treated areas, once the slash is disposed of, treatment areas would appear natural. The prescribed burn treatment units would have a longer-term direct effect lasting until vegetation re-establishes. After treatment, the area would be characterized by a more open and park-like setting with improved forest appearance and visual quality. Treatments are likely to enhance the recreational experience in the long-term.

There is a high concentration of developed recreational sites along the South Platte River corridor. Management activities such as broadcast burning and pile burning of slash would not occur in developed recreational sites such as campgrounds and picnic areas. A buffer area with no treatment would be located along the northern half of the South Platte River and CR 96 to minimize effects to recreational experiences.

The Sleeping Tom summer homes are in an area that would have mechanical treatments with all slash treatments followed by pile burning and broadcast burning. Noise, dust, and other impacts from project activities would be noticed by users of this area. Although these effects would be short-term and minor, some recreationists may chose to avoid the affected areas while the management activities are occurring.

Management activities along the South Platte River corridor would not diminish or change the values that make this river corridor eligible for addition to the National Wild and Scenic Rivers System. Specifically, the proposed activities would be consistent with the adopted ROS of roaded natural and with the potential river classification of Recreational.

Prescribed fire treatments would occur in areas with semi-primitive non-motorized and semi-primitive motorized activity. Dispersed recreational activities, such as hiking and OHV use occur in these areas and would be directly affected while burning is occurring. The Cove and Springer Gulch campgrounds are in

areas proposed for prescribed burning. However, prescribed burning would not be used in these developed sites.

Treatments would also reduce the potential for wildfire. An uncontrolled wildfire would cause considerably greater disruption to recreational activities. For example, most of the PSICC was closed to recreational use for a large portion of the summer of 2002 because of fire danger and ongoing fire suppression activities.

Other developed recreational sites, including the Blue Mountain, Riverside, and Spillway campgrounds and the Elevenmile, Idlewilde, Messenger Gulch, and O'Brien picnic areas, are not within or immediately adjacent to treatment units. Some recreationists may avoid these areas while management activities are occurring. Recreational users of Elevenmile Reservoir would be far enough away from the treatment areas that usage is not likely to be affected. Sightseeing along CRs 92 and 96 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 while management activity is occurring.

Recreational opportunities have been cumulatively affected by vegetation management activities within the project area. The current condition of recreational opportunities is based on past resource management activities, but in terms of developed facilities and dispersed recreational opportunities. Considering all past, current, and reasonably foreseeable activities together, the proposed project would enhance the overall variability in forest canopy by varying the age and sizes of the trees, improving forest health, and creating a more interesting visual landscape that would maintain a high level of recreational experience.

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, forest health would not be improved and there would be an increased risk of large-scale wildfire. Deteriorating forest health would increase the risk of a large-scale wildfire that could in turn negatively affect recreational use.

3.9 VISUALS

The project area contains varied terrain that includes deep narrow canyons, meadows, rugged mountain foothills, steep slopes, and scattered granite outcroppings. The varied and rugged terrain influences vegetation patterns and panoramic views. The project area landscape is composed of high-quality scenery that provides a setting for a wide variety of outdoor activities.

3.9.1 Management Direction

Forest-wide general direction (Forest Plan III-18) for visual resource management is to apply the Visual Management System (VMS) to all NFS lands. The VMS information is taken into consideration when Forest Plans are developed. These plans then establish Visual Quality Objectives (VQO) for Forests that are reflected in the MA direction. The project area is managed with the modification and partial retention VQOs.

The ROD for the Wild and Scenic River Study of the South Platte River and North Fork of the South Platte River (USFS 2004a) amended the Forest Plan and established a new management area along the study corridor. This amendment also set goals, standards, and guidelines for this management area, which

includes Elevenmile Canyon in the project area. The portion of the study area within the project area has been given a VQO classification of partial retention.

3.9.2 Visual Resources

The project area is located in the montane vegetation zone. This zone typically consists of ponderosa pine mixed with Douglas-fir and smaller amounts of Colorado blue spruce. 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 from 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. There are two major water bodies near the project area, Lake George at the north end and Elevenmile Reservoir at the southwest end. The South Platte River flows between them in a southwest-to-northeast direction. The lakes, river, and forested landscape are characteristics that contribute to the scenic quality of the area.

Existing disturbance in the project area includes recreational facilities, residences, highways, NFSRs, and trails. Public use of the area includes access to private land inholdings, hunting, fishing, hiking, bicycling, sightseeing, camping, and boating. Recreational use is enhanced by the scenic quality of the area. Concern for scenic quality is high, particularly for sightseers, hikers, and boaters.

The primary views of the analysis area are from travel routes, residential areas, recreational sites, and other use areas. Recreational use of the area occurs primarily along the South Platte River, around Lake George, and at Elevenmile Reservoir, which provide a variety of developed and dispersed recreational opportunities. Part or all of the project area can be viewed from SH 24; CRs 61, 90, 92, 96, 98, and 403; and several NFSRs.

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 area is also sensitive because of the number and proximity of developed recreational sites and other recreational use areas to proposed treatment units. Most of the project area is viewed in the foreground distance zone (0.0 to 0.5 mile) because the dense forest canopy limits viewing distances. Foreground views are adjacent to travel routes and developed recreational sites.

Proposed treatment units are within the foreground views of SH 24, CRs 61, 90, 92, 96, 98, and 403, several NFSRs, Lake George (town and lake), Eleven Mile Village, Elevenmile Reservoir, Sleeping Tom summer homes, South Platte River, Idlewilde Picnic Area, Cove Campground, Springer Gulch Campground, Messenger Gulch Picnic Area, Elevenmile Picnic Area, O'Brien Gulch Picnic Area, Blue Mountain Campground, Overlook Trail, and private residences located in and around the project area. Most of these viewing locations provide limited foreground views because of the dense forest and hilly terrain. The travel routes and Overlook Trail provide occasional middle ground and background views with a more panoramic scene. Most of the campgrounds and picnic areas are in the South Platte River canyon. These areas provide limited foreground views because the steep canyon limits viewshed possibilities.

These viewing sites are in three MAs: 2B, 4B, and 7D. In MA 2B, visual resources are managed such that management activities do not exceed the VQO of partial retention. This VQO allows activities that alter the landscape, but they must be visually subordinate to the characteristic landscape, and not recognizable as unnatural occurrences. In MA 4B, visual resources are managed such that VQO of modification is not exceeded. This VQO allows activities that visually dominate the original characteristic landscape, but they must harmonize or blend with the natural landscape. Activities would borrow from the naturally

established line, form, color, or texture, and by at a similar scale so that their visual characteristics are those of natural occurrences. In MA 7D, the VQOs are partial retention in the foreground of arterial and collector roads and primary trails and modification in other areas.

3.9.3 Analysis of Effects

The proposed management activities could affect visual quality through reduction of forest canopy, creation of slash and debris, and creation of contrasts from the temporary road construction. These activities may alter visual elements such as line, form, color, and texture in the affected viewshed. The quality of views from recreational use areas, residences, and existing travel routes could be affected. The effects to visual resources would depend on several key factors including silvicultural treatment; slash disposal methods; design, shape, and grouping of treated timber stands; and topographic relation to the viewer's position.

Alternative 1

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 a negative visual element in the landscape and increases the potential for wildfires. Damage from a wildfire would be an unpleasant element in the landscape.

Mechanical treatments would create an accumulation of downed trees and slash. A combination of methods would be used to dispose of cut trees and slash. The visual effect of slash piles would be temporary. Once the debris is disposed of, treatment areas would appear natural to the casual observer. Treatment units that have been thinned are characterized by a more open and park-like setting. Portions of the project area would not be treated by mechanical means, including areas that would be highly visible from recreational areas and roads, to minimize visual effects.

Prescribed fire treatments would occur after mechanical treatments are completed. Burning of slash piles would create temporary visual effects to foreground views but would not attract the attention of the casual observer. 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 required to re-establish vegetation. This treatment activity would occur primarily in areas that are in middle to background views. The natural characteristic of the treated area would harmonize with the natural landscape after vegetation is re-established.

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. After treatment is complete, these roads would be obliterated and revegetated with native species or, in the case of stump roads, covered with slash to prevent unauthorized use and as a reclamation measure. The effect of these roads would be temporary with duration dependent on the length of time to re-establish vegetation to a level that minimizes the linear band created through contrast between the disturbed area and surrounding vegetation.

Cumulative effects to visual quality are an assessment of past, current, and planned or foreseeable future activities within the analysis area. The past and current activities of timber harvest operations and subsequent fire suppression policies have created the dense, uniform forest with trees of similar ages and sizes that is present today. The project area is a popular recreational use area and NFSRs and recreational sites have been developed. Recreation is likely to continue to be a desirable activity and may require increased development of recreational sites. The area supports a number of year-round and seasonal

residents. Because of its close proximity to large metropolitan areas, the number of year-round residents is also likely to increase. This creates an increase in traffic, roads, utilities, and houses. The proposed action would maintain or improve the scenic quality of the project area by improving forest health. The improvement in forest health would enhance the recreational use of the area. The proposed project would alter the forest canopy structure and increase contrast between non-treated and treated areas. A highly diverse ecological mixture of vegetation types creates a more scenic forest.

Vegetation management strategies are generally located and designed using the VQO assigned to each MA by the Forest. The majority of the treatment units for the proposed project are located in MA 2B, which requires that visual resources be managed to maintain or improve the quality of recreational opportunities. Vegetation treatments would increase ecological diversity and enhance scenic quality because the treatments would imitate natural growth patterns and shapes in the surrounding landscape. This VQO would be met as soon as possible after project completion. This alternative would comply with the VQO for MA 2B.

Other treatment units are located within MAs 4B and 7D, which allow management activities to visually dominate the foreground and middle-ground provided they harmonize and blend with the natural setting. In MA 4B, most of the proposed treatment would be broadcast burning. After treatment is completed, there would be more areas that are open and a greater diversity of vegetation. The treatment would enhance the visual quality of the area. This alternative would meet the VQO for this MA. In MA 7D, proposed treatment would include mechanical treatment followed with broadcast burning and burning of slash piles. The treatment would enhance the visual quality of the area by creating diversity of vegetation and natural openings, reducing ubiquitous forest canopy, and removing undesirable vegetation. This alternative would meet the VQO for this MA.

Management activities along the South Platte River corridor would not diminish or change the values that make this river corridor eligible for addition to the National Wild and Scenic Rivers System. Specifically, the proposed activities would meet the designated VQO of partial retention.

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. The number of trees infected by mistletoe and pine beetles would increase. The amount of dead and down trees would increase. Deteriorating forest health would increase the risk of a large-scale wildfire 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 large-scale event. Visual quality may be reduced with the deteriorating condition of the vegetation and would be substantially affected if a large-scale event were to occur. Scenic quality would cumulatively decrease after a large-scale event in the affected areas. The VQOs for the affected areas may not be met.

3.10 ECONOMICS

The general forest direction related to social and economic resources for the PSICC includes goals to maximize present net value (PNV) of forest resources while emphasizing opportunities to improve amenity values, manage resources at economically and environmentally feasible levels, consistent with the emphasis on amenity values, and provide for local community stability when allocating resource uses.

Other goals with direct application to economic resources include goals for recreation, water, fish, wildlife, and visual resources, which are discussed in the appropriate resource sections.

3.10.1 Local and Regional Economy

The project area is located in Park County. There are many long-term local residents; however, an ever-growing percentage of the residents, full or part time, are transplants from a suburban or urban setting. People's perceptions of and desires for public land management vary greatly. Generally, though, especially locally, people have concerns over outbreaks of diseases or fires that could affect their homes and property; and expect the USFS to play an active role in dealing with those situations. The counties surrounding the PSICC, including Park County, continue to be attractive places for people to live. 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. Many of the seasonal and permanent homes are being built in close proximity to NFS lands. Some of these homes were lost in the Hayman Fire, which occurred to the north of the project area. Numerous seasonal and permanent homes are located on private lands adjacent to NFS lands, near Lake George and Elevenmile Reservoir.

Lake George is an unincorporated community located at the junction of the primary access routes into the project area from SH 24, and is the community most likely to be affected by the proposed project. Many full-time residents of Lake George depend on tourism-based and forest resource-related activities for their economic livelihood. These activities include wood products, hunting, outfitters and guides, and ranching. Residents surrounding the project area consider the forest resources and forest health as an important part of their quality of life.

Population

Park County grew 102 percent during the 1990s, or an annual average of 10.2 percent. Most of the growth occurred in the unincorporated areas of the county. The Lake George area grew by 76 percent during the decade. It is anticipated that population growth will slow to an annual average rate of five percent between 2010 and 2020. Lake George is located in Census Tract 5, Block Group 1. It is the only community in Block Group 1, which contains mostly NFS lands. Approximately 63 percent of the housing units are seasonal, which indicates that Lake George and the project area have a large seasonal population that is not included in the census counts of permanent residents. Population growth has been slower in this area than in Park County as a whole because the high proportion of NFS lands limits the area available for growth and because of the majority of residences in the project area are seasonal use homes. However, growth in this area outpaced the state growth by 46 percent during the 1990s, illustrating its desirability as a place to live. The populations of Lake George (Census Tract 5, Block group 1) and Park County are displayed in **Table 3-16**.

Table 3-16 Population Growth

Area	Population			Growth Rate (percent)		
	1990	2000	2002	1990-2000	2000-2002	Average Annual
Colorado	3,294,473	4,301,261	4,516,847	30.6	5.0	3.1
Park County	7,174	14,523	15,738	102.4	8.4	10.2
Census Tract 5, Block Group 1	332	585	n/a	76.2	n/a	7.6

1990 Census Tract 9598, Block Group 1 is the same area as 2000 Census Tract 5, Block Group 1. Population for 1980 and 1990 is from the April 1st Census. Data for all other years is a July 1st estimate from the Department of Local Affairs, Demography Section.

It is anticipated that Park County will continue to grow at a higher rate than Colorado for the foreseeable future, as shown in **Table 3-17**. In general, residents who live near the project area consist of retirees; people who work in tourism or service-based industries, local construction, and forest resource-related industries; and people who commute to Colorado Springs. It is likely that the project area block group will continue to draw new residents, particularly as Colorado's popularity is increasing as a destination for the retiree population. Growth trends for the project area block group will be similar to recent decades, in which the annual rate of growth is somewhere between the county and state growth rates.

Table 3-17 Population Projections for Colorado and Park County, 2000 - 2020

Area	Population					Average Annual Change (percent)			
	2000	2005	2010	2015	2020	2000-2005	2005-2010	2010-2015	2015-2020
Colorado	4,301,261	4,691,258	5,137,928	5,632,645	6,133,491	1.6	1.8	1.9	1.7
Park County	14,523	17,404	25,289	37,129	50,932	3.4	7.8	8.0	6.5

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

Employment and Income

Employment in Park County, including communities in the project area, is dominated by government, as shown in **Table 3-18**, which summarizes the number of jobs in 1999 for each industry and the percent of total employment for each sector. The majority of government employees are local government, primarily county workers. For other sectors, **Table 3-18** shows strong contrast in the spread of employment through the economic sectors between the county and the state, highlighting the importance of natural resources and tourism in the county 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 in Park County. The agriculture sector has a greater share of the county economy than it does for the state, illustrating the importance of rural, resource base sectors in the Park County economy. The accommodation and food sector is also of relatively greater importance in Park County than for the state, as is typical of economies that depend on tourism and recreation. Wildfires 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 wildfire incidents was extensive in the national press.

Table 3-18 Estimated Employment by Sector for Park County & Colorado in 2002

Economic Sector	Park County		Colorado	
	Number	Percent	Number	Percent
Estimated Total Jobs	2,976		2,588,082	
Agriculture	237	8.0	49,869	1.9
Mining	Not available		16,710	0.6
Utilities	4	0.1	8,176	0.3
Construction	518	17.4	205,964	8.0
Manufacturing	67	2.3	177,361	6.9
Wholesale trade	68	2.3	101,858	3.9
Retail Trade	197	6.6	269,614	10.4
Transportation and warehousing	37	1.2	71,703	2.8
Information	Not available		107,472	4.2
Finance activities	Not available		117,363	4.5

Table 3-18 Estimated Employment by Sector for Park County & Colorado in 2002

Economic Sector	Park County		Colorado	
	Number	Percent	Number	Percent
Real estate	55	1.8	63,362	2.4
Professional and business services	142	4.8	171,284	6.6
Management of companies and enterprise	0	0.0	19,172	0.7
Administrative and waste	72	2.4	148,605	5.7
Education	33	1.1	29,052	1.1
Health Services	67	2.3	208,552	8.1
Arts	46	1.5	52,953	2.0
Accommodation and food	357	12.0	245,082	9.5
Other services, except public administration	Not available		122,288	4.7
Government	805	27.0	401,642	15.5
Source: CDOLA 2004b				

Housing

Nearly 26 percent of the current housing stock in Park County consists of seasonal housing, which is a decrease of nearly eight percent from the proportion of seasonal housing to the total housing stock in 1990. Increased numbers of persons have been seeking residence in Park County because of opportunities for employment in the various economic sectors that serve the local tourist and recreation-based economy. Colorado Springs is within commuting distance of most of Park County. Recreation-related real estate development is also a stimulus for growth within the county.

The total estimated number of housing units in Census Tract 5, Block Group 1 was 755 in 2000. Most of the units (477 units or 63 percent) are seasonal use homes that are vacant for part of the year. The majority of all housing units are located within or near Lake George, Elevenmile Reservoir, and along SH 24. Most of these homes are within or adjacent to forested areas on PSICC and private lands. The median housing price in 2000 was $172,100, which was slightly higher than the state median housing price of $166,600.

Community Infrastructure

The PSICC shares wildfire suppression resources with other federal government agencies nationwide. Interagency wildfire crews are dispatched where they are needed. Contractors are also used for wildfire suppression activities. Fire protection in the project area is provided by the PSICC and the Lake George Fire Protection District, which includes the entire project area, and covers rural, National Forest, wildland/urban interface, and residential areas. There are three fire stations. The services provided by the fire district include fire suppression, medical emergencies, rescue and extrication, hazardous materials response, and service calls. A broad range of hospitals, clinics, and other medical services are located within one to two hours driving distance in Woodland Park and the Colorado Springs area.

3.10.2 Analysis of Effects

This section discusses the anticipated direct, indirect, and cumulative effects of implementing each alternative on the economy and social structure of the project area and Park County. 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

Population effects of the project would not be noticeable. The skills and services required for the project would be provided by current FS 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 wildfire. This may contribute to the attractiveness of the region as a tourist destination, causing continued growth of the local economy and the permanent population.

One possible negative 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 wildfire risk has been reduced, with evidence of this change available for viewing on adjacent forest lands. Because of the recent Hayman fire and its associated property losses, it is likely that many residents would prefer the reduced fire risk, 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).

Local population and visitors to recreational facilities may experience negative visual and health effects from smoke caused by prescribed fire. However, the prescribed burn units are located away from residential areas, and most smoke from the burns would dissipate before it reaches most people. Trails and roads that access prescribed burn units would be closed for the duration of the treatment. Nearby roads may be affected by smoke during prescribed fires.

Employment and Income

Minimal merchantable timber would be produced because 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 tourism and recreational activities in and near the project area.

Employment and income from tourism activity is important in Park County. Much of this activity is based on recreational opportunities on NFS lands in the county, 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 resulting economic effects would be temporary. For any displaced activity, there are several substitute sites. Mitigation measures are provided to decrease any potential effects to resource users. In addition, only a small percentage of the project area would be undergoing 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 that would implement the proposed treatments would be made up of 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. Communities in Park County and Colorado Springs provide a wide range of temporary and seasonal housing. In addition, outside contractor are likely to use travel trailers during the time they are working on the project.

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 the expanding wildland-urban interface area created by 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 wildfire. This would reduce the risk 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 have major consequences on the economy of Park County. Some of the economic consequences could reach beyond the local economy, and affect state and federal budgets as well. The analysis draws on the Hayman Fire Case Study Analysis (USFS 2003b), which contains the interim findings of the socioeconomic team (Kent et al. 2003).

There is a broad range of possible outcomes on the social and economic resources of Lake George and Park County from the implementation of this alternative. The analysis focuses of the potential effects of large-scale wildfire.

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 wildfire at the wildland/urban interface would likely cause a temporary decrease in the population of Lake George and the surrounding area, which includes homes occupied by permanent and seasonal residents. The current annual growth of 7.6 percent would decrease in the years following a wildfire. This effect would occur until damages to local property owners and business 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 wildfire and drought decreased 2002 visitation at tourist attractions in Fremont County between 12 to 15 percent. These declines occurred after

wildfires in the area started in June 2002. None of the attractions was damaged by wildfire, 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 the following year. A similar decline in tourist visitation to the Elevenmile Reservoir, and other attractions near the project area could occur from the occurrence of wildfires in the region, even if the fires did not damage homes or businesses located in wildland/urban interface areas. This type of loss would likely occur only during the season of reported wildfires, as tourist visits would probably recover the following year. These declines could cause a short-term loss of jobs in local service businesses.

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 wildfire 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 occur 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 over an undeterminable period after the re-establishment and recovery of resources and properties.

Many second homes are located in interface areas because of the scenic setting provided by such areas. The loss of these structures and the loss of the scenic landscape would cause substantial declines in the seasonal population near the project area. This group contributes to the local economy through dollars spent at local businesses.

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 an approximate 60 percent loss in the value of these properties. There were 208 Teller County homes in the fire perimeter. Eighty-two, or 39 percent, of these homes were destroyed in the fire. Values for burned acreages in Jefferson County were reduced by 50 percent, and burned structures were reduced up to 100 percent.

Many existing homes have been built within close proximity to the National Forest in the project area. Based on the number of houses lost within the Hayman fire perimeter, there could be more than 100 houses destroyed by fire in the project area. The property values for burned acres could be reduced by 50 percent, and burned structures are reduced up to 100 percent. In addition to the loss of the property value, the tax revenues from these properties to the county are lost.

For the residents and businesses near the project area, the detrimental effect to the scenic landscapes, as well as a slowing economy, would decrease the quality of life, which could cause a devaluation of property values and the loss of property taxes to the county government.

Community Infrastructure

It is likely that all of the existing fire protection resources in the project area would be involved in any large-scale wildfire suppression effort. Interagency wildfire crews would be dispatched from other areas

as needed. Local firefighters are all volunteer and would incur lost income because they would not be working at their regular jobs for the duration of a wildfire.

Local emergency care is provided by the Lake George Fire Protection District and the local ambulance service. In the event that a wildfire causes numerous injuries, the district may find it difficult to provide adequate emergency care. There are injuries and potential loss of life for fire fighters 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 Colorado Springs.

3.10.3 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. Costs to private property from large-scale wildfire are not included in this analysis because protection of private property is not part of the purpose and need of the project; however, Alternative 1 is likely to indirectly reduce the potential loss of private property near the project area. Alternative 2 would not reduce the potential loss of private property.

Because this analysis includes only costs, the PNV is negative. The difference among alternatives, however, is positive. The difference is the net cost realized by applying the treatments. The PNV and net cost of each alternative are summarized in **Table 3-19**.

Table 3-19 Comparison of Present Net Value and Net Cost

Cost Category	Alternative	
	1	2
Present Net Value		
All Partners (total)	-$4,308,618	-$1,286,713
Municipality	-$143,510	-$621,950
USFS	-$4,165,108	-$664,763
Net Cost		
All Partners (total)	$4,308,618	n/a
Municipality	$143,510	n/a
USFS	$4,165,108	n/a

Alternative 1 would have a beneficial effect on non-priced values relevant to the project purpose and need. 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 and need of this project are summarized in **Table 3-20**.

A large-scale fire, such as the Hayman Fire, can substantially reduce tourism and recreation 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 recreation use of surrounding forestlands. For example, visitor use days at developed recreation facilities on the South Park Ranger District were reduced by 68 percent in 2002 during the fire, compared with 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 over $27 million (Kent et al. 2003).

Table 3-20 Comparison of Non-Priced Values

Indicator	Alternative	
	1	2
Reduce size of large fires and the resulting erosion that could exacerbate soil and water quality problems	Size of fires reduced 60 percent. Moderate and high intensity burns of 149 acres would contribute to watershed effects.	Size of fires reduced 2 percent. Moderate and high intensity burns of 1,117 acres would contribute to watershed effects.
Restore the forest to more sustainable conditions that are resilient to fire, insects, and diseases	Forest conditions improved on 12,882 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 risk of large-scale habitat loss to fire, insects, or disease would be reduced.	Minimal benefit, habitat conditions for most MIS and special status species would continue to degrade 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 wildfire.
Provide recreational experiences	Risk of large-scale events would be reduced. Existing recreational opportunities would be maintained.	No benefit. Current risk of large-scale fire may worsen over time. Such an event could dramatically reduce recreational use.

3.11 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.

3.12 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 these projects involve an irreversible commitment of resources because much of the vegetation would not 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.

3.13 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 use of 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.

3.14 OTHER CONSIDERATIONS

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

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

3.14.2 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 (E.O. 12898 and Departmental Regulation 5600-2). None of the alternatives would have a discernible effect on minorities, American Indians, or women, or the civil rights of any United States citizen. No alternative would have a disproportionate adverse effect on minorities or low-income individuals.

3.14.3 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.

3.14.4 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.

3.15.5 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 are noted. The Clean Air Act and Clean Water Act 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 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.

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 been surveyed for the presence of cultural resources. 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 Forest Service. Therefore, the proposed project is consistent with the applicable heritage program laws.

State Laws

Applicable state laws are as follows:

Clean Air Act

All action alternatives would comply with Colorado air quality standards.

Clean Water Act

Consideration of the Clean Water Act is given in Section 3.4 (Watersheds) in this chapter.

4.0 LIST OF ACRONYMS, GLOSSARY, AND REFERENCES

4.1 ACRONYMS

AADT	Annual Average Daily Traffic
BA	Biological Assessment
BAER	Burned Area Emergency Rehabilitation
BBS	Breeding Bird Survey
BE	Biological Evaluation
BMP	Best Management Practice
CBC	Christmas Bird Count
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEQ	Council of Environmental Quality
cfs	cubic feet per second
COVERS	Colorado Vertebrate Ranking System
CR	County Road
CVU	Common Vegetation Unit
DAU	Data Analysis Unit
dbh	diameter at breast height
EA	Environmental Assessment
ESA	Endangered Species Act
FFE	Fire and Fuels Extension
FIL	Fire Intensity Level
FLI	Fireline Intensity
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
GIS	Geographic Information System
HABCAP	Habitat Capability Model
HSS	Habitat Structural Stage
MA	Management Area
MIS	Management Indicator Species
MPB	Mountain Pine Beetle
MSO	Mexican Spotted Owl
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFP	National Fire Plan
NFS	National Forest System
NFSR	National Forest System Road
OHV	Off-Highway Vehicle
PET	Proposed, Endangered, or Threatened
PFA	Post-fledging Family Area
PNV	Present Net Value
PSICC	Pike and San Isabel National Forests and Cimarron and Comanche National Grasslands
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
SH	State Highway
SHPO	State Historic Preservation Officer
SMU	Soil Map Unit
SVS	Stand Visualization System
TSS	Total Suspended Sediment
USACE	United States Army Corps of Engineers
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
VMS	Visual Management System
VQO	Visual Quality Objective
WCPH	Watershed Conservation Practices Handbook
WEPP	Water Erosion Prediction Project
WIZ	Water Influence Zone

4.2 GLOSSARY

90th percentile weather

Weather conditions (temperature, humidity, wind, etc.) that represent the upper 90th percentile of observations. Corresponds to periods of high fire danger.

97th percentile weather

Weather conditions (temperature, humidity, wind, etc.) that represent the upper 97th percentile of observations. Corresponds to periods of extreme fire danger.

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.

Bankfull discharge

Bankfull discharge is considered the channel forming flow that maintains channel dimension and transports the bulk of sediment over time. Bankfull discharge is approximately equivalent to the average annual flood flow.

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

Burned Area Emergency Rehabilitation

BAER teams consist of professionals from across the nation that work to rehabilitate burns areas for erosion control and flood mitigation, to reduce fire-related effects, and to protect people and property. BAER treatments are carried out from both air and ground and include aerial mulching; seeding; dry mulching; hand-seeding; scarification; ground hydro-mulching; application of soil binding agents; mulching along forest roads and highways; treatment of noxious weeds; historical and archeological surveying; cleaning, reinforcement, and removal of culverts and stream crossings; contour-felling; and grading and reconditioning of roads in burned areas.

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.

Channel morphology

The physical configuration of a stream channel: width, depth, shape, etc.

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.

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 bulk density

The mass of available fuel per unit crown volume.

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.

Crowning Index

The open 20-foot wind speed at which active crown fire is possible for the specified fire environment.

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 frequency

The recurrence of fire in a given area over time. Sometimes stated as number of fires per unit time in designated area or how often fire burns a given area, often expressed in terms of fire return intervals.

Fire hazard rating

A descriptive term based on the potential for torching and crowning fire behavior that is used to compare relative fire hazard.

Fire intensity level

A measure of fire behavior used in the Interagency Initial Attack Assessment Model (IIAA). It is based on the calculated flame length: FIL 1: 0-2 feet, FIL 2: 2-4 feet, FIL 3: 4-6 feet, FIL 4: 6-8 feet, FIL 5: 8-12 feet, FIL 6: greater than 12 feet. FIL is used in the IIAA model as an indicator of fire danger for dispatch purposes, to categorize rate of spread, and in the assessment of fire effects. Each FIL has an associated suppression cost.

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.

Fireline intensity

The rate of heat release in the flaming front per unit length of fire front. Can be converted to flame length. (FL = 0.45*(I0.46)). This expression is commonly used to describe the power of wildland fires.

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.

Fuelwood

Wood used for conversion to some form of energy, for example, in residential use or in cogeneration plants.

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.

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 fuel reduction

Removal of 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.

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.

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.

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.

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 means,

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 prescribed fire plan must exist and NEPA requirements must be met before ignition. This term replaces management ignited prescribed fire.

Primary residence

A home that is used for most or all of the year

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.

Proper Functioning Condition

Riparian/wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bed load, and aid floodplain development; improve flood-water retention and groundwater recharge; develop root masses that stabilize stream banks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian/wetland areas is a result of interaction among geology, soil, water, and vegetation.

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.

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.

Roads analysis

A Forest Service specific process that is an integrated ecological, social, and economic science-based approach to transportation planning and addresses existing and future road management options.

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.

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.

Secondary residence

A home that is only occasionally used, such as a vacation home or cabin.

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.

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

Torching Index

The open (20 foot) wind speed at which crown fire activity can initiate for the specified fire environment.

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 Management System

The VMS divides NFS lands into several visual categories based on variety class, sensitivity level, and distance zone. Variety classes are obtained by classifying the landscape into different degrees of variety. This determines those landscapes that are most important and those that are of lesser value from a standpoint of scenic quality. Sensitivity levels are a measure of the people's concern for the scenic quality of the Forest. Distance zones describe distances from which the landscape is viewed. The VMS is used to define VQOs.

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

1. 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.

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5.0 LIST OF PREPARERS

The following individuals comprise the interdisciplinary (ID) team that conducted the environmental analysis and prepared this EA.

Table 5-1 List of Preparers

Name	Title	Responsibility
USDA Forest Service, PSICC		
Brain Banks	District GIS Specialist	GIS Analysis
Steve Culver	Pike NF Fisheries Biologist	Project Management
Mike Hessler	District Fire Management Office	Vegetation Analysis, Fuels Analysis
Stephanie Leutzinger	District Wildlife Biologist	Management Indicator Species, Special Status Species, Biological Assessment, Biological Evaluation
Sara Mayben	District Ranger	Project Development
Bob Post	District Resource Assistant	Vegetation Analysis
Greystone Environmental Consultants		
Deb Ballheim	Writer/Editor	Editorial Review
Dave Cameron	Senior Project Manager	NEPA Compliance, Quality Control
Steve Faulk	Wildlife Biologist	Management Indicator Species, Special Status Species, Biological Assessment, Biological Evaluation
Matt Kizlinski	Silviculturalist	Vegetation Analysis, Vegetation Modeling
Selina Koler	Watershed Scientist	Watershed Analysis
John MacDonald	Wildlife Biologist	Management Indicator Species, Special Status Species, Biological Assessment, Biological Evaluation
Chris Rutledge	Senior Biologist	Project Management
Melissa Sartorius	GIS Specialist	GIS Analysis, Fire Modeling, Mapping
Henry Sauer	Hydrologist / Soil Scientist	Watershed Analysis
Matt Schweich	Project Manager / Senior Ecologist	Project Management, Fuels Analysis, Technical Review
Cherie Walth	Cultural Resource Specialist	Cultural Resources, Recreation, Visual Resources
Lisa Welch	Senior Planner	Transportation, Recreation, Visual Resources, Economic Analysis
Carrie Womack	Staff Scientist	Economic Analysis