Environmental Assessment

Bucks Lake Hazardous Fuels Reduction Project

Mt. Hough Ranger District, Plumas National Forest
Plumas County, California

The Bucks Lake Hazardous Fuels Reduction Project is located approximately 12 miles west of Quincy, California, within the Mt. Hough Ranger District of the Plumas National Forest. The proposed project encompasses all or portions of T. 23N, R. 7E, sections 1-4, 9-12; T. 23N, R. 8E, sections 5-7, 18; T. 24N, R. 7E, sections 27-29, 32, 33, 36; and T. 24N, R. 8E, sections 31, 32.

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- Environmental Consequences
- Compliance with the Forest Plan and Other Direction

## Introduction

- Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other
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SUMMARY

The Mt. Hough Ranger District is proposing activities within the vicinity of Bucks Lake that include the reduction of hazardous fuels and hazards around facilities and within developed recreation sites, reintroduction of fire, improvement of forest health and watershed conditions, and enhancement of wildlife habitat.

The Bucks Lake Hazardous Fuels Reduction Project (referred to as the Bucks Project hereafter) is located approximately 12 miles west of Quincy, California, within the Mt. Hough Ranger District of the Plumas National Forest. The proposed project encompasses all or portions of T. 23N, R. 7E, sections 1-4, 9-12; T. 23N, R. 8E, sections 5-7, 18; T. 24N, R. 7E, sections 27-29, 32, 33, 36; and T. 24N, R. 8E, sections 31, 32. The project area contains numerous campgrounds, day use facilities, Forest Service recreation residences, and popular hiking trails, such as the Pacific Crest Trail. Detailed alternative specific treatment area maps for the Bucks Project are provided in appendix A at the end of this document.

The Mt. Hough Ranger District has designed the Bucks Project to move the landscape away from these existing conditions toward a more ecologically resilient and sustainable landscape; one that has the ability to adapt and thrive in the face of natural disturbances, especially under changing and uncertain future environmental conditions.

There is a need for fire behavior to be modified in specific stands in order to reduce high fuel loading and resulting increased risks to people, structures, property, and resources. In addition, the Bucks Project area encompasses numerous campgrounds, trails, day use facilities, and Forest Service recreation residences (collectively referred to as developed recreation sites hereafter); all of these factors make the Bucks Lake area a popular destination for forest visitors and a high priority for hazard abatement. There is a need for forest health to be improved because current high stand densities in the Bucks Project area are leading to mortality from drought, insects, and fire. There is a need to improve watershed health, as improperly constructed or unmaintained roads may restrict passage of fish or other aquatic species and transport sediment to streams and riparian areas, thereby degrading water quality and aquatic habitat. Stream bank instability is another source of elevated sediment production within the project area. High-severity wildfires decrease the quality of habitat for Region 5 Forest Service Sensitive wildlife species (such as bald eagles, spotted owls, and goshawks) by removing overstory nest structures, eliminating nesting and foraging habitat, and reducing habitat connectivity.

The proposed action meets all purposes and needs more effectively than any other action alternative. All hazard trees proposed would be abated. Alternative A results in the least total surface fuel loading and proposes more acres of prescribed burn, in an effort to reintroduce fire into the project area. While maintaining larger (20 inches DBH) trees, alternative A reduces basal area by 20 percent and results in a larger number of acres meeting desired conditions. Alternative A improves stand species composition by 100 percent. More acres of radial thinning, early seral
habitat improvement, and aspen enhancement treatments are proposed under alternative A; therefore meeting the R5 Forest Service sensitive wildlife species habitat enhancement purpose and need. Visual quality objectives are met and economically, alternative A results in a positive net value.

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- Under the No Action Alternative, Alternative B, the proposed action would not take place. No DFPZs, groups selections, R5 Forest Service sensitive wildlife species treatments, or watershed improvement treatments would be implemented to accomplish the purposes and needs through a variety of specific treatments.

- Alternative C (Non-Commercial Alternative) is required in all projects with purpose and needs that include fuels reduction and excludes any activities other than fuels reduction to meet the purposes and needs. Alternative C proposes to construct approximately 1,477 acres of DFPZs by retaining all live trees greater than or equal to 10 inches DBH throughout all treatments and prescriptions, except to allow for operations.

- Under alternative D, hazard tree abatement, Defensible Fuel Profile Zones (DFPZs), group selections (GS), aspen treatments, and watershed treatments would be implemented to accomplish the purpose and need. However, alternative D incorporates and removes specific activities to both increase sawlog net value and reduce implementation costs, respectively. Changes in treatments include the reduction of acres in proposed underburning units; increasing acres of drop and leave hazard tree abatement; removal of grapple piling and masticating treatments and skyline logging systems; and maintaining 30-50 percent canopy cover in all mechanical thinning treatments. The proposed watershed improvement treatments would be implemented using other funding.

Based upon the effects of the alternatives, the responsible official will decide to implement this proposal, implement an alternative that moves the area towards the desired condition, or not to implement any project at this time.
INTRODUCTION

Document Structure

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

Introduction: The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency’s proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Comparison of Alternatives, including the Proposed Action: This section provides a more detailed description of the agency’s proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on a court order (alternative C) and issues identified from the public (alternative D). This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Environmental Consequences: This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area in the order of the preceding purposes and needs. Within each section, the affected environment is described first, followed by the effects of all action alternatives, followed by the no action alternative.

Agencies and Persons Consulted: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mt. Hough Ranger District Office in Quincy, California.

Background

Recent high-severity wildfires, fueled by overcrowded forest conditions, have caused concern in local communities due to the potential for loss of life and property, timber values, water quality, scenic landscapes, and biodiversity. Over the past 15 years, 28 wildfires covering over 107,000 acres, have been recorded within 10 miles of the proposed Bucks Project area. In 2005, the
Plumas County Fire Safe Council identified the Bucks Lake basin as a community at risk. The current landscape conditions within the project area, in combination with the close proximity of high use recreation areas and the increased risk of human-caused fire ignitions, makes the Bucks Project area a high priority for fuel reduction activities.

Within the Bucks Project area, historic management activities, coupled with the exclusion of fire for over a century, have resulted in dense forests with heavy accumulations of fuels; these conditions greatly increase the risk of high-severity wildfire. High-severity wildfires can result in forest fragmentation, increased erosion, reduced water quality, and degraded habitat for both common and rare species. Trees within dense, overcrowded forests also face increased levels of competition for water, light, and nutrients, which stresses the trees and increases susceptibility to drought, insect, and disease-related mortality.

The Forest Service has designed the Bucks Project to move the landscape away from these existing conditions toward a more ecologically resilient and sustainable landscape; one that has the ability to adapt and thrive in the face of natural disturbances, especially under changing and uncertain future environmental conditions. Through collaboration with a wide array of stakeholders, the Forest Service has identified the following purposes and needs for action.

**Purpose and Need for Action**

The purpose of this initiative is to reduce hazardous fuels, reintroduce fire, improve forest health and watershed conditions, enhance wildlife habitat, and reduce hazards around facilities and within developed recreation sites.

There is a need for fire behavior to be modified in specific stands in order to reduce high fuel loading and resulting increased risks to people, structures, property, and resources. In addition, the Bucks Project area encompasses numerous campgrounds, trails, day use facilities, and Forest Service recreation residences (collectively referred to as developed recreation sites hereafter); all of these factors make the Bucks Lake area a popular destination for forest visitors and a high priority for hazard abatement. There is a need for forest health to be improved because current high stand densities in the Bucks Project area are leading to mortality from drought, insects, and fire. There is a need to improve watershed health, as improperly constructed or unmaintained roads may restrict passage of fish or other aquatic species and transport sediment to streams and riparian areas, thereby degrading water quality and aquatic habitat. Stream bank instability is another source of elevated sediment production within the project area. High-severity wildfires decrease the quality of habitat for Region 5 Forest Service Sensitive wildlife species (such as bald eagles, spotted owls, and goshawks) by removing overstory nest structures, eliminating nesting and foraging habitat, and reducing habitat connectivity.

This proposed action has been designed to meet the standards and guidelines for land management activities described in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision.
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Forest Plan


Land allocations within the Plumas National Forest have been allocated to certain primary uses through three planning processes: the original PNF LRMP (USDA 1988) development process, the HFQLG FEIS, FSEIS, and RODs (USDA 1999a, 1999b, 2003a, 2003b), and the SNFPA ROD (USDA 2004a, 2004b). Each of these plan components includes standards and guidelines for land and resource management unique to each land allocation. Many of these allocations overlap. During the life of the HFQLG Act Pilot Project, HFQLG land allocations are to be employed for vegetation management projects, with one exception (SNFPA ROD allocation for Northern goshawk PACs).

Certain allocations (called prescriptions) in the PNF LRMP are still applicable in whole or in part, because they were not superseded by three amendments. Those allocations still in effect for the Bucks Project area are discussed further below.

The PNF LRMP (USDA 1988) displays management areas, which include descriptions, standards and guidelines, prescription allocations, and management objectives specific to each management area (page 4-113). Management areas that overlap with the Bucks Project area include: Grizzly Dome (#2), Bucks (#5), Faggs (#6), Silver (#21), Third Water (#22), and Bear (#25). Five management areas, Grizzly Dome (#2), Bucks (#5), Faggs (#6), Silver (#21), and Third Water (#22), overlap with proposed treatment units within the Bucks Project area. Because Bear does not overlap with treatment units and very small portion of the management area
overlap with the Bucks Project area, this management area is removed from further discussion. Of
the management areas that overlap with proposed treatment units, prescription allocations that
apply include: Rx1-Wilderness Prescription; Rx2-Wildland Scenic River; Rx5-Recreation Area
Prescription; Rx6-Developed Recreation Site Prescription; Rx7-Minimal Management
Prescription; Rx8-Semi-Primitive Area; Rx9-Riparian Area Prescription; Rx10-Visual Retention
Prescription; Rx11-Bald Eagle Habitat Prescription; Rx12-Spotted Owl Habitat Prescription;
Rx13-Goshawk Habitat Prescription; Rx14-Visual Partial Retention Prescription; Rx15-Timber
Emphasis Prescription; and Rx17-Research Natural Area. Areas of general direction and
standards and guidelines are located on pages 4-274 – 4-293 of the PNF LRMP.

Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the Department of the Interior and
Related Agencies Appropriations Act, including section 401—the Herger-Feinstein Quincy
Library Group Forest Recovery Act (HFQLG Act). The HFQLG Act states that the Secretary of
Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a
pilot project for five years on federal lands in the Lassen and Plumas National Forests and the
Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels
and vegetation management activities in meeting ecologic, economic, and fuel-reduction
objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of
8,700 acres of group selection across the Pilot Project Area, consistent with protection of
ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic
efficiency.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS,
Supplemental EIS, Records of Decision (1999 and 2003) and
Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed
on August 20, 1999 (USDA 1999b). The Record of Decision amended the land and resource
management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction
to implement the resource management activities required by the HFQLG Act. The Record of
Decision on the HFQLG Final Supplemental EIS addressing DFPZ maintenance was adopted on
July 31, 2003 (USDA 2003b). In February 2003, the Department of the Interior and Related
Agencies Appropriations Act was signed and extended the HFQLG Pilot Project legislation by
another five years. The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project
to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act
(Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public
notice, comment and objection processes, and judicial review. In March 2009, the Omnibus
Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration
Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

The 1999 HFQLG Record of Decision (pages 8-10) displays the changes in management direction applicable to the HFQLG Pilot Project Area. Amendments to the PNF LRMP are discussed in detail in the HFQLG Final Environmental Impact Statement on pages 2-6 – 2-18. Land allocations that apply to the Pilot Project area include offbase and deferred lands, late-successional old-growth stands (ranks 4 and 5), California spotted owl protected activity centers (PAC), spotted owl habitat areas (SOHA), riparian habitat conservation areas (RHCAs), and the National Forest System (NFS) lands outside these allocations that are available for vegetation and fuels management activities.

NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 8-10 of the HFQLG ROD and pages 2-6 – 2-18 of the HFQLG FEIS.

**Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)**

In January 2004, the Regional Forester signed the SNFPA Final Supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA Final Supplemental EIS. The 2004 Record of Decision on the SNFPA Final Supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires would lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

The 2004 SNFPA Record of Decision (pages 68 and 69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposal, in addition to the PNF LRMP and HFQLG ROD and FEIS, include California spotted owl home range core areas (HRCAs), Northern goshawk PACs, wildland urban interface (WUI), and extended WUI.
NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 68 and 69 of the SNFPA ROD (Table 2).

**Proposed Action**

The actions proposed by the Forest Service to meet the purposes and needs are to construct 1,511 acres of Defensible Fuel Profile Zones (DFPZs) through a combination of mechanical or radial thinning (ground-based or skyline yarding), hand thinning, piling and burning or chipping; grapple piling and burning; mechanical biomass removal; masticating, and prescribed underburning treatments; enhance wildlife habitat through a combination of radial thinning around large trees (156 acres) and mechanically remove conifers within aspen stands (12 acres); abate hazard trees within 552 acres of NFS land through mechanical removal (545 acres) or fell and leave (7 acres); improve water quality by developing road drainage systems along 13 miles of priority NFS roads through installation of road dips, 2-3 inch diameter rock armor, outsloping road segments, or replacing culverts; stabilize stream banks on 1,000 feet of Bucks Creek and 500 feet of Pat Maloy Ravine through a combination of planting native riparian vegetation by hand and/or placement of log and boulder vanes. The proposed action is described in more detail in Chapter 2, Alternative A.

**Decision Framework**

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to make the following decisions: to implement this proposal, implement an alternative that moves the area towards the desired condition, or not to implement any project at this time.

**Public Involvement**

The proposal was listed in the Schedule of Proposed Actions on December 18, 2006. A legal ad announcing the scoping period was published in the *Feather River Bulletin* and the proposal was provided to the public for comment during scoping May 4, 2011. The initial scoping period was extended for an additional 30 days and a legal ad was published June 8, 2011. The purpose of the scoping process was to inform the public about the proposed action and purpose and need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period. The In order to be eligible to file an objection to the preferred alternative, specific written comments related to the project must be submitted during scoping.

In addition, as part of the public involvement process and collaboration requirements under the Healthy Forest Restoration Act (HFRA), the Forest Service held an open house September 15, 2009 at Mt. Hough Ranger District in Quincy, California. Announcements for the open house was published in the *Feather River Bulletin* and informational flyers were sent to the Plumas National
Forest key contacts, including media. The Forest Service also held individual collaboration meetings with interest groups from July throughout April 2010 and hosted a field trip for all interested parties on May 26, 2010.

IDT members attended the Bucks Lake Homeowner’s Association annual meeting June 9, 2011.

Four verbal and nineteen written comments on the proposed action were received during the scoping period. A compilation of scoping comments and a summary of the issues is located in the project record at Mt. Hough Ranger District in Quincy, CA.

Using the comments from the public, other agencies, and Native American tribes (see Issues section), the interdisciplinary team developed a list of issues to address.

The following individuals, organizations, and agencies provided scoping comments during the official 30 day scoping period:

- Dorine Beckman
- Jerry Hurley, Fire Safe Council
- Justin Kooyman, Pacific Crest Trail Association
- Peter Kirby
- Rick and Jani Frey
- Dave Norton
- Kyle Felker
- John Forno, Sierra Pacific Industries
- Ted W. Harris
- Crista Stewart, Greenville Indian Rancheria
- LaTroy Justeson, Bucks Lake Snow Drifters
- Bill Wickman, American Forest Resource Council
- Chad Hanson, John Muir Project
- Frank Stewart, Counties’ QLG Forester
- J.R. Casarotti
- Rick Frey
- Ted W Harris
- Joe Blackwell
- Pat Mc Cutcheon
- Jeff Robinson
- Bob King

The Forest Service recently sent a cover letter to 699 individuals, organizations, agencies, and tribes indicating the need to issue a decision before October 2012. Therefore removing the 30 day comment period, and continuing the project planning process with the required 30 day objection period. The objection period is anticipated for February 2012 and the decision is anticipated to be signed sometime in August 2012.
The final EA and Decision Notice/Finding of No Significant Impact will be sent to agencies, organizations, and individuals that submitted comments, expressed interest to remain involved throughout the project planning process, and individuals who requested a copy.

**Issues**

Comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. Issues are phrased as cause-effect relationships, the concept of describing a specific action and the environmental effect(s) expected to result from that action applies whether one is using an EA or an EIS. Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. The Mt. Hough Interdisciplinary Team (IDT) separated the issues into two groups: significant and non-significant. Significant issues were defined as those where there may be a cause-effect relationship between a proposed action and a significant effect and the disclosure of that effect is documented in an EIS. Non-issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. Non-significant issues were identified as those not resulting in a significant effect. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…”. A list of non-significant issues and reasons why they were found non-significant may be found in the project record located at the Mt. Hough Ranger District in Quincy, CA.

As for significant issues, the Forest Service did not identify any significant issues during scoping. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. A list of issues and non-significance determinations from comments is available in the project record located at the Mt. Hough Ranger District in Quincy, CA. Alternatives D was requested by commenters who submitted scoping comments during the scoping period.

**Fuels**

- **Issue 1**: Wildlife treatments and radial thinning will not meet the fuel reduction objective.
  
  Refer to the Fire and Fuels section of this EA, page 36 and the Wildlife – Terrestrial and Aquatic section of this EA, page 157 for an effects analysis discussion.

- **Issue 2**: Falling and leaving snags will contribute to the already existing fuel loads.

- **Issue 3**: This project will prevent high severity wildfire, which will cause ecological damage.

Refer to the Fire and Fuels section of this EA, page 36 for an effects analysis discussion.
Recreation

- **Issue 4:** The treatments will negatively impact the PCT.
- **Issue 5:** Landings on paved roads will decrease the scenic quality of the recreation area.

Design criteria specific to units adjacent to the PCT and landings are disclosed in Table 5, page 22. Refer to the Recreation and Scenic Resources section of this EA, page 60 for an effects analysis discussion.

- **Issue 6:** Existing temporary roads provide important recreational opportunities.

Two non-system roads near Bucks Lake Lodge would not be subsoiled or re-contoured and would remain accessible for non-motorized use. Refer to the alternative A description on page 14, alternative D description on page 18, under the Watershed Improvement heading. Refer to the Hydrology and Soils section of this EA, page 115 and the Recreation and Scenic Resources section of this EA, page 60 for an effects analysis discussion.

Wildlife

- **Issue 7:** Project activities will cause adverse impacts to the BBWO.
- **Issue 8:** Logging high-intensity fire patches will reduce suitable foraging habitat for spotted owls.

Refer to the Wildlife – Terrestrial and Aquatic section of this EA, page 157 for an effects analysis discussion.

Economics

- **Issue 9:** Group selections would increase biodiversity, decrease amounts of overstocked stands, and create an economically viable sale.

Group selection treatments were analyzed under alternative D.

- **Issue 10:** Roadside hazard units will make the project a deficit sale.

Approximately 141 acres of hazard tree abatement was changed to drop and leave under alternative D.

**ALTERNATIVES, INCLUDING THE PROPOSED ACTION**

This chapter describes and compares the alternatives considered for the Bucks Project. It includes a description of each alternative considered. Maps for each alternative are illustrated in Appendix A. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).
Alternatives

Alternative A

The Proposed Action

Under alternative A, hazard tree abatement, Defensible Fuel Profile Zones (DFPZs), R5 Forest Service sensitive wildlife species treatments, including aspen enhancement, and watershed treatments would be implemented to accomplish the purpose and need. All live trees greater than or equal to 30 inches diameter at breast height (DBH) would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning or chipping; grapple piling and burning; mechanical biomass removal; masticating; mechanical and radial thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within all fuel treatment areas, borax, a fungicide would be applied to all conifer stumps greater than 14 inches, to prevent the introduction and spread of *Heterobasidion* root disease. Within recreation areas, borax would be applied to all stumps greater than 3 inches (R5 Supplemental FSM 2303.14). Approximately 1,511 acres of DFPZs would be constructed through the following treatments and associated prescriptions (Table 1):

1. Overstory Treatments

   - Mechanically thin trees between 10 and 30 inches DBH utilizing ground-based and skyline logging systems and remove as sawlogs. Most overstory treatments overlap with understory treatments described below. (Table 1):

      o Mechanically thin trees less than 30 inches DBH and generally retain 30-40 percent CC (251 acres)
      o Mechanically thin trees less than 30 inches DBH and generally retain 40-50 percent CC (297 acres).
      o Mechanically thin trees less than 30 inches DBH and generally retain 50-60 percent CC (42 acres).
      o Radial thin around large “legacy” trees by mechanically removing trees less than 30 inches DBH within a 30 foot radius. Generally retain 40-50 percent canopy cover (CC) within the matrix between legacy trees. A maximum of five legacy trees would be designated per acre (100 acres).
Radial thin around large “legacy” trees by mechanically removing trees less than 30 inches DBH within a 30 foot radius. Generally retain 50-60 percent canopy cover (CC) within the matrix between legacy trees. A maximum of five legacy trees would be designated per acre (56 acres).

2. Understory Treatments
   - Hand thin, pile, and burn trees less than 8 inches DBH (251 acres)
   - Hand thin, pile, and burn trees less than 8 inches DBH and underburn (26 acres)
   - Hand thin, pile, burn or chip trees less than 8 inches DBH (224 acres)
   - Mechanically remove trees less than 10 inches DBH (282 acres)
   - Mechanically remove trees less than 10 inches DBH and underburn (270 acres)
   - Grapple pile existing ground fuels and trees less than 8 inches DBH and burn piles and underburn (105 acres).
   - Masticate brush and trees less than 8 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (17 acres).
   - Low to moderate intensity prescribed underburn (222 acres).

Hazard Trees
Hazard tree removal would occur along approximately 16 miles (within 552 acres, Table 1) of National Forest System (NFS) and Plumas County roads within the following developed recreation sites: Grizzly Creek Campground (CG), Hutchins Group CG, Mill Creek CG, Sundew CG, White Horse CG, Lower Bucks Family CG, Lower Bucks fishing day use site, the Indian Rock day use area, Bucks Lake Overlook, and the Bucks kiosk. Hazard trees along main roads within the Bucks Lake and Haskins Creek Recreation Residence Tracts that are outside of permitted lots would also be considered for removal. All hazard trees removed will meet the Plumas National Forest Roadside/Facility Hazard Tree Guidelines and Identification Criteria (2008). In areas with sensitive resources or where removal is not feasible, hazard trees would be felled but not removed.

Wildlife Habitat Enhancement
Wildlife habitat enhancement treatments are integrated into the proposed treatments described above. Forest health and fuels reduction prescriptions would incorporate design standards to achieve the desired conditions for wildlife habitat within vegetation units using a combination of

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1 Permit holders are responsible for inspecting their permitted areas, authorized rights-of-ways, and adjoining areas for dangerous trees, hanging limbs, or other hazardous conditions that could pose a risk to facilities or public safety. After obtaining written approval, the holder is also responsible for removing identified hazards at the holder’s expense.
mechanical thinning, hand thinning, prescribed fire, mastication, and stream bank stabilization activities. This integration includes the following components: approximately 156 acres of the mechanical treatment units would include radial thinning around large trees; removal of conifers from approximately 12 acres of aspen stands; and enhancement of shrublands through burning on approximately 222 acres and mastication on approximately 17 acres (Table 1). Stream bank stabilization to provide barrier free access for aquatic species along Bucks Creek and Pat Maloy Ravine would be accomplished with the proposed watershed improvement activities.

**Watershed Improvements**

Approximately 13 miles of NFS roads and one trail, and Plumas County roads are to remain open but are improperly constructed or unmaintained and would be improved (Appendix C). Treatments would improve road drainage systems so that runoff is better dispersed and road drainage is not concentrated and directly connected to nearby stream channels, reducing the frequency and magnitude of sediment delivery from these National Forest System roads. A common treatment would be the installation of road dips to better disperse runoff from road surfaces and to frequently relieve roadway ditches so that the total length of ditches that flow to stream channels is substantially reduced. The placement of 2-3 inch diameter rock armor may be necessary at the outlet of the dip to dissipate erosive potential where erosion hazard is high. Additional improvements may include outsloping road segments or replacing culverts.

Temporary roads constructed as part of this project would be closed with a constructed barrier after use (Table 11). Temporary road surfaces would be subsoiled to a depth of 18 inches to restore hydrologic function and the road area would be re-contoured to match slopes of the surrounding natural landscape. Two non-system roads identified by the public near the Bucks Lake Lodge would not be subsoiled or re-contoured and would remain accessible for non-motorized use. One road heads southwest from the lodge and ends at a landing for a total length of 0.2 miles; the second road starts near the Timberline lodge and heads south by southeast towards Haskins Valley.

Stream bank stabilization activities (Table 12) are proposed on 1,000 feet of Bucks Creek (T24N, R7E, SE ¼ of section 36) and 500 feet of Pat Maloy Ravine (T24N, R7E, SE ¼ of section 28). Log and boulder vanes would be installed to stabilize the banks of Pat Maloy Ravine. Native riparian vegetation would be planted by hand at all proposed stream restoration sites (Pat Maloy Ravine and Bucks Creek) to improve riparian habitat, stabilize stream banks, and increase channel shade.
Alternative B

*The No Action*

Under the No Action alternative, the proposed action would not take place. No DFPZs, group selections, R5 Forest Service sensitive wildlife species treatments, or watershed improvement treatments would be implemented to accomplish the purpose and need.

Alternative C

*Non-Commercial Funding*

A recent court ruling requires that all projects with a singular purpose and need for fuels reduction, or with multiple purposes and needs that include fuels reduction, must have a non-commercial funding alternative. A non-commercial funding alternative is an alternative where the sole purpose is to achieve the fuels reduction element of the purpose and need and where all the proposed treatments are solely directed at reducing hazardous fuels. In a non-commercial funding alternative, there can be no additional timber harvesting added beyond that needed to meet the fuel reduction purpose and need (*Sierra Forest Legacy v. Mark Rey*, Case 2:05-cv-00205-MCE-GGH, Morrison C. England, Jr., United States District Court Judge, United States District Court, Eastern District of California, November 4, 2009).

Alternative C includes DFPZ treatments which would be implemented to accomplish the purpose and need for modifying fire behavior only. No other treatments proposed under any other action alternative would be proposed under this alternative. All live trees greater than or equal to 10 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 10 inches DBH would be minimized as much as practicable. No sawlogs are proposed for removal under this alternative.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning or chipping; masticating; mechanical thinning; grapple piling; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Approximately 1,477 acres of DFPZs would be constructed through the following treatments and associated prescriptions (Table 1):

**Understory Treatments**

- Hand thin, pile, and burn trees less than 8 inches DBH (251 acres)
- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (26 acres)
- Hand thin, pile, and burn or chip trees less than 8 inches DBH (224 acres)
- Mechanically thin and remove trees less than 10 inches DBH (282 acres)
- Mechanically thin and remove trees less than 10 inches DBH and underburn (270 acres).
• Grapple pile existing ground fuels and trees less than 8 inches DBH and burn piles and underburn (105 acres).

• Masticate brush and trees less than 8 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (17 acres).

• Low to moderate intensity prescribed underburn (303 acres).

Alternative D
Under alternative D, hazard tree abatement, Defensible Fuel Profile Zones (DFPZs), group selections (GS), aspen treatments, and watershed treatments would be implemented to accomplish the purpose and need. However, alternative D incorporates and removes specific activities to both increase sawlog net value and reduce implementation costs, respectively. All live trees greater than or equal to 30 inches diameter at breast height (DBH) would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Changes in treatments include the reduction of acres in proposed underburning units; increasing acres of drop and leave hazard tree abatement; removal of grapple piling and masticating treatments and skyline logging systems; and maintaining 30-50 percent canopy cover in all mechanical thinning treatments. The proposed watershed improvement treatments would be implemented using other funding.

Defensible Fuel Profile Zones (DFPZs)
DFPZs would be constructed using a combination of hand thinning, piling, and burning or chipping; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within all fuel treatment areas, borax, a fungicide would be applied to all conifer stumps greater than 14 inches, to prevent the introduction and spread of *Heterobasidion* root disease. Within recreation areas, borax would be applied to all stumps greater than 3 inches (R5 Supplemental FSM 2303.14). Approximately 1,010 acres of DFPZs would be constructed through the following treatments and associated prescriptions (Table 1):

1. **Overstory Treatments**
   - Mechanically thin trees between 10 and 30 inches DBH utilizing ground-based and skyline logging systems and remove as sawlogs. Most overstory treatments overlap with understory treatments described below (Table 1):
     - Mechanically thin trees less than 30 inches DBH and generally retain 30-40 percent CC (234 acres).
     - Mechanically thin trees less than 30 inches DBH and generally retain 40-50 percent CC (369 acres).
Radial thin around large “legacy” trees by mechanically removing trees less than 30 inches DBH within a 30 foot radius. Generally retain 40-50 percent canopy cover (CC) within the matrix between legacy trees. A maximum of five legacy trees would be designated per acre (145 acres).

2. **Understory Treatments**

- Hand thin, pile, and burn trees less than 8 inches DBH (79 acres)
- Hand thin, pile, burn or chip trees less than 8 inches DBH (224 acres)
- Mechanically thin and remove trees less than 10 inches DBH (294 acres)
- Mechanically remove trees less than 10 inches DBH and underburn (256 acres)

**Hazard Trees**

Hazard tree removal would occur along approximately 16 miles (within 552 acres, Table 1) of National Forest System (NFS) and Plumas County roads and within the following developed recreation sites: Grizzly Creek Campground (CG), Hutchins Group CG, Mill Creek CG, Sundew CG, White Horse CG, Lower Bucks Family CG, Lower Bucks fishing day use site, the Indian Rock day use area, Bucks Lake Overlook, and the Bucks kiosk. Hazard trees that occur along the main road of the Bucks Lake and Haskins Creek Recreation Residence Tracts but outside of permitted lots would also be considered for removal\(^2\). All hazard trees removed will meet the Plumas National Forest Roadside/Facility Hazard Tree Guidelines and Identification Criteria (2008). In areas with sensitive resources or where removal is not feasible, hazard trees would be felled but not removed.

**Group Selections (GS)**

Group selection is proposed in mechanical thinning units within DFPZs (34 acres) using mechanical equipment. Group selection involves harvest of trees less than 30 inches in diameter in small (0.5 to 2 acres) patches. All live trees greater than or equal to 30 inches DBH would be retained. Healthy, vigorous, undamaged, shade intolerant trees 20 inches in diameter and greater would be considered for retention for seed tree and forest structure purposes, where appropriate. Within group selections, borax, a fungicide would be applied to conifer stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease. This borax application is in addition to all conifer stumps greater than 3 inches within recreation areas.

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\(^2\) Permit holders are responsible for inspecting their permitted areas, authorized rights-of-ways, and adjoining areas for dangerous trees, hanging limbs, or other hazardous conditions that could pose a risk to facilities or public safety. After obtaining written approval, the holder is also responsible for removing identified hazards at the holder’s expense.
Wildlife Habitat Enhancement

Wildlife habitat enhancement treatments are integrated into the proposed treatments described above. Forest health and fuels reduction prescriptions would incorporate design standards to achieve the desired conditions for wildlife habitat within vegetation units using a combination of mechanical thinning, hand thinning, prescribed fire, and stream bank stabilization activities. This integration includes the following components: approximately 156 acres of the mechanical treatment units would include radial thinning around large trees; and removal of conifers from approximately 9 acres of aspen stands (Table 1). Stream bank stabilization to provide barrier free access for aquatic species along Bucks Creek and Pat Maloy Ravine would be accomplished with the proposed watershed improvement activities.

Watershed Improvements

Watershed improvements would be proposed under Alternative D because appropriated funding is expected for these proposed treatments. The watershed improvements proposed under alternative D are identical to those proposed for alternative A (Appendix C).
Table 1. Summary of treatments and acres by action alternative.

<table>
<thead>
<tr>
<th>Treatment Types</th>
<th>Proposed Action (A)</th>
<th>Non-Commercial (C)</th>
<th>Alternative D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Commercial Treatments</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sawlog Removal (Mechanical Thin)</td>
<td>590.0</td>
<td>0.0</td>
<td>603.2</td>
</tr>
<tr>
<td>Hand Thin, Pile, Burn</td>
<td>36.8</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>No Prescribed Fire</td>
<td>10.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Prescribed Fire</td>
<td>26.2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mechanical Biomass Removal</td>
<td>438.2</td>
<td>0.0</td>
<td>446.9</td>
</tr>
<tr>
<td>No Prescribed Fire</td>
<td>168.2</td>
<td>0.0</td>
<td>190.6</td>
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<tr>
<td>Prescribed Fire</td>
<td>269.9</td>
<td>0.0</td>
<td>256.3</td>
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<td>No Biomass Removal</td>
<td>115.1</td>
<td>0.0</td>
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<td>No Prescribed Fire</td>
<td>34.5</td>
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<tr>
<td>Prescribed Fire</td>
<td>80.6</td>
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<td>101.6</td>
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<td>Sawlog Removal (Radial Thin)</td>
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</tr>
<tr>
<td>Hand Thin, Pile, Burn</td>
<td>42.0</td>
<td>0.0</td>
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<tr>
<td>No Prescribed Fire</td>
<td>42.0</td>
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<td>42.0</td>
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<tr>
<td>Prescribed Fire</td>
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<td>0.0</td>
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<tr>
<td>Mechanical Biomass Removal</td>
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<td>0.0</td>
<td>103.4</td>
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<tr>
<td>No Prescribed Fire</td>
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<td>0.0</td>
<td>103.4</td>
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<tr>
<td>Group Selection</td>
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<td><strong>Hazard Tree Treatments</strong></td>
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<td>Hazard Tree (Removal)</td>
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<td><strong>Non-Commercial Treatments</strong></td>
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<td>Hazard Tree (Drop and Leave)</td>
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<td>Grapple Pile + Burn; Prescribed Fire</td>
<td>104.5</td>
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<tr>
<td>Hand Thin + Pile Burn</td>
<td>198.0</td>
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<td>37.3</td>
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<tr>
<td>No Prescribed Fire</td>
<td>198.0</td>
<td>250.5</td>
<td>37.3</td>
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<td>Prescribed Fire</td>
<td>0.0</td>
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</tr>
<tr>
<td>Hand Thin + Pile Burn or Chip; No Prescribed Fire</td>
<td>224.3</td>
<td>224.3</td>
<td>224.3</td>
</tr>
<tr>
<td>Mastication; No Prescribed Fire</td>
<td>16.5</td>
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</tr>
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<td>Mechanical Biomass (only treatment)</td>
<td>0.0</td>
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<tr>
<td>No Prescribed Fire</td>
<td>0.0</td>
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<tr>
<td>Prescribed Fire</td>
<td>0.0</td>
<td>269.9</td>
<td>0.0</td>
</tr>
<tr>
<td>Prescribed Fire (only)</td>
<td>222.3</td>
<td>302.9</td>
<td>0.0</td>
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<td><strong>TOTAL PRIMARY TREATMENT ACRES</strong></td>
<td>2063.1</td>
<td>1476.8</td>
<td>1596.0</td>
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</tbody>
</table>
Design Criteria

This section presents a series of tables (Table 2 through Table 12) that contain the design criteria for the treatments proposed in the action alternatives. The design criteria are part of the project design, apply to the proposed treatments, and were developed to reduce or avoid adverse environmental effects of the proposed treatments.

Table 2. Design Criteria for DFPZs

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground-based Harvesting and Yarding</td>
<td>Mechanical harvesting would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (length and location to be determined by district hydrologist/soil scientist during implementation) within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined.</td>
</tr>
<tr>
<td>Skyline Yarding</td>
<td>In units 4, 5, 6, 8, 10, 20, 23, 26, 32, 49, 59, 62, 63, 67, 69, 71, and 75: Skyline yarding would be used to remove commercial sawlogs. Trees greater than or equal to 10 inches DBH would be removed as sawlog product. Harvested trees would be limbed, topped, and this activity slash would be hand piled. Trees less than 10 inches DBH would be hand thinned, piled, and burned or chipped post-treatment. Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams. The corridor would not be wider than 20 feet. The width for lateral yarding to the skyline corridor would be 75 feet on either side of the mainline. Lateral yarding would not require lift. When there are short inclusions of side hill within the corridor, allow side hill yarding. The top 100 feet of the skyline corridor would be rehabilitated with weed-free straw mulch and native seed.</td>
</tr>
<tr>
<td>Residual species preference</td>
<td>Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, Western white pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.</td>
</tr>
<tr>
<td>Criterion</td>
<td>Actions</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Residual surface fuels** | Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover.  
Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre depending on the forest type.  
Retain large woody debris (greater than 12 inches diameter), where they exist, at 10 to 15 tons per acre of the largest down logs. Where needed, jackpot burn, or machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles.  
Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels. |
| **Snag retention**    | Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline. |
| **Structure Trees**   | Retain and protect high value wildlife habitat trees (trees with multiple tops, broken tops, rot, cavities, and other formations) that create structure for nests and dens.                                                                                          |
| **Mastication**       | Machine cut all species of shrubs down to a 4-6 inch stub height across 90% of the treatment area.                                                                                                                                                                    |
| **Fireline**          | Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible. |
| **Treatment of Stumps** | In fuel treatment areas, conifer stumps 14 inches and greater in diameter would be treated with borax within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease. In campgrounds, conifer stumps 3 inches and greater in diameter would be treated with borax. |

**Table 3. Design criteria for mechanical thinning.**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
</table>
| **Radial Thinning** | Thin around larger "legacy" trees, preferably shade intolerants and vigorous individuals showing little or no signs of disease or insect attack, by removing other conifers up to 30 inches DBH within a 30 foot radius. Legacy trees will be generally greater than 30 inches DBH. In units with very few greater than 30 inch DBH trees, use trees greater than 24 inches DBH as legacy trees.  
Designate a maximum of 5 legacy trees per acre. Legacy trees can be in clumps.  
Within the matrix between legacy trees, thin from below to a residual canopy cover of either 40-50 percent or 50-60 percent.  
Preferably retain shade intolerant species where present; red fir over white fir; and vigorous disease- and insect-free individuals over declining individuals.  
Individuals showing signs of heavy root disease infection, dwarf mistletoe, or... |
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>insect attack will be targeted for removal.</td>
</tr>
<tr>
<td>Forest Health</td>
<td>Thin trees greater than 10 inches DBH to 40-60 percent canopy cover. Preferably retain shade intolerant species where present, red fir over white fir, and vigorous disease- and insect-free individuals over declining individuals. Individuals showing signs of heavy root disease infection, dwarf mistletoe, or insect attack will be targeted for removal. Increase horizontal heterogeneity by retaining patches of large trees among the thinning matrix, with occasional openings to allow for small gap regeneration and recruitment. Patches will have higher densities and canopy covers than surrounding areas, while openings will have lower densities and more open canopies. Patches may range from a few to several larger individuals. Openings will resemble small scale disturbances such as individual large tree mortality and disease centers where a few individuals die, and where possible will be targeted in areas where shade intolerant species are present.</td>
</tr>
<tr>
<td>Mechanical Thinning</td>
<td>Tree Plantation Thinning</td>
</tr>
</tbody>
</table>
### Table 4. Design Criteria for Group Selections

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group size</strong></td>
<td>0.5 acre to 2.0 acres.</td>
</tr>
<tr>
<td><strong>Group location</strong></td>
<td>Group selections would primarily be located in CWHR size class 3 and 4 stands (average DBH of 6 to 24 inches). Locate groups outside of Riparian Habitat Conservation Areas and such that group selections are not visible from Bucks Lake Road or Bucks Lake.</td>
</tr>
<tr>
<td><strong>Ground-based Harvesting and Yarding</strong></td>
<td>Mechanical harvesting would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (length and location to be determined by district hydrologist/soil scientist during implementation) within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined.</td>
</tr>
<tr>
<td><strong>Diameter constraints</strong></td>
<td>All trees greater than or equal to 30 inches DBH would be retained, except where removal is required to allow for operability. Minimize damage to trees greater than or equal to 30 inches DBH as much as practicable. Healthy, vigorous, undamaged, shade intolerant trees 20 inches in diameter and greater would be considered for retention for seed tree and forest structure purposes, where appropriate.</td>
</tr>
<tr>
<td><strong>Slash treatment / Site Preparation</strong></td>
<td>Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn, to treat natural and activity generated fuels, and shrubs.</td>
</tr>
<tr>
<td><strong>Regeneration strategy</strong></td>
<td>Regenerate groups with native shade-intolerant conifers, indicative of the ecological habitat type in which the group is located, using a combination of natural and planted seedlings to achieve desired stocking levels. Plantation performance would be monitored after the first and third years, and regeneration actions would be undertaken, if needed, to ensure successful regeneration within five years after harvest. Control competing brush and grass by grubbing or mastication, if necessary, to assure survival and growth of conifers.</td>
</tr>
<tr>
<td><strong>Residual species preference</strong></td>
<td>Retain all sugar pine tagged as resistant to white pine blister rust. Where black oak is present, retain black oaks greater than or equal to 6 inches DBH.</td>
</tr>
<tr>
<td><strong>Snag retention</strong></td>
<td>Retain two of the largest snags per acre exceeding 15 inches DBH and 20 feet tall, unless removal is required to allow for operability.</td>
</tr>
<tr>
<td><strong>Fireline</strong></td>
<td>Construct firelines using hand crews or mechanical equipment around groups to be underburned and around machine piles or hand piles, as needed. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.</td>
</tr>
<tr>
<td><strong>Treatment of Stumps</strong></td>
<td>Conifer stumps 14 inches and greater in diameter would be treated with borax within a day of cutting, to prevent the introduction and spread of <em>Heterobasidion</em> root disease.</td>
</tr>
</tbody>
</table>
### Table 5. Design Criteria for Recreation and Visual Quality

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campground Closures</strong></td>
<td>Notice of campground closures would be posted in advance at campgrounds and on internet when they open in the spring. During active logging campgrounds would be closed for safety. Closures would be in the fall to reduce impacts to Forest visitors during the peak of the recreation season. Logging would begin in the Whitehorse, Huthchins Group and Grizzly Creek Campgrounds after Labor Day; Sundew and Mill Creek Campgrounds in October.</td>
</tr>
<tr>
<td><strong>Equipment Constraints in Campgrounds</strong></td>
<td>To protect existing infrastructure skidding on roads would be avoided. Facilities would be identified and avoided. All signs, picnic tables, bear boxes and fire rings would be avoided or moved to prevent damage. Barriers within campgrounds can be moved if necessary, and replaced after implementation.</td>
</tr>
<tr>
<td><strong>PCT Limited Operating Period</strong></td>
<td>No logging until after mid August in units where the PCT travels through or is adjacent. To accommodate hikers establish reroutes or provide traffic controls.</td>
</tr>
<tr>
<td><strong>PCT Equipment Constraints</strong></td>
<td>No heavy equipment within a 70 foot buffer along the PCT trail. Within the buffer the only activity is hand falling of trees equal or less than 8” DBH. All trees would be felled away from the trail and those within reach would be removed with a feller buncheder from 70’ away from the trail. No skidding on PCT, only one skid trail would cross the trail at approximately 660 feet from the Bucks Lake Road, in the natural opening. Recontour/smoothing, lop and scatter, de-compacting soil and replanting native vegetation, along the skid trail where it crosses the PCT. All other skid trails would be 100 feet from the trail. Landings would be placed so they are not visible from the trail. Alternative D – Group selections would be placed so they are not visible from the trail.</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>Photo points at the skid trail crossing would be established to capture if the above mitigations protected the PCT. Photos will be taken pre-project, 1,2, 3 and 5 years to document impacts and benefits.</td>
</tr>
<tr>
<td><strong>Trail Closures</strong></td>
<td>Advanced notice of trail closures would be posted at trailheads and on the internet. During active logging trails would be closed for safety. Trails would be closed after Labor Day to reduce impacts to Forest visitors.</td>
</tr>
<tr>
<td><strong>Equipment constraints for trails</strong></td>
<td>All Trails - No skidding on trails. Recontour/smooth and lop and scatter along skid trails where they cross the trail. Bucks Creek Loop – Protect all existing structures such as turnpikes, bridges and signs. Minimize skid trails crossing the trail and rehabilitate trail where</td>
</tr>
<tr>
<td>Criterion</td>
<td>Actions</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Retention VQO</td>
<td>To maintain a VQO of Retention along Bucks Lake Road and the lake itself, no landings or skid trails would be visible from these locations. To minimize effects landings would be located off all paved road. Alternative D – No group selections would be seen from the Bucks Lake Road and Bucks Lake.</td>
</tr>
<tr>
<td>Road closures and logging traffic</td>
<td>Sign all routes concerning logging activities. Road closesures for hazard tree falling activity would not occur on weekends from Memorial Day through Labor day because of the high use in the area and safety concerns.</td>
</tr>
<tr>
<td>Recreation Residence Tracts</td>
<td>No thinning activity is to occur on permitted lots. Place all piles to burn off permitted lots. No logging activity on weekends from Memorial Day weekend through Labor Day weekend.</td>
</tr>
<tr>
<td>Bucks Lake Lodge</td>
<td>No logging activity on weekends from Memorial Day Weekend through Labor Day weekend. Create a 200 foot buffer around existing structures and improvements. Protect all utility lines if they extend outside the buffer zone.</td>
</tr>
<tr>
<td>Burning Rx and piles</td>
<td>All burning should occur outside the busy recreation season after late September.</td>
</tr>
</tbody>
</table>

Table 6. Design Criteria for Aspen Stands

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting and yarding</td>
<td>Mechanical harvesting would be used to remove conifers up to 29.9 inches DBH and including biomass (trees less than 10 inches DBH). Remove all biomass by mechanical thinning or hand thin, pile, and burn.</td>
</tr>
<tr>
<td>RHCA Equipment Diameter constraints</td>
<td>No mechanical equipment operations on slopes steeper than 30 percent. Establish equipment exclusion zones adjacent to stream channels according to Table 9 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCA. Allow hand thinning and hand piling in areas where equipment is excluded. All trees greater than or equal to 30 inches would be retained, except where removal is required to allow for operability. Impacts on trees greater than or equal to 30 inches DBH would be minimized to the extent practicable.</td>
</tr>
<tr>
<td>Residual species preference</td>
<td>Retain all aspen. The residual stand may contain some conifers greater than 10 inches DBH with preference given to ponderosa and/or lodgepole pine.</td>
</tr>
<tr>
<td>Snag retention</td>
<td>Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH would be used to meet this guideline.</td>
</tr>
<tr>
<td>Slash treatment</td>
<td>Hand pile and burn both project generated and pre-existing fuels.</td>
</tr>
<tr>
<td>Prescribed fire treatment</td>
<td>Underburn within selected aspen stands to reduce excess live and dead</td>
</tr>
<tr>
<td><strong>Burn constraints</strong></td>
<td>Where possible, locate burn piles away from riparian vegetation to reduce the potential for scorch.</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Fireline</strong></td>
<td>Construct firelines using hand crews as needed, around areas to be underburned or hand piled. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.</td>
</tr>
<tr>
<td><strong>Residual surface fuels (less than 3 inches diameter)</strong></td>
<td>Retain surface fuels at a level that will result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. Based on post treatment evaluations, treat natural and activity generated surface fuels with hand thinning, piling, and burning.</td>
</tr>
<tr>
<td><strong>Residual down logs</strong></td>
<td>Where they exist, retain 10 to 15 tons per acre of the largest down logs (aspen and conifer) having diameters greater than 12 inches.</td>
</tr>
<tr>
<td><strong>Treat annosum root rot</strong></td>
<td>Apply Borax to the stumps of all harvested conifers that are 14 inches in diameter and greater within the day of harvest in order to minimize the spread of annosum root rot. Borax applications will follow all safety and resource protection measures listed in Appendix G.</td>
</tr>
<tr>
<td><strong>Heritage resource sites</strong></td>
<td>The District archaeologist would be consulted when arborglyph sites within aspen stands are identified. Sites would be flagged and avoided, following the Standard Resource Protection Measures (R-5 PA). However, treatment may occur if aspen carving trees would not be affected by conifer removal.</td>
</tr>
</tbody>
</table>
Table 7. Design Criteria for RHCAs

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHCA Equipment constraints</td>
<td>No mechanical equipment operations on slopes steeper than 30 percent. Establish equipment exclusion zones adjacent to stream channels according to Table 9 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.</td>
</tr>
<tr>
<td>Diameter constraints</td>
<td>Within mechanical harvest areas, implement a 20-inch upper diameter limit, except where needed for operability. Minimize damage to trees larger than 20 inches DBH as much as practicable.</td>
</tr>
<tr>
<td>Residual species preference</td>
<td>Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, Western white pine, black oak, ponderosa and Jeffrey pine, and Douglas-fir.</td>
</tr>
<tr>
<td>Snag retention</td>
<td>Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.</td>
</tr>
<tr>
<td>Burn constraints</td>
<td>Establish pile burning exclusion zones (Table 10) adjacent to stream channels. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.</td>
</tr>
<tr>
<td>Fireline</td>
<td>Construct firelines using hand crews around areas to be underburned or pile burned, as needed. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.</td>
</tr>
<tr>
<td>Residual surface fuels</td>
<td>Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels within the equipment restriction zone.</td>
</tr>
<tr>
<td>Fish passage improvement</td>
<td>Reclaim fish passage and habitat by improving or replacing culverts at specific locations where roads cross streams.</td>
</tr>
</tbody>
</table>

Table 8. Scientific Assessment Team (SAT) Guidelines for RHCA Buffer Widths

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Prescribed Stream Buffer Widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial, fish bearing¹</td>
<td>300 feet</td>
</tr>
</tbody>
</table>
Table 8 displays the Scientific Assessment Team guidelines for RHCA buffer widths based on stream type. For the Bucks Project, the above listed widths would be the maximum buffer width identified for each stream type. Table 9 below displays an additional buffer (inner buffer or equipment exclusion zone) within the RHCA and within the SAT guideline buffer identified above.

For example, there is a perennial fish bearing stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 100 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 100 feet. Equipment can enter the remaining 200 feet of the 300 foot maximum buffer.

When the slope within the SAT guideline buffer is greater than 30 percent, no mechanical equipment is allowed to enter the RHCA. For example, there is a perennial stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 100 feet from the edge of the active channel, the slope is 32 percent; no equipment is allowed within any portion of the 300 foot buffer.

Table 9. **Equipment Exclusion Zones in RHCA**s

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Slope Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0%-30% (feet)</td>
</tr>
<tr>
<td>Perennial, fish bearing</td>
<td>100</td>
</tr>
<tr>
<td>Perennial, no fish Intermittent</td>
<td>50</td>
</tr>
<tr>
<td>Ephemeral</td>
<td>25</td>
</tr>
<tr>
<td>Reservoirs/wetlands greater than 1 acre</td>
<td>75</td>
</tr>
</tbody>
</table>

Within the SAT guideline buffer, a project specific distance (feet) is applied to the placement of piles for future burning (Table 10). For example, there is an ephemeral stream with a treatment unit; a 100 foot buffer is applied. Within that 100 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 100 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 100 feet. Equipment can enter the remaining 200 feet of the 300 foot maximum buffer.
active stream channel, the slope is 32 percent. First, no mechanical equipment is allowed within any portion of the 100 foot buffer (Table 9). Second, piles must be placed 15 feet from the center of the stream bed (Table 10).

**Table 10. Pile Burning Exclusion Zones in RHCAs**

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Slope Class</th>
<th>All slopes (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Intermittent</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Ephemeral</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Reservoirs/wetlands greater than 1 acre</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.
Table 11. Design Criteria for Access and Transportation

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS road maintenance</td>
<td>Maintain approximately 13 miles of NFS roads.</td>
</tr>
<tr>
<td>NFS road reconstruction</td>
<td>Reconstruct 1.1 miles of NFS roads.</td>
</tr>
<tr>
<td>Non-system road reconstruction</td>
<td>Reconstruct 3.3 miles of non-system roads.</td>
</tr>
<tr>
<td>Non-system road construction</td>
<td>Construct approximately 2 miles of new temporary non-system roads.</td>
</tr>
<tr>
<td></td>
<td>Decommission these roads upon project completion.</td>
</tr>
<tr>
<td>Harvest landings</td>
<td>Landings would be utilized to remove sawlog and biomass products.</td>
</tr>
<tr>
<td></td>
<td>The Bucks Project is planned to accommodate product removal with one</td>
</tr>
<tr>
<td></td>
<td>landing per 40 acres. Landings may exceed more than one per 40 acres</td>
</tr>
<tr>
<td></td>
<td>when there is a need for more landings to limit resource protection</td>
</tr>
<tr>
<td></td>
<td>problems.</td>
</tr>
<tr>
<td></td>
<td>Existing landings shall be reconstructed and utilized considering the</td>
</tr>
<tr>
<td></td>
<td>location and effects to resources. Would construct new landings where</td>
</tr>
<tr>
<td></td>
<td>existing landings are not present or are inadequate due to the location</td>
</tr>
<tr>
<td></td>
<td>and effects to resources.</td>
</tr>
<tr>
<td></td>
<td>For existing landings supporting cull decks, identify and relocate</td>
</tr>
<tr>
<td></td>
<td>individual hollow log structures prior to cull deck construction.</td>
</tr>
<tr>
<td></td>
<td>Relocate hollow logs to forest stand outside of landing disturbance</td>
</tr>
<tr>
<td></td>
<td>area.</td>
</tr>
<tr>
<td></td>
<td>Landing spacing for skyline units would be 150 feet. Skyline units</td>
</tr>
<tr>
<td></td>
<td>may require more landings in order to process biomass.</td>
</tr>
<tr>
<td></td>
<td>Removal of green trees would occur to allow for temporary non-system</td>
</tr>
<tr>
<td></td>
<td>road and landing construction.</td>
</tr>
</tbody>
</table>

Notes:

a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b).

Table 12. Design Criteria for Watershed Improvements

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS road improvement</td>
<td>Treatments would improve road drainage systems so that runoff is better dispersed and road drainage is not concentrated and directly connected to nearby stream channels, reducing the frequency and magnitude of sediment delivery from these National Forest System roads. A common treatment would be the installation of road dips to better disperse runoff from road surfaces and to frequently relieve roadway ditches so that the total length of ditches that flow to stream channels is substantially reduced. The placement of 2-3 inch diameter rock armor may be necessary at the outlet of the dip to dissipate erosive potential where erosion hazard is high. Additional improvements may include outsloping road segments or replacing culverts.</td>
</tr>
<tr>
<td>Stream bank stabilization</td>
<td>Activities would include the placement of log and /or boulder vanes, where access is feasible, to encourage sediment deposition and concentrate flow paths away from banks. Native vegetation would be planted at all proposed sites.</td>
</tr>
<tr>
<td>Criterion</td>
<td>Actions</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>stream restoration sites to improve riparian habitat diversity, stabilize stream banks, and increase channel shade</td>
</tr>
</tbody>
</table>

Notes:

a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b).

Watershed improvements are not proposed under alternative C (non-commercial funding alternative).
### Comparison of Alternatives

The comparison of alternatives focuses on objectives and issues that provided measurable elements to the proposed action and emphasized the most important environmental effects. These are elements of the ecosystem that can be measured to indicate an increase or decrease in trends in ecosystem health. To compare these elements, measurement indicators were developed to show the differences between the alternatives and provide a clear basis for the decision to be made by the Responsible Official. The measurement indicators are used in the analysis to quantify and describe how well the proposed action and alternatives meet the project objectives.

Table 13 provides a summary of effects for each alternative and Table 14 displays specific economic effects for each alternative.

#### Table 13. Summary of Effects for Each Alternative

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Measure</th>
<th>Alternative A Proposed Action</th>
<th>Alternative B No Action</th>
<th>Alternative C Non-Commercial Funding</th>
<th>Alternative D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and Hazardous Fuels</td>
<td>DFPZ Acres Treated</td>
<td>1,511 Acres</td>
<td>0 Acres</td>
<td>1,477 Acres</td>
<td>1,010 Acres</td>
</tr>
<tr>
<td></td>
<td>Prescribed Fire Acres</td>
<td>703 Acres</td>
<td>0 Acres</td>
<td>703 Acres</td>
<td>358 Acres</td>
</tr>
<tr>
<td></td>
<td>Predicted Flame Lengths (ft)</td>
<td>0.4 Feet</td>
<td>3.9 Feet</td>
<td>0.4 Feet</td>
<td>0.4 Feet</td>
</tr>
<tr>
<td></td>
<td>Potential Torching (% of stand)</td>
<td>0%</td>
<td>45%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Predicted Mortality (% basal area)</td>
<td>18%</td>
<td>51%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td>Total Surface Fuel Loading (Tons/Acre)</td>
<td>29 Tons</td>
<td>38 Tons</td>
<td>30 Tons</td>
<td>33 Tons</td>
</tr>
<tr>
<td>Forest Health</td>
<td>Post-Treatment Retention of Trees &gt; 20 inches DBH</td>
<td>All stands would retain on average 92% of trees &gt;20 inches DBH</td>
<td>All stands would retain 100% of trees &gt;20 inches DBH</td>
<td>All stands would retain 100% of trees &gt;20 inches DBH</td>
<td>All stands would retain on average 90% of trees &gt;20 inches DBH</td>
</tr>
<tr>
<td></td>
<td>% Reduction in Basal Area</td>
<td>20% reduction in basal area</td>
<td>0% reduction in basal area</td>
<td>4% reduction in basal area</td>
<td>24% reduction in basal area</td>
</tr>
<tr>
<td>Purpose</td>
<td>Measure</td>
<td>Alternative A Proposed Action</td>
<td>Alternative B No Action</td>
<td>Alternative C Non-Commercial Funding</td>
<td>Alternative D</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-------------------------------</td>
<td>-------------------------</td>
<td>-------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Relative Stand Densities = 25-40%</td>
<td>505 acres would meet desired conditions</td>
<td>23 acres would meet desired conditions</td>
<td>86 acres would meet desired conditions</td>
<td>439 acres would meet desired conditions</td>
<td></td>
</tr>
<tr>
<td>Post-Treatment % Stands with Increased Shade-Intolerant Species Composition</td>
<td>100% of stands would improve species comp</td>
<td>0% of stands would improve species comp</td>
<td>73% of stands would improve species comp</td>
<td>91% of stands would improve species comp</td>
<td></td>
</tr>
<tr>
<td>% Increase in Quadratic Mean Diameter (QMD) @ 30 years</td>
<td>QMD would increase by 41%</td>
<td>QMD would remain the same</td>
<td>QMD would increase by 48%</td>
<td>QMD would increase by 40%</td>
<td></td>
</tr>
<tr>
<td>Increase in Open Canopy Stands (&lt;40% Canopy Cover)</td>
<td>190 acres would convert to open canopy conditions</td>
<td>0 acres would convert to open canopy conditions</td>
<td>0 acres would convert to open canopy conditions</td>
<td>206 acres would convert to open canopy conditions</td>
<td></td>
</tr>
<tr>
<td>Radial Thinning</td>
<td>156 Acres</td>
<td>0 Acres</td>
<td>0 Acres</td>
<td>145 Acres</td>
<td></td>
</tr>
<tr>
<td>Wildlife</td>
<td>Change suitable habitat for old forest species (4M, 4D, 5M, 5D, 6) to unsuitable and reduce connectivity via DFPZ and GS (D only)</td>
<td>43 Acres (2% of treated acres, 1% of existing acres)</td>
<td>0 Acres</td>
<td>0 Acres</td>
<td>59 Acres (4% of treated acres, 1% of existing acres)</td>
</tr>
<tr>
<td>Aspen Restoration Treatments</td>
<td>12 Acres</td>
<td>0 Acres</td>
<td>3 Acres</td>
<td>9 Acres</td>
<td></td>
</tr>
<tr>
<td>Early Seral Wildlife Habitat Improvement</td>
<td>703 Acres</td>
<td>0 Acres</td>
<td>703 Acres</td>
<td>372 Acres</td>
<td></td>
</tr>
<tr>
<td>Acres treated to reduce potential habitat losses to High severity fire</td>
<td>1,511 Acres</td>
<td>0 Acres</td>
<td>1,477 Acres</td>
<td>1,010 Acres</td>
<td></td>
</tr>
</tbody>
</table>
### Table 14. Comparison of Economic Effects by Alternative

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Measure</th>
<th>Alternative A Proposed Action</th>
<th>Alternative B No Action</th>
<th>Alternative C Non-Commercial Funding</th>
<th>Alternative D Non-Commercial Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils and Hydrology</td>
<td>Watershed Cumulative Effects</td>
<td>Bucks Creek subwatershed — 70.7% of TOC</td>
<td>Bucks Creek subwatershed — 48.5% of TOC</td>
<td>Bucks Creek subwatershed — 68% of TOC</td>
<td>Bucks Creek subwatershed — 63.8% of TOC</td>
</tr>
<tr>
<td></td>
<td>Miles of stream habitat improved</td>
<td>0.28 Miles</td>
<td>0 Miles</td>
<td>0 Miles</td>
<td>0.28 Miles</td>
</tr>
<tr>
<td></td>
<td>Sawlog Volume</td>
<td>6,130 mbf</td>
<td>0 mbf</td>
<td>0 mbf</td>
<td>7,762 mbf</td>
</tr>
<tr>
<td></td>
<td>Value Combined Sawlog - Biomass Project</td>
<td>$505,000</td>
<td>$0</td>
<td>-$629,000</td>
<td>$837,505</td>
</tr>
<tr>
<td></td>
<td>Forest Health Improvement Project Costs</td>
<td>$1,081,000</td>
<td>$0</td>
<td>$1,000,000</td>
<td>$591,000</td>
</tr>
<tr>
<td></td>
<td>Potential Direct and Indirect Jobs</td>
<td>87</td>
<td>0</td>
<td>6</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>Potential Employee Income</td>
<td>$3,364,000</td>
<td>0</td>
<td>$472,000</td>
<td>$3,916,000</td>
</tr>
<tr>
<td>Economics</td>
<td>Project Benefits Visual Quality</td>
<td>Highest</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Recreation Visual Quality</td>
<td>Hazard Tree Abatement</td>
<td>Met</td>
<td>No Hazard Tree Removal</td>
<td>No Hazard Tree Removal</td>
<td>Met</td>
</tr>
</tbody>
</table>

### Table 14. Comparison of Economic Effects by Alternative

<table>
<thead>
<tr>
<th>Revenue/Cost Employment</th>
<th>Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative A</td>
</tr>
<tr>
<td>Sawlog Volume</td>
<td>6,130 mbf</td>
</tr>
<tr>
<td>Sawlog Value (typical logging/hauling cost)</td>
<td>$1,264,000</td>
</tr>
<tr>
<td>Sawlog Additional Operation Cost</td>
<td>$474,000</td>
</tr>
<tr>
<td>Sawlog Net Value</td>
<td>$791,000</td>
</tr>
<tr>
<td>Biomass Volume</td>
<td>7,000 tons</td>
</tr>
<tr>
<td></td>
<td>Project A</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Biomass Value</td>
<td>$146,000</td>
</tr>
<tr>
<td>Biomass Additional Operation Cost</td>
<td>$431,000</td>
</tr>
<tr>
<td>Biomass Net Cost</td>
<td>-$286,000</td>
</tr>
<tr>
<td>Sawlog and Biomass Value (typical logging/hauling cost included)</td>
<td>$1,410,000</td>
</tr>
<tr>
<td>Sawlog and Biomass Additional Operation Cost</td>
<td>$905,000</td>
</tr>
<tr>
<td>Value Combined Sawlog Biomass Project</td>
<td>$505,000</td>
</tr>
<tr>
<td>Percent above Value</td>
<td>36%</td>
</tr>
<tr>
<td>Potential Advertised Value to the Government</td>
<td>$82,600</td>
</tr>
<tr>
<td>Forest Health Improvement Project Costs</td>
<td>$1,081,000</td>
</tr>
<tr>
<td>Value After Forest Health Improvements</td>
<td>-$576,000</td>
</tr>
<tr>
<td>Potential Direct and Indirect Jobs</td>
<td>87</td>
</tr>
<tr>
<td>Potential Employee Income</td>
<td>$3,364,000</td>
</tr>
<tr>
<td>DFPZ Acres Protecting Bucks Lake Economy (Recreation Industry section of this EA)</td>
<td>1,511 acres</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

Affected environment sections have been divided by resource areas, where as environmental consequence sections have been divided by resource areas and then by alternative, where is some cases, action alternatives are grouped. Further, effects analyses that are required by law are discussed per alternative.

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or alternative. Together, these descriptions form the scientific and analytical basis for the comparison of effects in Chapter 2.

The following resource specialist analyses are incorporated by reference: Bucks Lake Hazardous Fuels Reduction Project Forest Vegetation Report (Alex Yiu)(USDA 2012a); Bucks Lake Hazardous Fuels Reduction Project Wildlife Biological Assessment/Biological Evaluation (Gretchen Jehle and Gary Rotta)(USDA 2012b); Management Indicator Species Report for the Bucks Lake Hazardous Fuels Reduction Project (Gretchen Jehle and Gary Rotta)(USDA 2012c); Bucks Lake Hazardous Fuels Reduction Project Supplemental Wildlife Report: Affected Environment and Environmental Consequences Neotropical Migratory Birds (Gary Rotta)(USDA 2012d); Bucks Lake Hazardous Fuels Reduction Project Watershed Report (Kelby Gardiner)(USDA 2012e); Bucks Lake Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (Michelle Coppoletta)(USDA 2012f); A Cultural Resource Inventory of the Bucks Lake Hazardous Fuels Reduction Project Area ARR# 02-12-2012 (Doug Baughman)(USDA 2012g).

Past, Present and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR §1508.7).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate
impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR §220.4(f)) (July 24, 2008), which state, in part:

“CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with
reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR §1508.7)"

In determining cumulative effects, the past, present, and future actions displayed in appendix F were added to the direct and indirect effects of the proposed action and alternatives.

Fire and Fuels

Introduction

The dry forest types of the Sierra Nevada are some of the most fire-prone and fire adapted ecosystems in the Nation. Fire has long been recognized as a natural and predictable disturbance and a major ecological process shaping forest structure and function in the Sierra Nevada (Fites-Kaufman et al. 2007, Franklin and Fites-Kaufman 1996, McKelvey et al. 1996). Past frequent fire reduced fuel loads and reduce stand densities particularly in smaller trees. As fire interacted with weather, topography and fuels, a rich mosaic of forest conditions were created (North et al. 2009).

Over the past century, historic management practices, combined with an aggressive fire suppression program, have altered fire regimes, forest structure and function. As with many other National Forests in the west, the Plumas National Forest is experiencing larger and more intense fires. This past decade, the Plumas experienced more fire than it has in recorded history with nearly 12% burned within the Plumas NF administrative boundary (Figure 1). Despite these recent increases in fire size, far fewer acres currently burn within a given time period than did prior to European settlement. With the past decade as a benchmark, this burned area represents less than 1/5 of what would be expected under past natural fire regimes. Consequently, the nature of current day fires has shifted toward larger patch sizes in high severity stand replacing fire (Collins and Stephens 2010). It is unclear if these trends and management strategies will continue. However, as climate change begins to exert more of an influence on these systems, these trends and management challenges may become exacerbated.
Environmental Assessment  Bucks Lake Hazardous Fuels Reduction Project

Figure 1. Bars show the cumulative, (acres may have burned more than once within a given time period), percent of the land burned within the Plumas National Forest administrative boundary, (including private lands), by decade. The solid line indicates the cumulative percent of land that would be expected to burn within a decade assuming pre European settlement mean fire return intervals within various Sierra Nevada vegetation types. Dashed line and arrows indicate the variation that could be expected assuming more frequent fire, (minimum fire return intervals), or less frequent fire, (maximum fire return intervals). The data used were generated from Safford 2011.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

National Fire Plan

In August 2000, the President directed the Secretaries of Agriculture and the Interior to develop a response to severe wildland fires, reduce fire impacts on rural communities, and assure sufficient firefighting capacity in the future. Funding provided for fuel management and reduction to address dense forest vegetation resulting from decades of wildfire suppression and fire exclusion on Federal lands. Activities focus on wildland-urban interface areas to reduce risk to people and property.

Healthy Forest Restoration Act

The Healthy Forest Restoration Act, (HFRA), focuses primarily on expedited hazardous-fuel treatment on National Forest System lands at risk of wildland fire and insect or disease epidemics. Projects that qualify include:
3. WUIs of at-risk communities
4. Municipal watersheds that are at risk from wildland fire
5. Areas where wind throw, blowdown, ice storm damage, or the existence or imminent risk of an insect or disease epidemic significantly threatens ecosystem components or resource values
6. Areas where wildland fire poses a threat to, and where the natural fire regimes are important for, threatened and endangered species or their habitat


General direction under fire and fuels includes managing fuels to reduce high risk hazard and/or to facilitate cost-efficient resource protection. Standards and Guidelines also include giving preference to fuel utilization. Where utilization will not be effective, employ broadcast burning or underburning, pile and burn, treatment, and/or fuel break system construction.


The desired condition as described in Alternative 2 of the HFQLG Final Environmental Impact Statement (USDA 1999a) is an “all-aged, multistory, fire-resistant forest,” of open forest stands dominated by large, fire tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Fuels and vegetation management activities include constructing a strategic system of defensible fuel profile zones (DFPZs), group selection, and individual tree selection.


Goals for fire and fuels management include reducing threats to communities and wildlife habitat from large, severe wildfires and re-introducing fire into fire-adapted ecosystems. Broad-scale goals include:

- treating fuels in a manner that significantly reduces wildland fire intensity and rate of spread, thereby contributing to more effective fire suppression and fewer acres burned;
- treating hazardous fuels in a cost-efficient manner to maximize program effectiveness; and
- actively restoring fire-adapted ecosystems by making demonstrated progress in moving acres out of unnaturally dense conditions (in other words, moving acres from condition class 2 or 3 to condition class 1).

The decision includes managing hazardous fuels in and around communities combined with strategic placement of fuels treatments across broad landscapes to modify wildland fire behavior. Goals for fuels treatments include:

- strategically placing treatment areas across landscapes to interrupt potential fire spread,
- removing sufficient material in treatment areas to cause a fire to burn at lower intensities and slower rates of spread compared to untreated areas, and
• considering cost-efficiency in designing treatments to maximize the number of acres that can be treated under a limited budget.

**Effects Analysis Methodology**

Effects to fuels and potential fire behavior were analyzed at the same geographic scale described in the watershed analysis for this project. This analysis area encompasses four subwatersheds, most of which are contained by the Bucks Creek HUC_6 watershed. Of the 10,675 acre watershed analysis area, 1,872 acres are surface water in the form of Bucks, Lower Bucks, and Thompson Lakes.

With respect to fire, these watersheds, as a group, are geographically bounded by high-elevation ridgelines that are sparsely vegetated in places. Because of this, most of the fires that have occurred in these watersheds have been managed at the watershed level or smaller. Ecologically, the dynamics between vegetation and fire and fuels are inherently linked; vegetation treatments (and absence thereof) have a profound effect on fuels accumulations and fire behavior, and conversely, fire has a profound effect on vegetation establishment and development.

The potential fire behavior and effects of alternatives were modeled pre treatment and post-treatment, with the latter reflecting treatments after completion. Fuel treatments are expected to remain effective for at least 10 years—this is based on experience with existing fuel treatments on the Mt. Hough Ranger District. Fuel treatments would likely require entry for burning and other maintenance prior to the 30-year horizon modeled for tree stand growth (USDA 2004a). Future maintenance activities are discussed in appendix F (Past, Present, and Reasonably Foreseeable Future Projects).

A Geographic Information System (GIS) was used to analyze fire history, fire regimes and Wildland Urban interface designations.

Field inventories were conducted to measure attributes of existing vegetation in the analysis area. Stands in the analysis area were inventoried using the Common Stand Exam protocols for the Pacific Southwest Region (U.S. Department of Agriculture [USDA] Forest Service Region 5). These stands are representative of the analysis area and the areas to be treated in all action alternatives. Data was collected on live and dead trees and fuel models. For analysis purposes, the stand data was loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development (Dixon 2002). The model was used to quantify existing stand conditions and to predict the effect of alternative treatments on potential fire behavior and fuels.

The effects of all alternatives were analyzed at the stand and landscape level using widely accepted models including Fire Family Plus, (Main et al. 1990), and the Fire and Fuels Extension of the Forest Vegetation Simulator, (Reinhardt and Crookston 2003). The output data reflects fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the common stand exam plots. These models are extensively described and documented in their accompanying user manuals.
Table 15. 90th percentile fire weather conditions calculated with Fire Family Plus 4.1 for the Quincy and Manzanita weather stations. Weather data used covered July 1 through September 31 for the past 10 years (2001 to 2010). In addition to the information below, an average temperature of 92°F and a Relative Humidity of 10% were calculated for these stations as a group.

<table>
<thead>
<tr>
<th>Station information</th>
<th>Fuel Moisture</th>
<th>20 foot Winds (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather Station</td>
<td>Station #</td>
<td>Elevation (feet)</td>
</tr>
<tr>
<td>Quincy</td>
<td>040910</td>
<td>3,652</td>
</tr>
<tr>
<td>Manzanita</td>
<td>040609</td>
<td>5,660</td>
</tr>
<tr>
<td>Average</td>
<td>4,656</td>
<td>2.22</td>
</tr>
</tbody>
</table>

### Potential Fire Behavior and Fuels

The measurement indicators for fuels and potential fire behavior and severity include; flame length, potential torching, crowning index, canopy base height, canopy density, percent basal area mortality, surface fuel loading. These indicators are described below:

**Flame Length**: The predicted length of flame measured in feet. Flame length is influenced in part by fuel type, fire type (surface or crown fire), and weather conditions. Together, flame length and fuel type influence the rates at which firelines can be safely and effectively constructed by different fire resources, including fire fighters, bull dozers, and aerially delivered fire retardant (Table 2). Increased flame lengths can increase the likelihood of crown fire and the amount of suppression resources (fire fighters, fire engines, and aircraft) needed to contain a wildfire. Flame lengths above 4 feet may present serious control problems—they are too dangerous to be directly contained by fire crews (Schlobohm and Brain 2002; Andrews and Rothermel 1982). Flame lengths over 8 feet are generally not controllable by ground-based equipment or aerial retardant and present serious control problems including ignition of multiple spot fires and uncontrollable crown fire activity. The 2004 SNFPA ROD provides direction that the desired condition for fuel treatments include flame lengths at the head of the fire less than 4 feet (USDA 2004b).

Table 16. Relationship between Flame Length and Potential Success of Active Suppression

<table>
<thead>
<tr>
<th>Flame Length</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4 feet</td>
<td>Fires can generally be attacked at the head or flanks by firefighters using hand tools. A hand line should hold the fire.</td>
</tr>
<tr>
<td>4 to 8 feet</td>
<td>Fires are too intense for direct attack at the head with hand tools. A hand line cannot be relied on to hold the fire. Bulldozers, engines, and retardant drops can be effective.</td>
</tr>
<tr>
<td>8 to 11 feet</td>
<td>Fire may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.</td>
</tr>
<tr>
<td>Greater than 11 feet</td>
<td>Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.</td>
</tr>
</tbody>
</table>

Source: NWCG 2004
Potential Torching: The potential probability of torching occurring under 90th percentile weather conditions as predicted by FFE. This is the probability of finding an area of the stand where torching can occur. A torching situation is generally defined as one where tree crowns of large trees can be ignited by a surface fire or flames from burning crowns of small trees that reach the larger trees. Probability of torching is the proportion of areas where trees are present and torching is possible (Rebain et al. 2010).

Crowning index: The open wind speed at which an active crown fire is possible, given the stand’s canopy bulk density and the fire weather conditions.

Canopy Base Height: Average height from the ground to the lowest level of the forest stand’s canopy. Represents the lowest height in a stand at which there is a sufficient amount of forest canopy fuel to propagate fire vertically into the canopy.

Canopy Bulk Density: The density of aerial fuels found within the canopy measured in Kg/m3 dry weight. As canopy density increases, crown dominated fire spread is more likely to occur.

Percent Basal Area Mortality: The potential tree mortality as measured by the percent of basal area that would be killed in a fire event occurring under 90th percentile weather conditions as predicted by FFE (Reinhardt and Crookston 2003, Rebain et al. 2010). “The probability of mortality is based on bark thickness and percent crown volume scorched, which are derived from scorch height, tree height, crown ratio, species, and tree diameter” (Carlton 2004). The mortality calculation uses established calculation methods (Reinhart et al. 1997).

Surface Fuel Loading: Weight of all dead and down surface fuels expressed in tons per acre.

Affected Environment

Fire Regimes and Condition Class

Prior to fire exclusion and intensive timber harvest of the early to mid-20th century, the relative frequent occurrence of fires generally contributed to open stands dominated by large-diameter fire-resistant trees with relatively low surface fuel loads with interspersed areas of young seral stands (Weatherspoon 1996). Prior to fire suppression policy, John Leiberg (1902), described the surface fuels in unharvested forests on the Plumas National Forest types as follows:

“There is no humus; the forest floor is bare, or at the most is covered with a layer of pine needles rarely exceeding 2 inches in depth, most commonly an inch or less.”

Given the spatial and temporal extent of past fires well documented in scientific literature (Taylor 2000; Moody and Stephens 2002; Skinner and Chang 1996), this type of surface fuel loading would have been much more common prior to fire exclusion than the ubiquitous high surface fuel loading found today. Overall, the historical vegetation structure, species composition, and surface fuels reflected, in part, past fire regimes as well as land management practices of both the Northern Maidu (Anderson 2005; Stewart 2003) and land uses of the thousands of settlers who moved to the Plumas County region after the gold rush (Young 2003).
This project and the analysis area are located in the upper-montane forest zone. In general, this vegetation type is characterized by the presence of true fir. Jeffrey pine is dominant on 394 acres within the analysis area however, this is represented by plantations. These plantations were established in the 1960s in the footprint of a large fire that occurred in 1926 in the north east corner of the analysis area. True fir is still the dominant vegetation type and true fir has also established a presence in the understory on many sites within the pine plantations. Conifer species in the upper-montane zone vary in their ability to survive fire. Red and white fir have thin bark when they are young, but their bark becomes thicker as they age allowing them to survive low intensity fires. Within the analysis area, Jeffrey pine is most adapted to frequent fire cycles followed by sugar pine, and white pine. Fire tolerant species are found in low numbers scattered throughout the project area and are an indicator that fire played a greater role in past forest structure and function. Because they are shade intolerant, these pine species are often found as old growth single trees or small groups of old growth trees that are unable to reproduce due to a thick understory of fir (Figure X). These shade intolerants were probably much more prevalent and abundant under past fire regimes particularly on south and southwest facing slopes.

Lodgepole pine is also present in the analysis area. Lodgepole pine has low fire survivability however many populations maintain serotinous or closed cones that open in response to fire in order to re-seed after stand replacing events. No serotinous lodgepole pine was found in this area indicating that stand replacing fire events may have played less of a role in lodgepole regeneration events.
Upper-montane forests usually receive a proportionally higher number of lightning strikes however, fewer fires tend to result (van Wagendonk 1994). This is because lightning in these higher elevation ecosystems is often accompanied with rain. Fire regimes tend to be more variable in frequency and severity with median fire-return interval estimates ranging from 12 to 69 years (Beaty and Taylor 2001, Bekker and Taylor 2001, Skinner and Chang 1996). Fires are usually of low intensity with occasional crown fires occurring during extreme fire weather conditions. Very similar to the vegetation types within this analysis area, Collins and Stephens, (2010), characterized recent fires in a long established natural fire regime in Yosemite National Park. They found that although stand replacing fire was not the dominant process operating within these systems, it was an important component of the fire regime accounting for about 15 percent of recently burned areas. They also found that fir dominated vegetation types tended to have larger stand replacing patches compared to pine dominated sites. In recent times, it has been found that fuel beds in these true fir forest types are among the heaviest and most compact found for conifers in the Sierra Nevada (van Wagendonk et al. 1998).
Safford et al., (2011), estimated pre-European settlement and contemporary fire return intervals for major vegetation types in California as part of a project with the USFS Pacific Southwest Region Ecology Program (Figure 3). These data were based on vegetation modeling, expert opinion and an extensive literature search of reconstructed fire histories. Fire histories are some of the most valuable data and are constructed utilizing tree ring fire scarring patterns observed in field collected samples. Using these data, comparisons can be made between pre-European settlement and contemporary fire return intervals. The majority of acres within the analysis area, (66 percent), are assigned a mean fire return interval of 15 years. Within the proposed action area, field observations of the evidence of past fire suggest that fire returns may have been less frequent than these data suggest. Also presented in Safford’s dataset are minimum and maximum fire return intervals that give us some estimate of the range of natural variability. Taking into account field observations in the proposed action area and the expected variability in fire return intervals, the majority of this area probably had return intervals ranging anywhere from 15 to 30 years.

Figure 3. Estimated pre-European settlement mean fire return intervals within the analysis area.
Only three fires have been recorded within the analysis area in the past 100 years totaling 2,641 acres (Table 3). To put this in perspective, we can assign numbers to vegetation types and the pre-settlement fire return intervals. When this is done, we could expect anywhere from 2,671 to 5,299 acres, (34 percent to 63 percent of the analysis area respectively), to burn within a given 10 year period assuming more conservative pre-settlement mean fire return interval estimates. This represents a large departure from pre-settlement fire return intervals for even the most conservative estimates. Overall, this equates to a current fire return interval of about 90 years. This means that on any given piece of ground, anywhere from three to nine fire cycles have been missed.

Table 17. Acres burned within the analysis area recorded in the past 100 years.

<table>
<thead>
<tr>
<th>Fire Name</th>
<th>Fire Year</th>
<th>Acres burned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un-named</td>
<td>1926</td>
<td>1,367</td>
</tr>
<tr>
<td>Un-named</td>
<td>1926</td>
<td>1,262</td>
</tr>
<tr>
<td>Bucks</td>
<td>1999</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,641</td>
</tr>
</tbody>
</table>

In addition to the impacts associated with fire suppression, past harvest activities were primarily focused on overstory removal and sanitation or salvage harvest. This has resulted in the reduction of large dominant and codominant fire resilient and shade intolerant overstory trees. Current stand conditions have shifted to smaller diameter intermediate and suppressed trees. In addition, a near absence of landscape level, low-intensity surface fires has contributed to increased stand densities in smaller diameter classes, particularly in shade-tolerant species (Skinner and Chang 1996).

**Wildland Urban Interface**

In addition to the unnatural fuel buildup developing in forests, wildland firefighting has become more complex, expensive, and dangerous due to dramatic increases in the population of the West. New housing development is occurring in fire-prone areas, often adjacent to Federal land, creating a Wildland Urban Interface (WUI). The wildland-urban interface is made up of areas where structures and other human development meet or intermingle with undeveloped wildland. The majority of this project falls within Urban Core, Wildland Urban Interface (WUI) or the Extended WUI as delineated by Plumas County in conjunction with the Plumas County Fire Safe Council in 2010 (Table 17).

Table 18. Number of WUI acres within the Proposed Action DFPZ units and within the overall analysis area.

<table>
<thead>
<tr>
<th></th>
<th>Urban Core</th>
<th>WUI</th>
<th>Extended WUI</th>
<th>Outside WUI</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DFPZ Units</td>
<td>425</td>
<td>348</td>
<td>714</td>
<td>23</td>
<td>1,511</td>
</tr>
<tr>
<td>Analysis area</td>
<td>1,368</td>
<td>2,715</td>
<td>3,018</td>
<td>240</td>
<td>7,341</td>
</tr>
</tbody>
</table>
The Fire Origins Layer contains fire records tracking the point of origin on fires starting as early as 1911. Thirty two fire starts were recorded from 1970 to 2009 within the analysis area (Figure 4). Extensive development of residential homes in the Wildland Urban Interface surrounding Bucks Lake poses a continued risk of human-caused ignitions throughout dry summer months. In addition, residences on private lands are also at risk to wildfires that may occur on adjacent NFS lands. Safe and effective fire management in this area will be critical for the protection of life and private property.

![Figure 4. Cause of fire starts in the analysis area recorded from 1970 to 2009.](image)

Environmental Consequences

**Comparison of Effects by Treatment**

In order to give a clear and concise comparison of alternatives, Table 18 displays the expected fire behavior and fuels impacts for all alternatives for the major classes of fuels treatments proposed. These treatments include mechanical thinning with no follow up prescribed fire, mechanical thinning with follow up prescribed fire, stand alone hand thinning and pile burning or chipping, prescribed fire only, grapple piling and burning, and mastication. Overall, alternatives compare a similar forest stand footprint. However, it is important to note acres do shift or are eliminated depending on the alternative, introducing some variation in results that are not entirely alternative dependent. For the sake of ease of comparison, the No Action Alternative uses the same footprint as the Proposed Action.
Table 19. Major categories of fuels treatments and average potential fire behavior under 90th percentile fire weather conditions for all alternatives.

<table>
<thead>
<tr>
<th>Prescription</th>
<th>Alternative</th>
<th>Flame Length (feet)</th>
<th>Potential Torch (feet)</th>
<th>Crowning Index (mph)</th>
<th>Canopy Base Height (feet)</th>
<th>Canopy Density (kg/m³)</th>
<th>Percent Basal Area Mortality</th>
<th>Surface Fuel Load (tons per acre)</th>
<th>Acres Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Thinning No Prescribed Fire</td>
<td>No Action</td>
<td>3.7</td>
<td>16</td>
<td>13</td>
<td>15</td>
<td>.230</td>
<td>33</td>
<td>43</td>
<td>370</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>0</td>
<td>20</td>
<td>24</td>
<td>.121</td>
<td>11</td>
<td>45</td>
<td>370</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>15</td>
<td>20</td>
<td>.193</td>
<td>14</td>
<td>46</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>0.4</td>
<td>0</td>
<td>19</td>
<td>24</td>
<td>.131</td>
<td>12</td>
<td>45</td>
<td>391</td>
</tr>
<tr>
<td>Mechanical Thinning with Prescribed Fire</td>
<td>No Action</td>
<td>3.0</td>
<td>36</td>
<td>16</td>
<td>5</td>
<td>.173</td>
<td>29</td>
<td>41</td>
<td>377</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>0</td>
<td>24</td>
<td>26</td>
<td>.099</td>
<td>10</td>
<td>21</td>
<td>377</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>24</td>
<td>17</td>
<td>.094</td>
<td>12</td>
<td>21</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>0.4</td>
<td>0</td>
<td>24</td>
<td>17</td>
<td>.099</td>
<td>10</td>
<td>21</td>
<td>256</td>
</tr>
<tr>
<td>Hand Thin Pile Burn</td>
<td>No Action</td>
<td>1.6</td>
<td>19</td>
<td>16</td>
<td>11</td>
<td>.177</td>
<td>23</td>
<td>42</td>
<td>422</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>0</td>
<td>17</td>
<td>14</td>
<td>.167</td>
<td>14</td>
<td>33</td>
<td>422</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>16</td>
<td>17</td>
<td>.182</td>
<td>14</td>
<td>33</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>0.4</td>
<td>0</td>
<td>20</td>
<td>9</td>
<td>.131</td>
<td>13</td>
<td>32</td>
<td>261</td>
</tr>
<tr>
<td>Prescribed Fire Only</td>
<td>No Action</td>
<td>2.7</td>
<td>82</td>
<td>17</td>
<td>4</td>
<td>.150</td>
<td>62</td>
<td>32</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>9</td>
<td>23</td>
<td>3</td>
<td>.111</td>
<td>39</td>
<td>21</td>
<td>222</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>23</td>
<td>4</td>
<td>.105</td>
<td>30</td>
<td>22</td>
<td>303</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Grapple Pile + Burn</td>
<td>No Action</td>
<td>5.0</td>
<td>45</td>
<td>15</td>
<td>5</td>
<td>.157</td>
<td>61</td>
<td>40</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>0</td>
<td>19</td>
<td>20</td>
<td>.144</td>
<td>19</td>
<td>18</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>19</td>
<td>20</td>
<td>.144</td>
<td>19</td>
<td>18</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Mastication</td>
<td>No Action</td>
<td>7.3</td>
<td>71</td>
<td>15</td>
<td>6</td>
<td>.160</td>
<td>96</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>0.4</td>
<td>0</td>
<td>19</td>
<td>9</td>
<td>.119</td>
<td>16</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>0.4</td>
<td>0</td>
<td>19</td>
<td>9</td>
<td>.119</td>
<td>16</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0</td>
</tr>
</tbody>
</table>

Mechanical Thinning with no Follow up Prescribed Fire Direct and Indirect Effects

These treatments generally included areas where fuels treatments are needed however, prescribed burning was not practical or feasible. The greatest number of acres would be treated under alternative D, (391 acres), followed by the Proposed Action, and Non Commercial, (370 and 282 respectively). All action alternatives demonstrate more moderate fire behavior post treatment. All
action alternatives show similar decreases in flame length, potential torching, and percent basal area mortality. The Non Commercial alternative would be less effective in preventing crowning and had slightly higher basal area mortality. This result can be largely explained by the 10 inch diameter limit and its impacts to post treatment fuels conditions. The Non Commercial alternative would also be less effective in raising crowns and reducing the canopy density, (Table 18), as compared to the Proposed Action and alternativeD. Resulting stands under the Non Commercial alternative had more ladder fuels and more aerial fuels available for consumption and this translates into increases in potential fire behavior and effects.

All action alternatives show a small increase in surface fuel loading resulting from thinning and whole tree yarding activities. These fuel loading increases were nominal in the range of 2 to 3 tons per acre and did not appear to strongly impact modeled fire behavior.

### Mechanical Thinning with Prescribed Fire Direct and Indirect Effects

Mechanical thinning followed by prescribed fire would be very effective in reducing fuel loads and mitigating wildfire hazards. This combination of treatments would be preferred as it offers some of the greatest benefits in terms of restoring stand structure and function, reducing fuel loading, and reintroducing fire as an ecological process. The greatest number of acres would be treated under the Proposed Action, (377 acres), followed by the Non Commercial alternative and alternative D, (270 and 256 respectively). All action alternatives demonstrate more moderate fire behavior post treatment (Table 18). All action alternatives show similar decreased fire behavior in terms of flame length, potential torching, crowning index and percent basal area mortality. Again, the Non Commercial alternative would result in slightly elevated basal area mortality for this treatment. Due to the 10 inch diameter limit, these stands would be left denser with greater canopy and ladder fuels triggering more tree mortality from torching.

All action alternatives demonstrated a 50% reduction in surface fuel loading for the mechanical thinning with prescribed fire treatment. Here, the benefits of prescribed fire as a follow up treatment are realized in terms of reducing fuels and potential fire behavior.

### Hand Thinning and Pile Burning Direct and Indirect Effects

Hand thinning piling and burning would be an effective fuels treatment however these treatments tend to be expensive and labor intensive. These treatments would be employed to protect high values at risk such as Wildland Urban Interface areas, and where all other treatment options were not feasible due to steep slopes or other complicating factors. The effects of pile burning treatments would be highly localized and would include scorch and subsequent mortality of individual trees adjacent to piles. The greatest number of acres would be treated under the Non Commercial, (500 acres), followed by the Proposed action and alternative D, (422 and 261 respectively). The prescription for hand thinning piling and burning would not change between alternatives and some of the predicted changes in fire behavior and fuels are the result of comparing different acres. Regardless, all action alternatives show similar decreased fire behavior
in terms of flame length, potential torching, crowning index and percent basal area mortality (Table 18). In addition, surface fuel loading also declines by about 20% in all action alternatives as a result of the piling existing dead and down.

**Prescribed Fire Only Direct and Indirect Effects**

Prescribed fire would be an effective and relatively inexpensive fuels treatment and opportunities were sought to strategically reintroduce fire as an ecological process. The greatest number of acres are proposed for treatment under the Non Commercial alternative, (302 acres), followed by the Proposed action, (222 acres). No stand alone prescribed fire acres are proposed for treatment in alternative D. There were no changes in the treatment type or fire weather conditions simulated between alternatives so changes in modeled fire behavior and fuels are again the result of comparing slightly different stands and acre footprints. Regardless, both the Proposed action and Non Commercial alternatives show similar decreased fire behavior in terms of flame length, potential torching, crowning index and percent basal area mortality (Table 18). In addition, surface fuel loading also decreases by about 1/3 in both alternatives.

**Grapple Piling and Burning Direct and Indirect Effects**

Grapple Piling and burning treatments were placed in areas with heavy ground fuel loads and where harvest equipment either could not access the area or the stands were currently meeting desired conditions in terms of overstory stand structure. Both the Proposed action and the Non Commercial alternatives propose this treatment type on the same acre footprint of 104 acres. This treatment also shows decreased fire behavior in terms of flame length, potential torching, crowning index and percent basal area mortality (Table 18). In addition, canopy density decreased slightly, base crown height increased by 15 feet and surface fuel loading decreased by about 50% post treatment.

**Mastication Direct and Indirect Effects**

Mastication treatments use hydraulic equipment to mulch shrubs, small trees, snags and dead and down material. Fire behavior would be modified as aerial ladder fuels and ground fuels are rearranged and compacted. Only 16 acres are proposed for treatment under both the Proposed Action and Non Commercial alternatives however, this treatment was unique enough to be analyzed separately. As would be expected, surface fuel loads increase by about 14% post treatment. In a wildfire situation, this may increase the heat resonance time on the ground producing mortality from root and root collar damage. However, other measures of fire intensity would likely decrease, such as rate of spread and flame length, providing better control for fire fighters. Modeling showed decreased fire behavior in terms of flame length, potential torching, crowning index and percent basal area mortality (Table 18). In fact, this small unit shows some of the largest changes in flame lengths going from 7.3 feet to 0.4 feet, and basal area mortality from 96% to 16% post treatment.
Comparison of Alternatives

Alternative A – Proposed Action Direct and Indirect Effects

The Proposed Action would best meet the desired conditions described in the Purpose and Need. The Proposed Action would have the greatest impact in terms of reducing hazardous fuels, protecting values at risk and reintroducing fire as an ecological process. Overall, the proposed action would treat the greatest number of DFPZ acres, 1,511 as compared to the Non Commercial alternative and alternative D, (1,475 acres and 908 acres respectively). The resulting landscape level fuels treatment would provide firefighters with safer locations to manage fire. This would be particularly important when multiple fires threaten the area, as was the case in 2008 with the Bucks Lightning complex that totaled 53,669 acres, and the Scotch Fire that totaled 13,008 acres in this same year. The Proposed Action would provide fire managers with more flexibility in their response to wildfire such as indirect attack to provide for firefighter safety. The Proposed action places a strong emphasis on treatments within the Wildland Urban Interface crucial to the protection of life, private property and other values at risk.

The Proposed action places a strong emphasis on restoring stand structure and reintroducing fire as a natural process where it is practicable to do so. This alternative would utilize the most effective methods in terms of reducing hazardous fuels and potential fire behavior. As demonstrated in this analysis, one of the most effective fuels treatments implement mechanical treatment followed by prescribed fire. This combination of treatments helps restore forest structure and effectively reduces ground and ladder fuel loads. The Proposed Action proposes the greatest number of acres of this treatment type totaling 481 acres when we include grapple piling treatments. Prescribed fire is proposed on 703 acres under this alternative. The reintroduction of fire into these fire prone and fire adapted ecosystems will be crucial in maintaining healthy, productive and diverse ecosystems. Patches of fire induced tree mortality would be expected, providing habitat for fire dependent species such as the black backed woodpecker.

B – No Action Direct and Indirect Effects

Surface, ladder, and canopy fuels would remain untreated under the no action alternative and as a result, potential fire behavior would remain unchanged. In addition, modeling shows that many of the hazardous fuels and potential fire behavior indicators worsen over time, (Table 5).

Table 20. Average potential fire behavior under 90th percentile fire weather conditions for the no action alternative for the years 2011 and 2022.

<table>
<thead>
<tr>
<th>Year</th>
<th>Flame Length (feet)</th>
<th>Potential Torching</th>
<th>Crowning Index (mph)</th>
<th>Canopy Base Height (feet)</th>
<th>Canopy Density (kg/m³)</th>
<th>Percent Basal Area Mortality</th>
<th>Surface Fuel Load (tons per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>3</td>
<td>29</td>
<td>14</td>
<td>11</td>
<td>.201</td>
<td>36</td>
<td>42</td>
</tr>
<tr>
<td>2022</td>
<td>6</td>
<td>22</td>
<td>12</td>
<td>9</td>
<td>.253</td>
<td>41</td>
<td>54</td>
</tr>
</tbody>
</table>

Currently, predicted flame length under 90th percentile fire weather conditions averages 3 feet within proposed treatment units. However, flame length would be expected to increase to 6
feet by the year 2022, assuming no fuels reduction treatments are implemented. Flame lengths above 4 feet may present serious control problems as they are too dangerous to be directly contained by fire crews. In addition, other measures of predicted fire behavior worsen over time, including percent basal area mortality and, to a lesser extent, crowning index, (the wind speed required to sustain active crowning). These predictions are largely based on worsening fuel conditions. Stands continue to be overcrowded and ladder fuels continue to increase as indicated by a decrease in the base canopy height from 11 feet in 2011 to 9 feet in 2022. In conjunction with the increase in ladder fuels is an increase in the amount of aerial fuels available for consumption as indicated by a 26% increase in canopy density. We also see surface fuel loading in dead and down material increasing by 12 tons per acre or 29% over the next decade. This is a result of high density stands continually adding to fuel pools as trees shed needles and branches, and snags are created through self thinning and other predicted mortality.

In addition to predicted fire behavior, torching and crowning events produce burning embers that can be blown to unburned areas outside the main fire adding to potential fire size and complexity. At the landscape level, increased spotting tends to increase erratic fire behavior, resulting in increased fire size and higher tree mortality, (Schroeder and Buck 1970). All these factors decrease the effectiveness of suppression operations, leading to a greater potential for large, high-severity fires. Complex fires of this nature have already occurred within and adjacent to the analysis area including the 1999 Bucks Fire (34,236 acres), and the 2000 Storrie Fire (56,075 acres).

Continued high densities of ground, ladder and canopy fuels and the associated increases in expected fire behavior would compromise fire management’s ability to safety manage fire in this area. As fire becomes more difficult to manage, other major negative effects may result including increased suppression intensity and cost. For example, more resource damage and cost would be incurred with construction of dozer lines as opposed to hand lines. In addition, more intensive management would require higher rehabilitation costs after the fire is out. Reducing the risk of high intensity wildfire will be critically important for public safety in the heavily utilized recreation area at Bucks Lake and its’ associated wildland urban interface. In addition, these fire management challenges would likely be exacerbated over time.

Alternative C – Non Commercial Direct and Indirect Effects

The Non Commercial alternative attempts to achieve solely fuels reduction treatments elements of the purpose and need with a 10 inch DBH limit. The Non Commercial alternative would treat slightly less DFPZ acres than the Proposed Action, (1,475 and 1,511 respectively). This alternative performed equally well for hand thinning and pile burning, prescribed fire only, grapple piling, and mastication as no prescription changes occur among alternatives. Differing effects come to light for this alternative when analyzing mechanical treatments where the major influencing factor would be the 10 inch diameter limit. For mechanical fuels treatments, the Non Commercial Alternative performed relatively well for some post treatment fire behavior and fuels
outputs such as flame length, potential crowning, and residual surface fuel loading. However, this alternative was less effective in increasing wind speeds required to support crowning, reducing basal area mortality after wildfire, increasing canopy base height, and reducing canopy density (Table 18). The 10 inch diameter limit in the Non Commercial alternative tended to leave stands denser and more susceptible to fire induced mortality. In addition, the 10 inch diameter limit would also limit the ability to influence species composition in favor of shade intolerant and fire resilient species. Pockets of sugar pine, Jeffrey pine and western white pine provide for much needed diversity within this landscape and are at risk of disappearing. As described in Figure 2, despite excellent seed crops from relic old growth trees, natural regeneration of these shade intolerants is not occurring, jeopardizing the persistence of these unique locally adapted gene pools.

**Alternative D – Direct and Indirect Effects**

This alternative would attempt to both increase the value of harvested timber and decrease the cost of implementation. The largest difference for this alternative is the number of acres affected by fuels reduction and fire restoration treatments. In this alternative DFPZ acres decrease by 501 acres from 1,511 to 1010 acres as compared to the Proposed Action. More costly treatments oriented toward forest restoration and the reintroducing fire as an ecological process would be dropped including, stand alone prescribed fire, grapple piling and burning, and mastication. The largest reductions in acres are in Prescribed fire which would be reduced by 345 acres from 703 to 258 acres as compared to the Proposed Action.

Overall, alternative D performs equally well to the Proposed action in all aspects of fire and fuels post treatment indicators modeled when compared on an acre to acre basis (Table 18). The shifting of stand treatments did create some variation in residual canopy base height for both mechanical thinning with prescribed fire and hand thinning and piling treatments however this impact was negligible. Group selections embedded into DFPZ treatment units account for 34 acres. Group selections would provide some short term benefit to fire control in terms of creating forest canopy gaps. Longer term, the early seral forest conditions that would develop in these gaps may not be conducive to fire control; however they would hardly be noticeable within the larger landscape.

Alternative D also has a large amount of hazard tree drop and leave (70 acres). This may increase fuel loads along roads where there is increased risk of human caused ignitions. This risk is difficult to quantify as the number of hazard trees is unknown.

This alternative does maintain more expensive treatments such as hand thinning piling and burning or chipping in the most crucial Wildland Urban Interface areas around Bucks Lake. In doing so, this alternative meets the essential purpose and need of reducing fuels and fire hazards in order to protect life and private property. However, overall alternative D would be less comprehensive and less effective as a landscape fuels treatment with about a 1/3 reduction in DFPZ acres treated as compared to the Proposed Action. In the long term, this alternative would
provide fewer options for fire managers during a wildfire event and may be less effective overall in providing for firefighter safety as compared to the Proposed action and to a less degree, the Non Commercial alternatives.

**Cumulative Effects Common to All Action Alternatives**

The cumulative effects of past management practices, fire exclusion, and high-mortality fires (as detailed in appendix F) have largely shaped the forest that exists in the analysis area today. These factors have influenced vast areas of the Sierra Nevada mountain range and are well documented in the scientific literature. These past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. Changes in vegetation structure as a result of recent fires and past projects since the baseline data were collected have been incorporated into the Bucks Lake Project’s existing conditions.

On National Forest System lands and private lands, past harvest activities focused on selection and sanitation harvests resulting in overstory removal of dominant and codominant trees, and retention of midstory and understory trees. These harvest systems often used lop and scatter techniques for limb wood and tree tops. These practices resulted in promoting closed-canopy, high-density stands of small trees with relatively high fuel loads. Many of these stands continue to be conducive to high-mortality fire today.

Since the mid to late 1990’s, commercial and non-commercial thinning from below, with and without prescribed fire, has been the principal silvicultural treatment implemented on NFS and private lands in the analysis area. This silvicultural treatment has been used to establish several fuel treatments on NFS and private lands both within and adjacent to the analysis area. These treated areas currently meet desired conditions in terms of potential fire behavior and tree mortality.

One of the strongest cumulative effects in the analysis is a series of private land thinning and fuels reduction projects concentrated around Bucks Lake communities. Together these projects total about 564 acres with implementation beginning in 2007. These projects were primarily designed to protect the Wiland Urban Interface around Bucks Lake communities and spatially mesh well with proposed USFS treatment units. Although these projects were planned separately, together they will provide a more comprehensive landscape Defensible Fuel Profile Zone.

Larger hazardous fuels reduction projects occurring on National Forest System lands are largely outside of this analysis area but include the Waters DFPZ project, and Meadow Valley DFPZ project. In addition, the On Top project is currently under development on the Feather River Ranger District.

**Cumulative Effects of Alternative B –No Action**

Alternative B would not meet the purpose and need as discussed in Chapter 1. Alternative B would not reduce hazardous fuel accumulations and potential fire behavior would remain unchanged. Overall, the existing forest and landscape structure and predicted fire behavior for
this alternative could lead to a greater potential for large, high-severity fires in forested areas. The No Action alternative would not improve firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events. Alternative B would not provide continuity between existing and future fuel treatments, thereby decreasing their overall effectiveness at the landscape level.

As discussed above, one of the greatest additive cumulative impacts has been the exclusion of low intensity fire in Sierra Nevada fire prone and fire adapted ecosystems. The No Action alternative would cumulatively add to and exacerbate the ecological problems associated with missed fire cycles and altered fire regimes. The no action alternative would allow stands to continue to develop under the influence of the legacy of past management practices and fire suppression.

**Air Quality**

**Introduction**

This section will address the Clean Air Act, ambient air quality standards, and potential impacts of this project. The major focus will be on particulate matter generated when forest fuels are burned.

**Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction**

The Clean Air Act of 1970, as amended in 1977 and 1990, is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes the Environmental Protection Agency to establish National Ambient Air Quality Standards to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Many aspects of the implementation, monitoring and enforcement of the Clean Air Act are delegated to the States. In this area, the Northern Sierra Air Management District regulates Forest Service burning operations and has the final say on setting burning parameters. The District is required by state law to achieve and maintain federal and state Ambient Air Quality Standards, which are air quality standards set at levels that will protect the public health.

**Analysis Methodology**

Air pollution is regulated by two types of standards: emission standards and ambient air quality standards. Emission standards are the levels of air pollutants a source is allowed to release into the air. Ambient air quality standards are levels of air pollutants that if exceeded are considered unhealthy to breathe. If there have been no violations of an ambient air quality standard, an area is said to be in attainment. If there have been violations of a standard, the state or federal government designates the area as being in nonattainment for that pollutant. A list of Federal and California State air quality standards can be found at
http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. A wide variety of standards are designated for such pollutants as ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, sulfates, hydrogen sulfide, vinyl chloride and particulate matter. One of the most important measures of air pollution, and most relevant to this project, is particulate matter. Particulate matter pollution consists of very small particles floating in the air. Of greatest concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. These particles are less 1/7th the thickness of a human hair and are divided into two size classes for air quality standards and monitoring; particles that are less than 10 microns in diameter, (PM10), and those that are less than 2.5 microns in diameter, (PM2.5). These standard measures for air quality are important due to their impact to public health and the environment.

For compliance to air quality standards in California, PM10 must not exceed 20 μg/m³ (micrograms per cubic meter of air), averaged over an annual year and must not exceed 50 μg/m³ averaged over a 24 hour period (Table 1). In addition, PM2.5 must not exceed 12 μg/m³ averaged over an annual year and must not exceed 35 μg/m³ averaged over a 24 hour period.

Table 21. Relevant California and National ambient air quality standards measured in μg/m³ (micrograms per cubic meter of air).

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Time</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM10</td>
<td>24 Hour mean</td>
<td>50 μg/m³</td>
</tr>
<tr>
<td></td>
<td>Annual arithmetic mean</td>
<td>20 μg/m³</td>
</tr>
<tr>
<td>PM2.5</td>
<td>24 Hours</td>
<td>35 μg/m³</td>
</tr>
<tr>
<td></td>
<td>Annual arithmetic mean</td>
<td>12 μg/m³</td>
</tr>
</tbody>
</table>

The Forest Vegetation Simulator (FVS) was used to estimate tons of particulate matter expected to be released into the atmosphere for each relevant treatment by alternative. As discussed in greater detail below, tons of particulates produced provides a relative measure of potential impacts. However, the most important dilution factors of air volume and time of exposure are difficult to quantify as they are entirely dependent on weather conditions. Thus, the relative measures provided here in tons of particulates produced per acre are not direct measures of air quality standards which are measured in terms of density, (micrograms per cubic meter of air), and duration of exposure (24 hour, and annual arithmetic mean standards). Direct impacts to air quality standards are difficult to predict as there are far too many variables to be accounted for (Joe Fish 2012 personal communication). As a substitute, the Northern Sierra Air Management District recommends analyzing emissions in the context of smoke management and targeted weather conditions that provide for mixing, dispersion and transport of particulates such that air quality standards are met.

Affected Environment

According to the Northern Sierra Air Quality Management District, (2006), the town of Quincy had difficulties meeting ambient air quality standards in the late 1980 and early 1990s for PM10
and PM2.5 particulates. However, twelve years of monitoring data has shown dramatic improvements in air quality and this trend is expected to continue. Quincy consistently meets standards for PM2.5 particulates. Within the past 10 years, the PM10 annual arithmetic mean standard of 20 μg/m³ has been met about every other year and on average only 2 days out of the year exceed the 24 hour standard of 50 μg/m³. Overall, in their latest report in 2006, the Northern Sierra Air Quality Management District considered Quincy to be an air quality success story.

Twelve communities are within 20 miles of the Bucks Lake project and are listed in Table 2. Major sources of particulates in the analysis area are thought to be largely locally generated and include woodstoves, open burning, and dust from traffic and wind. In addition, wildfires and agricultural burning in the Sacramento valley are also thought to be major contributors. In particular, woodstove smoke and strong wintertime inversions have had a major impact on particulate monitoring stations in Quincy. As more efficient and EPA compliant stoves replace older models, improvements in air quality have been noticeable. Smoke from local and more distant USFS prescribed fires are also suspected as a contributor to periodic spikes in particulates.

Table 22. Communities within the vicinity of the Bucks Lake project area.

<table>
<thead>
<tr>
<th>Community</th>
<th>Distance (miles)</th>
<th>Bearing (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucks</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Meadow Valley</td>
<td>6</td>
<td>060</td>
</tr>
<tr>
<td>Belden</td>
<td>10</td>
<td>330</td>
</tr>
<tr>
<td>Quincy</td>
<td>13</td>
<td>070</td>
</tr>
<tr>
<td>Twain</td>
<td>13</td>
<td>040</td>
</tr>
<tr>
<td>Caribou</td>
<td>14</td>
<td>005</td>
</tr>
<tr>
<td>East Quincy</td>
<td>15</td>
<td>070</td>
</tr>
<tr>
<td>Keddie</td>
<td>15</td>
<td>050</td>
</tr>
<tr>
<td>Paxton</td>
<td>15</td>
<td>040</td>
</tr>
<tr>
<td>La Porte</td>
<td>16</td>
<td>140</td>
</tr>
<tr>
<td>Indian Falls</td>
<td>17</td>
<td>040</td>
</tr>
<tr>
<td>Seneca</td>
<td>17</td>
<td>010</td>
</tr>
</tbody>
</table>

Environmental Consequences
Comparison of Alternatives Direct and Indirect Effects

As mentioned above, the overriding measure of potential impacts in terms of air quality relate to the production of particulates in the PM2.5 and PM10 classes as forest fuels are burned. Particulates in tons per acre expected to be released into the atmosphere for each relevant treatment and alternative are shown in tables 3 and 4 below.

Table 23. Tons of particulates produced for relevant treatments in each alternative.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Alternative</th>
<th>PM2.5 average tons per acre</th>
<th>PM10 average tons per acre</th>
<th>Acres</th>
<th>PM2.5 Total emissions (tons)</th>
<th>PM10 Total emissions (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Thinning with Prescribed Fire</td>
<td>No Action</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Proposed Action</td>
<td>.217</td>
<td>.256</td>
<td>377</td>
<td>82</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Non Commercial</td>
<td>.217</td>
<td>.256</td>
<td>270</td>
<td>59</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Alternative D</td>
<td>.221</td>
<td>.261</td>
<td>256</td>
<td>57</td>
<td>67</td>
</tr>
<tr>
<td>Alternative</td>
<td>PM2.5 Total Emissions (tons)</td>
<td>PM10 Total Emissions (tons)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Action</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Action (Simulated Wildfire)</td>
<td>483</td>
<td>574</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Action</td>
<td>195</td>
<td>229</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Commercial</td>
<td>202</td>
<td>238</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative D</td>
<td>85</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overall, the Non Commercial alternative would produce the greatest amount of particulates and is closely followed by the Proposed Action (Table 4). A large reduction in particulates, (about 43 percent), would be expected under alternative D as compared to both the Proposed Action and Non Commercial alternatives. This is the direct result of reductions in acres treated with prescribed fire and pile burning.

For the sake of comparison, a wildfire under extreme fire weather conditions was simulated on all the stands within the DFPZ totaling 1,511 acres (Table 5). This would represent a very small wildfire which is very plausible given the fire history within and adjacent to the analysis area.

Table 24. Total particulate emissions (tons) by alternative.
All burning would be completed under approved smoke management plans which set the number of acres or piles that can be burned over time and weather parameters under which burning can occur. These smoke management plans describe Northern Sierra Air Quality Management District regulations for burning activities in terms of smoke management, provide a detailed implementation schedule, and describe monitoring and reporting requirements. One of the most important factors determining burn days would be weather conditions and predicted impacts to air quality. Burn days would be dependent on current and predicted weather condition and take into account such factors as wind direction and the dispersion characteristics in the atmosphere. Some degree of atmospheric instability is required to ensure appropriate mixing dispersal and transport of particulates. Smoke direction and dispersal would be continually monitored during burning operations and ignition would be halted if poor conditions develop.

It is also important to note that not all units designated for fire use would receive burning treatments. All mechanically treated units would be evaluated to determine post treatment surface fuel loads. Units meeting desired conditions may not be burned, thereby decreasing total burned acres and emissions. In addition prescribed burning units were generally created larger than what would actually burn in order to provide ample holding opportunities.

Implementation of underburning and pile burning would occur over five to seven years as weather conditions and resource availability permit. During burning activities, smoke would likely be visible from many of the communities listed in Table 2. Due to the control over acres burned and ignition times to favor good smoke dispersion, it is not anticipated that underburning and pile burning activities would substantially impact the local communities under any action alternative. In addition, dust emissions from logging traffic would be spread out during the mechanical treatment implementation period of approximately five years. In addition, dust would be mitigated by road watering and other standard management practices described in contract specifications.

**No Action Alternative Direct and Indirect Effects**

Forest fuel accumulations will eventually burn in these dry forest types where decomposition by fungi and bacteria are unable to keep pace with the production of biomass through photosynthesis. Under the No Action alternative, no controlled burning would occur and particulate emissions would be produced under future wildfire scenarios where virtually no control can be exerted in terms of managing for air quality. This reality is supported by recent fire events such as the Moonlight fire of 2007 and the Canyon Complex and Rich Fires of 2008 in which smoke impacted communities in and around the analysis area for weeks to months at a time. In contrast, emissions from controlled broadcast burning or pile burning on Forest Service system lands are managed on a day to day or even hour by hour basis. In addition, implementation of fuel treatments in the Bucks Lake Project could reduce emissions from future wildfires by reducing their ultimate size and/or intensity.

As mentioned above, for the sake of comparison a wildfire was simulated on all stands within the Proposed Action DFPZ totaling 1,511 acres (Table 5). This would represent a small wildfire
as compared to some of the historic fires near the analysis area including the 1999 Bucks Fire, (34,236 acres), the 2008 Scotch Fire, (13,008 acres), and the 2008 Bucks Lightning Complex, (53,669 acres). Despite the small size of the wildfire simulated on these DFPZ acres, particulates generated increase by about 140 percent as compared to the Proposed Action or Non Commercial alternatives (the two alternatives with the highest emissions). This is largely due to increased fire intensity. When placed in the context of impacts to air quality standards from wildfire, impacts to under controlled ignition scenarios are negligible.

**Table 25. Wildfire simulated under extreme fire weather conditions for all acres within the Proposed Action DFPZ.**

<table>
<thead>
<tr>
<th>No Action Alternative</th>
<th>PM2.5 average tons per acre</th>
<th>PM10 average tons per acre</th>
<th>All DFPZ Acres</th>
<th>PM2.5 Total emissions (tons)</th>
<th>PM10 Total emissions (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulated Wildfire (Extremen Fire Weather)</td>
<td>.32</td>
<td>.38</td>
<td>1,511</td>
<td>483</td>
<td>574</td>
</tr>
</tbody>
</table>

**Cumulative Effects of Action Alternatives**

Other planned projects that include burning in the area include the American Valley project and the Meadow Valley project. In addition, the On Top project is currently being planned on the adjacent Feather River Ranger District. An extremely important point to make when addressing cumulative impacts and prescribed burning is that additional “shelf stock” in acres available for burning does not necessarily translate into more acres burned on an annual basis. Prescribed burning windows of opportunity are largely dependent on fuel conditions and atmospheric smoke dispersion characteristics as described above. In addition, burning resources such as skilled and qualified personnel, fire engines, equipment and crews are also limited. Taking these limitations into account, the Forest Service has been implementing treatments at or near our capacity (Table 5). Action alternatives in this project may provide some expanded seasonal and geographical opportunities. However, due to the limiting factors mentioned above, additional planned acres would not incrementally add to cumulative impacts to air quality. In addition, annual smoke production from burning activities would result in particulate matter emissions less than the threshold of 100 tons per year for a general conformity analysis.

**Table 26. Acres of under burning and pile burning from 2007 to 2011 accomplished for the Mt Hough Ranger District.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Under burn acres</th>
<th>Pile burn acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>153</td>
<td>55</td>
</tr>
<tr>
<td>2008</td>
<td>332</td>
<td>275</td>
</tr>
<tr>
<td>2009</td>
<td>134</td>
<td>1,487</td>
</tr>
<tr>
<td>2010</td>
<td>292</td>
<td>417</td>
</tr>
<tr>
<td>2011</td>
<td>373</td>
<td>1,249</td>
</tr>
</tbody>
</table>

In recent years the Forest Service has started to consider climate change and how it may impact forest management. Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time
periods, indeed as long as forests exist, they will continue to absorb carbon. Complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives. However, based on climate change science, the relative effects of these treatments on the ecosystem carbon cycle are recognized. The positive long-term effects on the carbon cycle of proposed fuel reduction treatments are a good example of this. Given the anticipated increase in large wildfires in California (Calif. Climate Action Team 2009), the action alternatives propose beneficial fuel reduction treatments which could contribute to reducing or limiting emissions, size, and intensity of potential future wildfires.

**Recreation and Scenic Resources**

**Introduction**

The Bucks Project is located within the Bucks Lake Recreation Area. The recreation analysis includes the effects of this project on recreationalists, the facilities and the roads within the Recreation Area. Forest Service developed recreation sites within the project area includes five campgrounds, a boat ramp and picnic area, two day use swimming/picnic areas, an information kiosk/picnic site, two recreation residence tracts (Bucks and Haskins) with a total of 122 homes, Bucks Lake Lodge resort and three trails (Pacific Crest Trail, Bucks Lake Loop and Mill Creek Trail). At Lower Bucks Lake there is a small campground, a day use area and two organizational camps under special use permits. The Bucks Lake Wilderness is adjacent to a treatment unit, but no activity is within the wilderness. There is also approximately 1080 acres of private land ownership, including a resort and store. PG&E owns a campground, marina, lodge, cabins and recreation residences. The private land, including PG&E land is within the project area boundary but not within treatment units. The short and long term effects as well as benefits are included in the analysis.

Most of the project is under the LRMP prescriptions of visual retention (the area visible from the lake and the roads around the lake). Visual retention requires the maintenance of a natural-appearing landscape where management and other activities are generally not evident to the casual forest visitor. Areas just beyond the visual retention zone are classified as visual partial retention where activities must remain visually subordinate to the characteristic landscape.

**Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction**

The Bucks Lake Hazardous Fuels Reduction Project is designed to fulfill the management direction specified in the PNF LRMP, as amended.

The Bucks Lake Recreation Area is a special area designation that is identified in the LRMP. Areas with this designation are directed to specifically follow Rx-5 Recreation Area Prescription. The purpose of this prescription is to provide attractive, well-maintained landscapes around the major reservoirs and within other areas of major recreation use. The general direction is to control...
dispersed recreation, including camping, overflow area occupancy, and fuelwood and 
miscellaneous Forest products removal consistent with the Recreation Opportunity Spectrum 
(ROS) Class and the Visual Quality Objective (VQO). The ROS for this area is “Roaded 
Natural”. Vehicle use is restricted and off road use is prohibited. General direction in the LRMP is to maintain a high VQO.

All developed sites are directed to also follow Rx – 6 Developed Recreation Site Prescription. The purpose of this prescription is to provide convenient recreation facilities for the public and to preserve or improve the surrounding Forest. Both these prescriptions allow for timber harvest that maintains a generally continuous forest cover, maintains or enhances recreation values and maintains a healthy forest cover. The proposed hazard tree removal, hazardous fuels reduction and thinning from below of over stocked stands meets the criteria established in the LRMP.

The Pacific Crest Trail (PCT) runs through two units and is adjacent to one other unit. Direction for management of the PCT is given in the Pacific Crest Trail Management Plan for the Plumas National Forest. This document will be used to address vegetation management activities along the trail. Forest-wide direction for timber production in the foreground sets a goal to maintain the optimum sustained yield in the foreground as viewed from the Trail and maintain a pleasing visual resource by maintaining diversity in age and species. The Big Creek section (from Bucks Summit to Lookout Rock) of the PCT is the main portion within the project area. This section is an Experience Level 4 which states, land management activities and land users are an obvious part of the scene. The Spanish Peak section covers a small portion of the Trail within the project area, as it travels from the Bucks Summit toward Spanish Peak. This section is a level 3 which states, land management activities are readily observable. Both these Recreation Experience levels allow for timber harvest as well as fire management.

Effects Analysis Methodology

The Recreation Opportunity Spectrum (ROS) is a system used to divide the Forest into recreational opportunity areas based on area size, distance from roads, and degree of development. Existing and potential recreation activities are identified within each category to guide future management. Categories range from “primitive” to “urban”. The ROS class will be used to analyze the effects of this project. Three ROS classifications that apply to this project area are Roaded Natural (RN), Rural (R) and Semi-Primitive Non Motorized (SPNM)

The Visual Management System was developed to provide a process for the management of the “seen” aspects of both the land and the activities which occur on it. The synthesis of this information is used to determine Visual Quality Objectives (VQO) for managing Forest lands. This direction is in the LRMP and will be used to analyze the effects of this project.

Geographic and Temporal Bounds

The analysis area for recreation and visual quality is the project area including the southern portion of the Bucks Lake Wilderness. The project area is larger than the Bucks Lake Recreation
Area; therefore all developed recreation sites will be included within the project area. The rationale for the boundary including the southern portion of the wilderness is that the effects of noise, traffic, smoke and scenic values could be seen and heard across the lake, impacting portions of the wilderness.

In the analysis of the Proposed Action, current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of man including the lake, all the facilities and the use levels. These were incorporated in the analysis for the existing environment. The timeframe that these cumulative effects would impact recreation is during the project and for a few years beyond its completion. During the actual project implementation there will be disturbance from logging, including actual site closures and follow-up burning. Visual effects may linger for several years as effects from activities such as skid trails, thinning, burn piles and charring from under burning may remain visible.

**Analysis Methodology**

Camping use numbers are from the campground concessionaire’s use and revenue reports. These numbers are relatively accurate because they are tracked regularly. The numbers used for the day use facilities are from the Forest Service Meaningful Measures and INFRA information. These numbers are estimates from visual observations when site visits are made. The Persons at one time (PAOT) equals 5 persons for a camping unit and 3.5 for a parking space. PAOT’s are used to identify capacity and use for each developed recreation site. Use numbers for organization camps and resorts are reported by the permittee to the Forest Service. The Plumas National Forest LMRP gives general direction on managing the recreation areas. Other information comes from the professional judgment of the District recreation staff.

**Affected Environment**

The Bucks Lake Recreation Area is a major recreation destination on the Plumas National Forest. The lake and its facilities are very popular with recreation visitors and local residents. Bucks Lake is a reservoir which was formed in 1925 with the Bucks Creek Hydroelectric Project. The lake is well known throughout California for its excellent fishing and boating opportunities. The recreation area is about 5,500 acres. Developed overnight facilities include five Forest Service campgrounds with 65 family campsites and three group campsites. Developed day use sites include a boat ramp/picnic area, an information kiosk/picnic site and two swimming areas. The six campgrounds and two day use sites are operated and maintained by a concessionaire under a special use permit (this includes Lower Bucks). There are two recreation residence tracts (Bucks and Haskins) with a total of 122 homes under special use permit. The Bucks Lake Lodge Resort special use permit includes a restaurant/store (currently being constructed), 12 unit motel and 11 cabins. At Lower Bucks Lake there is a 7 unit semi-developed campground, a day use area and two organizational camps under special use permit. The Bucks Lake Wilderness borders the northeast side of Bucks Lake, 200 feet above high water. There are a number of non- motorized
trails within the project area. There is approximately 1080 acres of private land ownership. PG&E owns about one-third of the shoreline around the lake and has a campground, marina, lodge, cabins and recreation residences. The remaining balance of private land is mostly divided within four formal subdivisions. Summer recreational opportunities include camping, boating, water skiing, fishing, swimming, hiking, biking, horseback riding, pleasure driving, wildlife watching, hunting and picnicking. During the winter Bucks Lake is also used by recreationalists. It is identified as a winter snowmobile area, with staging areas at Bucks Summit and Big Creek Road. There are 106 miles of groomed and marked trails associated with the entire system. Most major roads (approximately 30 miles) within the Bucks project are part of this system. Recreation opportunities include snowmobiling, ice fishing, cross country skiing, ice skating, and snow play. Some Resort facilities do stay open through the winter, allowing for overnight use. There are two annual group events sponsored by the Bucks Lake Snowdrifters; a snowmobile poker run in February and a play day in March.

Developed sites within treatment units include: Whitehorse Campground, Sundew Campground, Mill Creek Campground, Grizzly Creek Campground, Hutchins Group Campground, Bucks Kiosk, two swimming areas, Bucks Recreation Residence Tract, Haskins Recreation Residence Tract, Bucks Lake Lodge, Lower Bucks Lake Campground and Day Use Area, Timber wolf organization camp and Church of Jesus Christ of Latter Day Saints (LDS) organization camp. Three trails, the Pacific Crest Trail, the Bucks Lake Loop trail and a small segment of the Mill Creek Trail are within treatment units. There are two short unnamed lake access trails associated with the day use sites.

Whitehorse Campground is a 20 unit fee campground, with water, 2 vault toilet buildings, and paved interior roads and spurs with barriers. Each campsite has a fire grill and picnic table. Depending on snow and demand this campground is open from Memorial Day to Labor Day. This campground has low use because it is not located on the lake and is used mostly when other campgrounds are full. In 2010 and 2011 it was open in July, August and September with an average occupancy of 9 percent serving an average of 408 people annually.

Sundew Campground is a 23 unit fee campground, with water, 2 vault toilet buildings, and paved interior roads and spurs with barriers. Each campsite has a fire grill, bear proof food storage box and picnic table. Depending on snow this campground is open from Memorial Day to October. This campground has high use and is one of the most popular on the lake. In 2010 and 2011 it was open in June, July, August and September with an average occupancy of 55 percent serving an average of 4195 people annually.

Mill Creek Campground is a 11 unit fee campground, with water, 1 vault toilet building, and paved interior roads and spurs with barriers. Each campsite has a fire grill, bear proof food storage box and picnic table. Depending on snow this campground is open from Memorial Day to October. In 2011 this campground was left open without fees until snow closes it. This campground has high use and is one of the most popular on the lake. In 2010 and 2011 it was
open in June, July, August and September with an average occupancy of 72 percent serving an average of 2868 people annually.

Grizzly Creek Campground is an 11 unit fee campground, with 2 vault toilet buildings, and paved interior roads and spurs with barriers. Each campsite has a fire grill and picnic table. Depending on snow this campground is open from Memorial Day to October; however there is no gate so it’s available until snow prevents access. This campground is popular with hunters in the fall but otherwise receives low use because it is not on the lake. In 2010 and 2011 it was open in June, July, August and September with an average occupancy of 9 percent serving an average of 461 people annually.

Hutchins Group Campground has 3 units for 25 people each. This fee campground has water, one vault toilet building, and paved interior roads and spurs with barriers. Each campsite has a fire grill, bear proof food storage box and picnic tables. This campground is by reservation only and is open from Memorial Day to Labor Day. In 2010 and 2011 it was open in June, July, August and September with an average occupancy of 60 percent serving an average of 2667 people annually.

Bucks Kiosk is a day use site with two vault toilets, picnic tables, interpretive display and paved parking. It has a capacity of 21 PAOT’s. Use at this site is relatively low.

West End Cove Picnic/Swimming Area has a vault toilet building and picnic tables. An accessible path leads to the toilet building. A native surface trail is developed from the road to the lake. The capacity is 21 PAOT’s, however use at this site is very high during the summer and exceeds this amount regularly. The facilities at this site are owned and operated by PG&E.

Indian Rocks Picnic/Swimming Area has a vault toilet building and picnic tables. An accessible path leads to the toilet building. A native surface trail is developed from the road to the lake. The capacity is 25 PAOT’s, however use at this site is very high during the summer, especially weekends and exceeds this amount regularly. The facilities at this site are owned and operated by PG&E.

Bucks and Haskins Recreation Residence tracts have 122 homes combined. No vegetation treatment activities will take place within the individual permitted lots. To reduce hazardous fuels the areas around the permitted lots will be non-commercially thinned.

The Bucks Lake Lodge Resort permit includes a restaurant/store, 11 rental cabins and a 12 unit hotel on 8.4 acres. In 2010 the lodge restaurant and store were completely destroyed in a fire. The lodge is currently being rebuilt, but visitor use has been dramatically reduced by this disaster. It is unknown what the use levels will be once the facility is in full operation. Treatment activity will occur within the permitted boundary if needed but there will be a 150 foot buffer around facilities and utilities.

Lower Bucks Lake Campground and Day Use Area has 7 fee camp sites and one free day use area. The campsites each have a picnic table and fire ring/grill. The day use site has a vault toilet. In 2010 and 2011 the campsites were open in June, July, August and September with an average occupancy of 55 percent serving an average of 1288 people annually. This site has no gates so it’s
available until snow prevents access. The only vegetation management activity is hazardous tree removal within 150 feet of the 24N24 road.

Camp Timberwolf organization camp is a Boy Scout camp and the permit covers 3.1 acres. This camp serves approximately 600 people annually. The only vegetation management activity is hazardous tree removal within 150 feet of the 24N24 road.

The LDS organization camp is a girl’s church camp and the permit covers 10.75 acres. This camp serves approximately 700 people annually. The only vegetation management activity is hazardous tree removal within 150 feet of the 24N34 road.

The Pacific Crest Trail (PCT), a National Scenic Trail, is a continuous trail from Mexico to Canada. The PCT travels through treatment units 88 and 71 and is adjacent to unit 87. Less than 1 mile is within or adjacent to treatment units. Treatments include: mechanical thinning with whole tree removal and prescribed fire (units 88 and 87) and hand thinning, piling and burning (unit 71).

Bucks Creek Loop Trail is 4.3 miles and approximately 3.5 miles is within or adjacent to treatment units. The trail travels through units 88, 100, 91, 106, 108, 109, 959, 955, and borders unit 107. Treatments include: mechanical thinning with whole tree removal (units 88, 91, 108); hand thinning, piling and burning (units 100, 106, 109); grapple pile and burn (unit 955) and prescribed burning (units 88, 959, 107). Heavy maintenance of the Bucks Creek Loop has been funded through the American Recovery and Reinvestment Act of 2009. In the past two years this trail has had extensive heavy maintenance accomplished, including rerouting sections, building turnpike through wet areas, installing a log stringer bridge and adding numerous new signs. Annual logging out, brushing, maintaining water bars or other erosion control devices has also occurred.

The Mill Creek Trail access starts at the north end of the Mill Creek Campground. A short segment is within unit number 118.

Table 27. Recreation Developed Sites and Trails Within Treatment Units

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Unit Number(s)</th>
<th>Unit Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Horse Campground</td>
<td>Unit 108</td>
<td>8.7</td>
</tr>
<tr>
<td>Sundew Campground</td>
<td>Unit 102</td>
<td>12.9</td>
</tr>
<tr>
<td>Mill Creek Campground</td>
<td>Unit 118</td>
<td>6.7</td>
</tr>
<tr>
<td>Grizzly Creek Campground</td>
<td>Unit 94</td>
<td>7.4</td>
</tr>
<tr>
<td>Hutchins Group Campground</td>
<td>Units 76 &amp; 77</td>
<td>1.6 &amp; 3.6</td>
</tr>
<tr>
<td>Bucks Kiosk Information/picnic</td>
<td>Unit 96</td>
<td>7.8</td>
</tr>
<tr>
<td>West End Cove Picnic/swimming</td>
<td>Unit 20</td>
<td>43.3</td>
</tr>
<tr>
<td>Indian Rocks Picnic/swimming</td>
<td>Unit 20</td>
<td>43.3</td>
</tr>
<tr>
<td>Bucks Recreation Residence Tract</td>
<td>Unit 20</td>
<td>43.3</td>
</tr>
<tr>
<td>Haskins Recreation Residence Tract</td>
<td>Unit 112</td>
<td>98.6</td>
</tr>
</tbody>
</table>
### Insect and Disease within Campgrounds

Management objectives for all campgrounds include the protection and enhancement of native vegetation that will provide screening and shade for campsites and reduce the number of hazard trees. A Forest Health Protection Plant Pathologist and Entomologist conducted a field evaluation of the Bucks Lake Campgrounds in August 2011. The following was observed at Whitehorse and Grizzly Creek Campgrounds, pockets of heterobasidion root disease (*Heterobasidion occidentale*), conks of red ring rot (*Phellinus pini*), lodgepole pine dwarf mistletoe (*Arceuthobium americanum*), and a small amount of white fir dwarf mistletoe (*Arceuthobium americanum*).

Management recommendations included thinning the stand to an appropriate stocking level and the removal of large trees with crown decline (thin foliage, low crown ratio, heavy dwarf mistletoe infection, dead top, etc.). True firs growing next to identified heterobasidion root disease pockets should also be considered for removal if crowns appear rounded at the top (a sign of stagnated growth). All lodgepole pine with *Phellinus pini* conks should be carefully inspected for decay and most likely removed, especially trees with greater than five conks.

Mill Creek and Sundew Campgrounds are located within an old Jeffrey pine plantation. A few white fir, sugar pine, lodgepole pine and quaking aspen are also present in and around campsites. Density is variable with some over stocked pockets. Jeffrey pine beetle group kills, *Elytroderma* disease (*Elytroderma deformans*), and white pine blister rust (*Cronartium ribicola*) were observed in both these campgrounds. Management recommendations included:

- thinning pine plantations within campgrounds to the appropriate stocking levels;
- stocking levels can be varied to meet other objectives such as shading, screening, and aesthetics as long as the majority of the stands are thinned;
- all green infested Jeffrey pines should be cut and removed from the area before beetle emergence next summer;
- remove heavily infected *Elytroderma* diseased trees if more suitable leave trees are available;
• any sugar pine with a blister rust infection on the bole should be removed due to a high probability of being attacked by mountain pine beetle.

Hutchins Group Campground has a mixed conifer stand comprised of mostly red and white fir in both the over and understory. Lodgepole, sugar and Jeffrey pine are all present in the overstory but regeneration is limited in most areas. Throughout Hutchins Campground, Heterobasidion root disease (*Heterobasidion occidentale*) is prevalent in true fir. Nearly all red fir are showing symptoms of crown decline, especially older trees, due to multiple factors including root disease, heavy red fir dwarf mistletoe (*Arceuthobium abietinum* f. sp.* Magnifica*) and cytospora (*Cytospora abietis*) infections. These diseased trees are being attacked by fir engraver beetles (*Scolytus ventralis*) and wood borers (Families: Cerambycidae and Buprestidae). Management recommendations are to:

• thin the stand to the appropriate density for the site and remove diseased or dead trees;

• treatments should favor Jeffrey and sugar pine for retention as they are not host to *H. occidentale*;

• the presence of root disease throughout the campground may necessitate the removal of all large old true fir that show symptoms of crown decline;

• younger healthy true fir with low levels of dwarf mistletoe (mostly white fir) can be retained if they exhibit vigorous growth (Cluck/Woodruff 2011).

**Hazard Tree Abatement**

There are approximately 16 miles (within 552 acres) of National Forest System (NFS) and Plumas County roads and within the following developed recreation sites: Grizzly Creek Campground (CG), Hutchins Group CG, Mill Creek CG, Sundew CG, White Horse CG, Lower Bucks Family CG, Lower Bucks fishing day use site, the Indian Rock day use area, Bucks Lake Overlook, and the Bucks kiosk. Hazard trees along main roads within the Bucks Lake and Haskins Creek Recreation Residence Tracts that are outside of permitted lots would also be considered for removal. All hazard trees removed will meet the Plumas National Forest Roadside/Facility Hazard Tree Guidelines and Identification Criteria (2008). In areas with sensitive resources or where removal is not feasible, hazard trees would be felled but not removed.

Individuals are at risk from dead and dying trees located along roads, because they deteriorate, become unstable, and eventually fall. Falling trees may hit individuals, their cars or may block roads causing access concerns. In addition to roadside hazards, dead trees pose hazards to hikers,

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3 Permit holders are responsible for inspecting their permitted areas, authorized rights-of-ways, and adjoining areas for dangerous trees, hanging limbs, or other hazardous conditions that could pose a risk to facilities or public safety. After obtaining written approval, the holder is also responsible for removing identified hazards at the holder’s expense.
loggers, slash crews, and workers conducting future burning on both National Forest System and private lands.

**Environmental Consequences**

The three action alternatives have similar effects on recreation, with some variations. The Bucks Lake Recreation area has two ROS classes:

- **Rooded Natural** - sights and sounds of man are moderate. Mostly natural appearing as viewed from sensitive roads and trails. Access travel is conventional motorized;
- **Rural** – Sights and sounds of man are evident. Natural environment is culturally modified, yet attractive. Access and travel facilities are for individual intensive motorized use.

Both these classifications allow for resource modification and utilization practices being evident, therefore these ROS classification would not be effected.

The Pacific Crest Trail Management Plan for the Plumas National Forest, Big Creek section sets the following criteria associated with this type of project:

- **Goals** – Coordinate timber harvesting with recreation use along the trail;
- **Policies** – Accept a “modification” VQO for the areas viewed from this segment.

The Spanish Peak section travels north from Bucks Summit on an old four wheel drive road for the first 2 miles. The PCT is adjacent to a unit for a short distance. Along this segment the following criteria are associated with this type of project:

- **Goals** – provide a scenic and easy Trail readily available for the person looking for an easy day hike;
- **Policies** – Encourage vegetation measures to re-vegetate the abandoned road.

**Alternative A The Proposed Action – Direct and Indirect Effects**

**Developed and Dispersed Recreation**

The proposed action would have an overall beneficial effect on recreation by reducing hazard trees, reducing hazardous fuels and improving forest health. The recreation area around Bucks Lake invites the public to stop and enjoy the area. This heavy visitor presence along roads and recreation sites increases the potential risk of hazard trees. To minimize the risks, hazard trees would be identified and removed before they fail. This is especially important in campgrounds where known root disease pockets exist. Along 16 miles of roads the vast majority of trees with structural defects, likely to cause failure in all or part or the tree that could hit the road prism, would be removed. Risks from falling snags would remain within the general forest, where dispersed recreation may occur. There is a short-term risk to loggers and crews from hazard trees that are currently unstable. Danger to the public from falling snags would be reduced along roads and within campgrounds. The Bucks Lake Recreation Area is restricted from cutting firewood for personal or commercial use because of safety and other concerns in this highly populated area.
However this has contributed to the presence of hazard trees and accumulation of fuels. The removal of hazard trees would provide a safer environment for suppression resources to access the areas within the Bucks Project area and prevent any further loss of stands in an event of a wildfire.

The reduction of hazardous fuels in over stocked stands, as well as on the ground, would reduce the risk of wildfire. This would have a beneficial indirect effect on recreation opportunities by helping to maintain and preserve the landscape of existing recreation sites and areas. Due to the high recreational development of this area, protecting the infrastructure, including hundreds of homes, from wildfire is especially important. In the past there have been little or no fuels and timber treatments (except hazard tree removal) within campgrounds, creating overstocked and decadent stands. Improving forest health by thinning these stands will help insure that the valuable trees within campgrounds remain vigorous. By managing the timber stand, leave trees can be chosen to provide appropriate spacing for privacy and shade, instead of losing random large groups of trees to insect and disease. When hazard tree removal and thinning occurs in developed recreation sites, borax is applied to all stumps greater than 3 inches, to prevent the spread of fungi spores. This is done to protect the high value residual trees, as well as to minimize the development of additional hazard trees. This application occurs within twenty four hours of creating the stump. The campgrounds and other developed sites would be closed during the logging so the potential for unintended human contact with the borax is extremely limited. The toxicity of borate compounds has been extensively studied in both humans and laboratory animals and presents very little risk, therefore public health and safety would be protected. (Keddie Ridge hazardous Fuels Reduction Project, Environmental Impact Statement, Human Health Risk Assessment)(SERA 2006)

There will be short term negative direct and indirect impacts from the actual logging and burning associated with this project. This project could start as early as 2012 and the duration is usually 3 to 5 years depending on contractual agreements. Campgrounds, day use sites and trails would have to be temporarily closed during the actual logging activities. Road closures during roadside hazard tree removal would be necessary for safety. All closures would be minimized as much as possible to reduce impacts. Individuals may be displaced by the logging activities closures. Advanced placement of signs informing visitors of closures would help reduce the impact.

There would be a short term risk of vehicle accidents under the action alternative due to an increased presence of heavy equipment and logging trucks on National Forest System roads. The number of log trucks, crew vehicles, and individual cars and trucks would increase during the next 3 to 5 years to accomplish the work required under the action alternatives. This increase would affect safety on the forest roads within the project area as well as Plumas County roads. Numerous log truck loads per day would be hauling from the Bucks Project and the risk of collision is greatest where trucks are entering or exiting the roadways. However the Forest Service requires safety signing as part of the administration of timber sale contracts, which would alert
the public of potential traffic safety hazards. Heavy equipment and logging trucks can create additional noise, traffic and dust, which could have a temporary effect on visitor’s opportunity for an enjoyable and peaceful recreation experience. The noise would probably be loud enough to carry outside the project area across the lake to the Wilderness. The timing of these activities would affect the level of impact. Although this is a year round recreation area, the main season starts Memorial Day weekend (snow permitting) and continues through Labor Day weekend. July and August are the most popular months at the lake; weekends are popular throughout the summer. To reduce impacts to the visitors, units that require road closures during operations, such as hazard trees along roads, would not be logged on weekends from Memorial Day weekend through Labor Day weekend, unless there is an emergency. Units 20, 112 and 115 are located adjacent to the Recreation residences and the Bucks Lake Lodge; no weekend logging would occur from Memorial Day weekend through Labor Day weekend. In the campgrounds, logging in October would have the least impact to users.

Part of this project is to burn slash piles and use prescribed fire, creating smoke. The smoke from burning would affect the air quality in the Recreation Area and the southern end of the Wilderness. To minimize these effects burning would occur either before July or after Labor Day and during June it would not be on weekends unless favorable winds were going to move the smoke away from the Recreation Area.

Motorized trails and temporary roads would be used to access and remove trees. The 8M56 trail is open to all vehicles and would be improved with this project. The trail would be widened and stream crossings would be brought up to standard. This would change the experience of riding this trail from a rough one to a more developed one. This may degrade the experience for some users but would provide an opportunity for more vehicles to drive it. Comments received from the public expressed interest in having temporary roads analyzed for potential recreation opportunities. Two non-system roads identified by the public near the Bucks Lake Lodge would not be subsoiled or re-contoured and would remain accessible for non-motorized use. One road heads southwest from the lodge and ends at a landing for a total length of 0.2 miles; the second road starts near the Timberline lodge and heads south by southeast towards Haskins Valley. All other temporary roads constructed for this project would be decommissioned.

The trails within treatment units are the PCT, the Bucks Lake Loop, a short segment of the Mill Creek Trail and two unnamed trails leading from the road to the lake at the day use sites. The Mill Creek Trail along the northeast side of the lake is out of the project area but is right on the edge of the lake and within the larger affected area.

The PCT travels through treatment units 88 and 71 and is adjacent to unit 87. Unit 88 is a mechanical thin unit and the PCT would have to be crossed to access the entire unit. The PCT is an important national and regional trail. Through hikers (those traveling the entire trail or large sections, south to north) usually hike through this area from mid July to mid August. It is important not to have active logging in the treatment units directly impacting the trail during this time. The section of trail that goes through the two units does not offer any attractions and
therefore receives little use from day hikers. The segment adjacent to unit 87 is on an old four
wheel drive road and is popular with day hikers because it leads into the Wilderness and to
Spanish Peak. To accommodate hikers reroutes or traffic control will need to be established. This
will help limit impacts during trail closures. Unit 88 is an overstocked, Jeffrey pine plantation.
The thinning of this unnatural landscape would have long term benefits to the recreation
experience and visual quality along the trail. This project would create a more open stand with
healthier trees, which encourages natural regeneration of diverse species and reduces the potential
for catastrophic fire. Monitoring using photo points would capture the impacts and benefits of
mitigation measures. Other mitigations associated with the PCT are:

- A 70 foot buffer along the trail to reduce visual impacts would allow hand felling of trees
  up to 8 inches. All trees would be felled away from the trail and those within reach would
  be removed with a feller buncher from 70 feet away from the trail. Only one skid trail
  would cross the trail at the specified location, in the natural opening.
- Re-contouring/smoothing, lop and scatter of slash, de-compacting soil, and replanting
  native vegetation, along the skid trail where it crosses the PCT,
- All other skid trails will be 100 feet from the trail and landings will be placed so they are
  not visible,
- Any impacted trail tread will be rebuilt.

The Bucks Creek Loop Trail would be closed during logging to protect hikers; this would be a
temporary effect on hiking opportunities. This trail has recently had over $50,000 invested in it
for salaries and supplies, as well as volunteer labor, to bring it up to standard. To reduce the
effects of this project, this investment needs to be protected during implementation of this project,
including existing structures (turnpikes, bridges and signs). Skidding on the trail would be totally
avoided and skids crossing the trail would be limited. The trail would be rehabilitated at skid
crossings after the logging has occurred. During prescribed burning all structures would be
avoided.

The Bucks Lake Wilderness has a Semi-Primitive Non-Motorized (SPNM) ROS
classification. SPNM allows for “a predominately unmodified natural environment of a size and
location that provides a good to moderate opportunity for isolation from sights and sounds of
man. The area is typically 2,500 acres or more and at least half a mile from motorized use.” The
Wilderness boundary is less than half a mile from the Bucks Lake road on the southeastern side
by Bucks Summit and on the west boundary by Mill Creek Campground. Since motor boats are
allowed on the lake, the boundary is less than half a mile from motorized boat noise. There could
be additional noise associated with logging but this would be temporary and not substantially
more than what is already occurring from vehicle traffic and boats. Therefore the negative effects
would be very limited because not hearing motorized equipment on this southern side of the
Wilderness is not an expectation.

The Mill Creek Trail segment along the lake has similar effects as the Wilderness. When
walking along this trail the sound of motor boats is prevalent already. Therefore the negative
effects of additional noise from logging would be very limited. The segment of the Mill Creek Trail that is in unit 118 is very small and it would be closed during the logging of the Mill Creek Campground. Trail crossings would be limited, with re-contouring to fix any damaged trail tread.

**Visual Quality**

The Plumas Land and Resource management Plan (LRMP) provides the following direction for visual quality. The Visual Quality Objective (VQO) for Bucks Lake is Retention and the LRMP general direction for this objective is to maintain pleasing visual corridors. Standards and Guidelines state that the Rx-10 Visual Retention Prescription applies to the Bucks Lake and Bucks Lake Road. The Rx-10 and Rx-14 (Visual Partial Retention Prescription) apply to the remainder of the area.

The Rx-10 Visual Retention prescription standard and guidelines under visual resources are to provide a natural-appearing landscape where management and other activities are generally not evident to the casual forest visitor. Under timber resources this prescription’s general direction is to obtain scheduled timber yields through longer rotations and smaller openings, or uneven-age systems that meet a VQO of Retention. The types of treatments proposed along the paved roads and lake include commercial thinning, non-commercial thinning and hazard tree removal. There would be short term effects from logging and burning to visual quality but these would be minimized by providing landing and skid trail layout that has a buffer and moves material away from the Bucks Lake road. Evidence of landings and skid trails would be evident from visual corridors along other paved roads. Recreation comments from the public specifically identified landings be located off of paved roads, with a buffer so they are not visible. The long term effects would be beneficial, providing a healthy forest that is well managed, wildfire resistant, and meets the Retention VQO.

The Rx-14 Visual Partial Retention Prescription in the LRMP provides for a natural–appearing landscape by assuring that management activities remain visually subordinate to the natural landscape. Such areas are generally seen as middleground and background from major recreation areas and are of primary or secondary visual importance. No management activities are prohibited in these areas. The timber general direction for this prescription is to obtain scheduled timber yields thru longer rotations and smaller openings, or uneven-age systems, that meet the VQO of Partial Retention.

The report, *Social Science to Improve Fuels Management: A Synthesis of Research on Aesthetics and Fuels Management* is one of several publications to gather information relevant to public attitudes and beliefs about the aesthetic impacts of fuels treatments. A review of the research on forest aesthetics shows considerable consensus about what the public considers to be a scenic forest. Several conclusions from the forest aesthetic research apply to fuels management.

- **Large mature trees** are an important part of scenic beauty and should be retained in forest thinning projects.
- **Forests with more open structure** that allow visual access through the understory are considered more scenic than forest with extremely dense understory vegetation.

- **The amount of tree thinning** that can occur without significant impacts to scenic beauty varies by forest type and topographic area. Large clear cuts are considered to have a negative affect on scenic beauty in almost all forest types. However, researchers have found that partial clearing of up to 50 percent of trees in a dispersed pattern may be visually acceptable in moderately sensitive areas, especially if large trees are preserved.

- **Downed wood** from timber harvesting and tree thinning is considered ugly and has a negative impact on scenic beauty. Removing dead wood or chipping onsite can greatly increase scenic ratings for tree thinning projects.

- **Low-intensity prescribed fire** can actually improve scenic beauty, but may have short-term negative visual impacts, such as dead wood and scorched trunks.” (Jakes/ Barro, General Technical Report NC-261)

The types of treatments proposed in this alternative would be consistent with the above conclusions and would benefit visual quality in the long term. Stands of trees would be thinned leaving an attractive and well maintained landscape. Healthy large trees would be retained. Within the campgrounds there would be whole tree yarding and chipping. The potential for wildfire would be reduced protecting scenic values. Under burning could cause short-term negative effects on visual quality, especially along travel corridors, however these would disappear after a few years.

**Alternative A The Proposed Action – Cumulative Effects**

In the analysis cumulative effects of past actions, the proposed action, and current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of man including the lake, all the facilities, and the use levels. There are two present projects in the Recreation Area. One is to install septic tanks and leach fields at the host sites at Hutchins Group Campground, Whitehorse Campground and Sandy Point day use. A holding tank would be installed at Mill Creek Campground. Each site has had percolation test completed and are now undergoing pizometer tests. If locations pass the pizometer test, a categorical exclusion would be completed for this project. The other action is replacing existing fire rings with new ones at Whitehorse Campground. Since the fire rings will go in the same location as the old ones, this is simply part of normal maintenance and improvements of campground infrastructure and does not require environmental analysis. All these projects have very limited impacts. Holes would be dug for the septic tanks and leach fields, this would have ground disturbance at host sites, but overall these projects would not affect other campers. They potentially could benefit visitors because with these added amenities better quality hosts are attracted to the job. This may ultimately improve the recreation experience for campers. Campers
would directly benefit from new fire rings because the current ones are falling into disrepair. Other foreseeable actions include installing composting toilets at the boat-in campsites. The actual proposals for this project has not been developed to analyze effects. If this project were to move forward it would benefit the visiting public and the resources by providing proper sanitation for the boat in campsites. Prior to implementation this project would be analyzed, including cumulative effects.

Under alternative A the roads targeted for hazard abatement would remain open, allowing recreation, road maintenance, and other project implementation activities to continue as well as access needed by recreation residents, private land owners, and other agency activities. On-going recreation includes camping, snowmobiling, hiking, fishing, motorized travel, and other general recreational activities.

Since roadside hazard tree abatement is limited to 150 to 200 feet on either side of the road, the effects are localized and restricted to roadsides. This estimate represents the maximum and furthest extent of measurable effects on forest vegetation that would occur as a result of implementing hazard tree abatement. Hazard tree removal, thinning for forest health and the reduction of fuels would benefit safety and visual quality in the Recreation Area. In summary, the alternative A would have a positive cumulative effect on the ability to maintain roads, facilities and preserve recreation opportunities within the Bucks Project area.

**Alternative C Non-Commercial Funding – Direct and Indirect Effects**

**Developed and Dispersed Recreation**

The non-commercial alternative only includes the fuels reduction portion of the unit treatments. This does not include hazard tree removal or forest health stand improvement. This alternative would be beneficial to reduce the threat of wild fire but would not offer the other benefits of hazard tree removal and forest health. Hazard trees have been identified along roads and within developed recreation sites. Removal of these trees is important for the safety of the public as they recreate at the lake. Many of the recreation sites have serious insect and disease concerns, as identified in the Forest Health Protection report. Not addressing these concerns will allow the insects and disease to infest more trees. This could create future safety hazards as well as loss of valuable trees in campgrounds. Alternative C does not meet all the purpose and needs identified for this project. All other direct and indirect effects would be similar to the alternative A, the Proposed Action.

**Visual Quality**

The type of activity proposed is limited and likely to have minimal affect on visual quality. Landing and skid trail layout is designed to move material away from the visual sensitive Bucks Lake road. Along other paved roads there would be piling and burning that may be evident from the visual corridor. Conclusion from the Forest aesthetics research as it relates to fuels management suggest that forests with more open structure that allow visual access through the
understory are considered more scenic than forest with extremely dense understory vegetation. Although some understory thinning would occur, no trees over 10 inches would be removed. In many of the stands this may not create a more open structure.

**Alternative C Non-Commercial Funding – Cumulative Effects**

Under alternative C no hazard tree abatement would occur. Safety along roads and within campgrounds would not be improved. Roads may be temporarily closed if trees failed and blocked the road. Access needed by the recreating public, recreation residents, private land owners, and other agency activities might be negatively impacted by these closures. Campground forest health would only be minimally improved, causing continued larger tree mortality. Disease and insects often cause trees to die in groups, creating openings that may not be desirable for shade and privacy in campgrounds.

This alternative offers fewer benefits to the public because it does not include hazard tree abatement and offers only minimal forest health improvement. Other cumulative effects are the same as in the proposed action.

**Alternative D – Direct and Indirect Effects**

**Developed and Dispersed Recreation**

Alternative D is similar to the Proposed Alternative except for the addition of group selection treatments into some units, a lower residual crown cover and drop and leave of hazard trees rather than removing them, in 141 acres. The units directly associated with recreation sites have the same residual crown cover and do not have any group selection. Therefore the direct and indirect effects for these treatments would be the same as alternative A the Proposed Action. In Alternative D dropping hazard trees and then leaving them on the ground occurs in 112.5 acres within the Bucks Lake Recreation Area. Most of these locations are on steeper ground along paved and dirt roads. This may create a safety issue if some of the trees have the potential to roll into the roads. Large logs left between the road and Bucks Lake and Lower Bucks Lake may impede access by the public from the road to the lakes.

**Visual Quality**

The effects of Alternative D would be the same as the Proposed Action except for the addition of group selection treatments and hazard trees being left on the ground. The location of these group selections were placed so that they would not be seen from the main road corridor, the PCT or the lake. This will minimize the level of negative effect group selections may have. To meet the VQO of Retention, the openings the groups create could not be seen from the Bucks Lake Road or the lake itself. Although the intention is to create visual buffers around the group selection so they cannot be seen from the roads or lake, it is unknown if this objective would be met, therefore it is unknown if the Retention VQO would be met.
The units that have drop and leave for hazard trees are located along Bucklin Road, Lower Bucks Lake and 24N29Y. These units are adjacent to the recreation residence tract, organization camps and campgrounds, as well as potentially being visible from the both lakes. The VQO for this area is Retention and Partial Retention, which provides for a natural—appearing landscape by assuring that management activities remain visually subordinate to the natural landscape. Such areas are generally seen as middleground and background from major recreation areas and are of primary or secondary visual importance. Based on the conclusions from the forest aesthetic research as it applies to fuels management; downed wood from timber harvesting and tree thinning is considered ugly and has a negative impact on scenic beauty. Removing dead wood or chipping onsite can greatly increase scenic ratings for tree thinning projects. Decomposition of these trees may take a long time, especially if they are larger trees. Since hazard trees would be left on site along heavily used paved and dirt roads this may have a negative impact on visual quality. This is a very popular, designated Recreation Area, therefore it is important to retain visual quality for the long term.

**Alternative D – Cumulative Effects**

**Developed and Dispersed Recreation**

Cumulative effects are similar to the proposed action. The main difference is that hazard trees would be left on the ground. This would create larger amounts of fuels that may potentially increase the risk of wildfire. Large trees on the ground in steeper locations could roll into the road creating safety hazards. Access to the lake from the road may be more difficult depending on how many trees are fallen in a particular area.

**Visual Quality**

Recreation comments from the public, particularly individuals who live at Bucks Lake requested a group selection unit (in the Ararat Project) along Bucklin Road be eliminated. This comment represents the public’s concerns if groups are included in this project. Although the retention VQO for this project specifically names the Bucks Lake Road, based on public comments groups would not be visible from any paved road. The layout of the group selections was intended to not be visible from the roads, but it is unknown whether this objective was accomplished. The falling and leaving of hazard trees may have a negative effect on visual quality, especially compounded with the other activities of logging, such as skid trails and landings.

**Alternative B The No-Action Alternative – Direct and Indirect Effects**

**Developed and Dispersed Recreation**

The No-Action Alternative would not reduce hazardous fuels, hazard trees or improve stand health. With this alternative there would be no direct effects from logging and burning, including closures, noise, dust, and smoke. There would be no change in current recreation opportunities or ROS classifications. This alternative would not cause any short-term indirect effects on recreation
opportunities. However, taking no action could result in long-term effects on recreation opportunities due to the increased risk of a large scale wildfire and reduced forest health, which could degrade recreation opportunities and scenic landscapes.

A fire in the overstocked stands of trees could destroy the forest around the lake. With so many people at the lake the potential for a wildfire started by humans is higher. A large fire at the lake would negatively change the landscape and could potentially destroy valuable infrastructure.

Hazard trees in the campgrounds are removed regularly to reduce potential safety concerns. Hazard trees along roads are usually removed when they present on obvious safety issue. This is a costly and ineffective method of dealing with the problem. In alternative B many hazard trees along roads would be retained, posing a risk to the public and forest workers. Hazard trees back off the roads would not be removed which would not provide safe environment for the public walking in the woods. Hazard trees associated with pockets of disease would not be addressed. The Forest may be forced due to safety concerns to close the roads that would not receive treatment until such time as enough appropriated dollars would be obtained to treat the roadside hazards internally. The purpose and need to abate hazards by removing hazard trees along roadsides and within campgrounds would not be fulfilled. There would be no additional vehicle traffic due to logging operations.

Stand health would not be improved by thinning, so trees under stress would continue to die. The disease and insect issues identified by the Forest Health Report in the recreation sites would not be addressed. This would allow the spread of insects and disease to infest more trees. If random groups of valuable trees in campgrounds die, this would negatively affect the landscape, as well the ability to provide shade and screening for campers. Long term forest health objectives would not be met.

**Visual Quality**

The direct effects of logging and burning on visual quality would not occur. Views from the road and lake would remain the same providing a natural-appearing landscape where management and other activities are generally not evident the casual forest visitor. Long term negative effects may occur if a devastating wildfire burns the landscape and facilities. Tree mortality from overstocked stands would continue degrading the view. Disease and insects attack could spread to valuable live trees creating large openings when entire groups of trees fail.

**Alternative B No Action – Cumulative Effects**

**Developed and Dispersed Recreation and Visual Quality**

Past activities in the analysis area have cumulatively helped shape the landscape character. These past activities have played a large part in creating the landscape the forest visitors identify with. There would be no change in the current recreation or scenic opportunities. The no action alternative would perpetuate adverse cumulative effects on the scenic quality of the analysis area over time because the existing conditions would continue, thus increasing the risk of wildfire.
A large-scale fire could have adverse effects on recreation and scenic qualities for several years. Hazardous fuel conditions have contributed to the severity of other large fires in other areas on the forest. The effects from these fires can still be seen from forest roads, lakes and campgrounds. Log truck traffic would not increase under this alternative, and this alternative would not contribute to cumulative effects on safety from traffic accidents.

**Comparison of Alternatives**

Based on the analysis, all the action alternatives would have some temporary negative effects on Recreation and Visual Quality. Closures, noise, dust and smoke would impact recreation activities and opportunities during implementation. Alternative D may have the greatest negative effects associated with group selection, although they have been located to minimize visual impacts from the main roads, trails or the lake, it is unknown at this time if that objective would be accomplished. The public has commented that they do not want group selections to be visible from the roads. Another potential negative effect is that hazard trees along many roads would be left on the ground. If there are a large number of hazard trees in an area, this may have a negative effect on visual quality as well as create obstacles to hiking off road to the lake.

All the action alternatives would have long term benefits to the Forest and Recreation Area. Alternative C is limited to hazardous fuels reduction and would therefore have limited benefits. Alternative C does not meet all the purpose and needs identified for this project. Hazard trees would not be removed and improvements to forest health would be limited. Alternative D would reduce fuels but some of the units would have hazard trees dropped and left which would increase fuels on the ground. Alternative A removes the hazard trees so it is the most beneficial for fuels reduction. Therefore because Alternative D does not treat hazardous fuels as aggressively, there is a greater potential for a catastrophic wildfire in the Bucks Lake Recreation Area.

Alternative B, the no action alternative, does not meet the purpose and needs identified for this project. Alternative A best meets the purpose and needs for this project with limited negative impacts to both Recreation and Visual Qualities.

**Compliance with the Forest Plan and Other Direction**

This project is in compliance with the ROS classes in the Recreation area as described in the LRMP. The Wilderness itself does not meet the typical SPNM classification because it is located closer than a half mile from motorized use and is not isolated from sight and sounds of man along the southern boundary. This project would temporarily increase the sights and sounds of man during implementation but it would be very limited.

The alternatives A, B, and C meet the VQO of retention for the Bucks Lake Road and the lake as described in the LRMP. In the short term (up to five years) evidence of logging would be visible in areas of partial retention and may not be subordinate to the characteristic landscape, as described in the LRMP. In the long term the evidence would become subordinate to the landscape and meet the VQO of partial retention. The group selections in alternative D were located away.
from main roads, the PCT and the lake. If this objective is met than it would be in compliance with the VQO’s of retention and partial retention.

Alternatives A and C meet Rx -5 Standards and Guidelines, “Develop and implement selection systems that maintain a generally continuous forest cover and maintain or enhance recreation values.” The group selections in alternative D may not meet the intent of this prescription.

All action alternatives meet the Rx-6 Standards and Guidelines “maintain a healthy forest cover”.

**Forest Vegetation**

**Introduction**

The forested landscape in the Bucks lake Project area is comprised of dense variations of Sierra Nevada mixed conifer with white fir (*Abies concolor*) and red fir (*Abies magnifica*) being the main overstory trees in most stands. Sugar pine (*Pinus lambertiana*) is a minor overstory component in many of these true fir dominated stands. Douglas-fir (*Pseudotsuga menziesii*), Jeffrey pine (*Pinus jeffreyi*), ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*) and lodgepole pine (*Pinus contorta var. murrayana*) are present in many stands but at lower levels; with the exception of a few Douglas-fir dominated mixed conifer stands and Jeffrey/ponderosa pine dominated plantations established over the last 40 years in burned areas. Forests in the project area range from 5,000 feet to 6,000 feet in elevation with an annual precipitation ranging from 70 to 90 inches.

The Bucks Lake Project area lies in the wet productive westside of the northern Sierra Nevada range. These forests are within an ecological transition zone from lower Sierran mixed conifer forests to higher elevation true fir forests. The Forest Survey Site Class (FSSC) in the project area ranges from 3 to 7 (based on an index where FSSC 7 represents the least productive site class); however the majority of the project area ranges from 4 to 6 which represents a mean annual increment – growth rate – of 20 to 119 cubic feet per acre per year (USDA SCS 1988).

**Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction**

The Bucks Lake Hazardous Fuels Reduction Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental environmental impact statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, b; USDA 2003a, b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, b). Fuel and vegetation management activities are designed to comply with the standards and guidelines as described in the SNFPA FSEIS and ROD (USDA 2004a, b).
National Forest Management Act

The National Forest Management Act (NFMA) of 1976, including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 state that it is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. Both acts also state “insure that timber will be harvested from National Forest System land only where – (ii) there is assurance that such lands can be adequately restocked within five years of harvest.”


The desired condition as described in Alternative 2 of the HFQLG Final Environmental Impact Statement (USDA 1999a) is an “all-aged, multistory, fire-resistant forest,” of open forest stands dominated by large, fire tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Riparian ecosystems would be resilient to impacts caused by naturally occurring disturbance processes such as wildfire, flood, and drought.

The 2004 SNFPA provides management direction for the HFQLG pilot project area in appendix E of the Record of Decision (USDA 2004b). Appendix E directs the Plumas National Forest to “implement the HFQLG Forest Recovery Act Pilot Project, consistent with the HFQLG Forest Recovery Act and Alternative 2 of the HFQLG EIS. The HFQLG Forest Recovery Act Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel reduction objectives. Fuels and vegetation management activities include constructing a strategic system of defensible fuel profile zones (DFPZs), group selection, and individual tree selection. A management program for riparian areas is also included in the pilot project.”


The standards and guidelines for fuels and vegetation management projects for the HFQLG Pilot Project are shown in Table 2 of the 2004 SNFPA Record of Decision (USDA 2004b). This table includes direction for designing and implementing fuels and vegetation management activities within the various land allocations of the HFQLG pilot project area for the life of the pilot project.
Effects Analysis Methodology

**Geographic and Temporal Bounds**

The geographic region defining the vegetation analysis area (Figure 5) encompasses four Bucks Project subwatersheds, most of which are contained by the Bucks Creek HUC_6 watershed. Just over 400 acres of analysis subwatershed include the neighboring Grizzly Creek HUC_6. The analysis area is flanked by Bucks Summit on the northeast to McFarland Ravine at the southeast corner. The Mt. Hough Ranger District boundary makes up the southern edge and progresses west to Grizzly Creek Campground where it heads north along the ridge above Thompson Lake to the spillway of Lower Bucks Lake. Bucks Mountain above Pat Maloy Ravine is the northwestern corner, the boundary heads southeast to Mill Creek Campground and along the shoreline of Bucks Lake to the confluence of Bucks Creek. The boundary makes one final ascent north around Whitehorse Creek towards Spanish Peak and finally ties back in to Bucks Summit. Of the 10,675 acre analysis area, 1,872 acres are surface water in the form of Bucks, Lower Bucks, and Thompson Lakes. Vegetation treatments may directly affect forest vegetation within treatment areas and indirectly affect forest vegetation in nearby areas. These subwatersheds represent the furthest measurable extent that forest vegetation effects resulting from the proposed actions would occur. The analysis area includes vegetation occurring with the treatment areas as well as the vegetation outside the treatment areas within the analysis area. Cumulative effects of other projects within the watersheds would likely affect forest vegetation within the project area and would be included in this analysis.

Figure 5. Spatial Extent of Forest Vegetation Analysis Area
The analysis of direct, indirect, and cumulative effects is also bounded in time. Documented past projects within the analysis area dating back to 1961 were considered past actions. Historical management regimes and wildfires prior to the documented projects were considered as factors influencing the successional processes that shaped the landscape seen today.

For the purpose of the vegetation analysis, the temporal bounds include a 30-year horizon for future effects. Within 30 years, the treated stands would approach current levels of stocking and would approach the typical entry cycle for managed stands. This timeframe also allows for ensuring treatment activities are designed to be consistent with past direction from the Regional Forester to thin to “ensure that density does not exceed an upper limit (for example: 90 percent of normal basal area, or 60 percent of maximum stand density index)” and to “design thinnings to ensure that this level will not be reached again for at least 20 years after thinning.” (Regional Forester letter, “Conifer Forest Density Management for Multiple Objectives”, July 14, 2004).

It is important to note that unknown or unanticipated future wildfires, disease outbreaks, or mortality may occur in the analysis area prior to completion or implementation of this project—these potential future disturbance events are not included as part of this analysis.

**Analysis Methodology**

Field inventories were conducted to measure attributes of existing vegetation in the analysis area. Stands in the analysis area were inventoried using the Common Stand Exam protocols for the Pacific Southwest Region (U.S. Department of Agriculture [USDA] Forest Service Region 5). These stands are representative of the analysis area and the areas to be treated in all action alternatives. Data was collected on live and dead trees and fuels.

For analysis purposes, all stand data was loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development (Dixon 2002). The model was used to quantify existing stand conditions and to predict the effect of alternative treatments on forest development. Stand growth, mortality, regeneration, and development by stand were simulated to predict the effects of treatments over time. The FVS model output predicts average stand conditions and attributes by stand. The stand attributes analyzed include trees per acre, basal area, quadratic mean diameter, stand density index, canopy cover, and species composition. Model outputs by stand were utilized to examine the effects of treatment over the larger landscape scale. Model outputs have unknown variances that may sometimes be large; however, this is normal for modeling efforts, and model outputs are best evaluated in a relative rather than an absolute sense. In addition, model simulations have limited capacity to predict mortality due to drought or insect and disease outbreaks. Considering this, model outputs such as stand density and basal area provide useful metrics for determining relative risk of these effects. This further underscores that interpretation of model outputs are best evaluated in a relative sense in conjunction with professional judgement, firsthand knowledge of stand conditions, forest health evaluations, and pertinent scientific research, studies, and literature. For more information regarding FVS
modeling by alternative, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

A Geographic Information System (GIS) was used to analyze forest vegetation on the landscape scale for the analysis area. Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated by specialists at the Mt. Hough Ranger District with firsthand knowledge of the project area to more accurately represent vegetation conditions on the ground. These data were combined in a GIS to provide a complete map of the existing vegetation within the analysis area. All vegetation information is displayed using CWHR vegetation typing and serves as the baseline acres for analysis. The distribution of CWHR size class and density was analyzed relative to the stand-level effects modeled by CWHR size class. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

**Measurement Indicators**

*Forest Vegetation: Stand Structure and Composition and Landscape Heterogeneity*

The effects of treatment on stand structure, compositional structure, and landscape structure of forest vegetation are evaluated for each alternative. These measurement indicators focus on residual post-treatment attributes of forest vegetation structure, species composition, and landscape diversity and heterogeneity as residual post-treatment conditions are the best indicator of how well desired conditions as described in Chapter 1 would be met for the project purposes and needs.

*Stand Structure*—Stand structure is analyzed using three measures of stocking and density: (1) trees per acre and their distribution by diameter class, (2) basal area per acre, and (3) relative stand density.
Table 28. Diameter Class and Tree Size by Forest Product

<table>
<thead>
<tr>
<th>CWHR Tree Size</th>
<th>Sapling to Pole Size Trees</th>
<th>Small-sized Trees</th>
<th>Intermediate-sized Trees (small to medium)</th>
<th>Medium to Large-sized Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Biomass Trees</td>
<td>Sawlog Trees</td>
<td>Reserve Trees</td>
<td></td>
</tr>
<tr>
<td>Diameter Class</td>
<td>0-10 inches DBH</td>
<td>10-20 inches</td>
<td>20-30 inches</td>
<td>+30 inches</td>
</tr>
</tbody>
</table>

Note: DBH = diameter at breast height

Trees per Acre and Their Distribution by Diameter Class: The number and distribution of trees per acre by diameter class (Table 28) is an important unit of measure because it shows the effect of treatments on different size trees. High density stands also slow the rate of fire line construction by hand crews and mechanical equipment. The four diameter classes are based on diameter classes for forest products (biomass and sawlog products), ecological importance for fire behavior and wildlife habitat, and guidelines for reserve trees upon which silvicultural prescriptions are based. The sawlog-sized trees are split into two 10-inch diameter classes to track the effect of treatments on the intermediate-sized tree class as described in the GTR 220 (North et al. 2009). Pre- and post-treatment measures of trees per acre is used to show the effects of treatments on reducing stocking and the percent retention of trees greater than 20 inches in diameter is used to show the effects of treatments on the intermediate and large tree size classes which are valued for ecological structure and function for wildlife habitat.

Basal area per acre: Basal area per acre is “the cross-sectional area of all stems in a stand measured at breast height and expressed per unit land area” (in this case, per acre) (Helms 1998). Basal area per acre is commonly used as a measure of stand density. This measure has been used by many including Oliver (1995), Powell (1999), and Sartwell (1971) to describe the threshold for ponderosa pine (150 square feet per acre), above which bark beetle related mortality is expected to occur. This threshold would apply to pine plantations present within the Bucks Project.

For true fir stands, Oliver’s research (1988) found that “plots with 200 square feet per acre or more basal area suffered the bulk of the mortality.” True fir stands are capable of maintaining higher densities; however, at high stand densities, root disease and drought increase the susceptibility of true fir species to mortality caused by the Scolytus fir-engraver beetle (Oliver et al. 1996). Basal area per acre has also been used by Landram (2004) to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest.

For the westside zone (where the Bucks Lake Project is primarily located) Sierran mixed conifer (SMC) forest, the insect risk thinning guides for the Plumas suggest thinning to 200 square feet per acre. This threshold would apply to mixed conifer stands within the Bucks Project.

Relative stand density: The concept of stand density index was first developed for even-aged stands by Reinecke (1933) to compare “the density of stocking of various stands.” The relative density concept describes a stand’s density relative to the maximum possible density and may serve as a proxy for a stand density relative to its carrying capacity. In general, the concept of
stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Curtis 1970; Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Helms and Tappeiner 1996; Jack and Long 1996; Oliver and Uzoh 1997; Powell 1999; Woodall et al. 2002).

A relative density between 55 and 60 percent has been described as the lower limit of the “Zone of Imminent Competition Mortality” above which trees begin to die due to competition related stress (Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Smith et al. 1997; Powell 1999; Long and Shaw 2005). For the purpose of this analysis, 60 percent was used as a measure of the onset of competition-related mortality because stress induced by competition increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health because stands managed below this threshold are less likely to incur mortality due to the agents mentioned above.

The desired relative densities immediately post-treatment are between 25 and 40 percent, the lower bounds of which correspond with the onset of competition and crown closure. These levels are substantially below the threshold of imminent competition mortality, and treatments within the desired range should have a reasonable “lifetime” before reaching densities at which mortality is expected to occur. Desired relative densities within 20 to 30 years would be below the 60 percent threshold of imminent competition mortality (Blackwell 2004) as this longer time frame would be representative of a reasonable cutting or entry cycle.

Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California. The calculation of this maximum stand density is largely dependent on the mix of species. A more site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the “proportion of basal area each individual species represents in the stand” (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For the purpose of this analysis, relative density based on the maximum stand density index as calculated by FVS is used.

**Compositional Structure**—Compositional structure is measured by calculating the percent of species composition pre and post-treatment. Species composition is analyzed because silvicultural prescriptions, particularly group selection treatments, may have an effect at the stand level on differing species dependent on shade tolerance and species biology. Residual species composition post-treatment is an important measure because these trees represent the seed bank of the future, which is one factor that affects species diversity over time. The shift in species composition in the northern Sierra Nevada mixed conifer forests from shade-intolerant species, such as ponderosa pine, to shade-tolerant species, such as white fir, has been well documented in scientific literature (McKelvey and Johnston 1992, Skinner and Chang 1996, Ansley and Battles 1998). Treatments that improve the percentage of pine species in mixed conifer forest would be beneficial. Percent change in shade-intolerant species composition (ponderosa and sugar pine is used to show the effects that treatments within the alternatives would have on species composition.
Landscape Structure— For the purposes of this analysis, landscape structure refers to the distribution of relative successional (seral) stages on the landscape, and the relative distribution of closed-canopy and open canopy stands. This is an important indicator because it may be used as a measure of landscape heterogeneity and diversity, and as a measure of cumulative effects to forest vegetation on the landscape scale. Landscape structure is measured by calculating the distribution of these seral stages within the vegetation analysis area. The relative distribution of seral stages within the landscape is measured by using CWHR size class as a proxy for seral stage. Table 29 displays the CWHR tree size and density class categories. CWHR size class serves as an effective proxy for seral stage because it classifies forest vegetation by ranges of average tree size which represent discrete developmental stages of tree growth. CWHR density class serves an effective proxy for open and closed-canopy conditions because it classifies canopy cover. Average tree size is represented by the quadratic mean diameter (QMD) of trees in the stand. In addition, this allows for a congruent analysis of effects on forest vegetation and wildlife habitat. Forest stands were aggregated by treatment prescription because stand structure and effects of treatments on stand structure would not substantially vary by forest vegetation type.

Types and Duration of Effects

Direct Effects

These are effects on forest vegetation that are directly caused by treatment implementation or, as with Alternative B (no action), a lack of treatment.

Indirect Effects

These would be effects on forest vegetation that are in response to the direct effects of treatment implementation or, as with Alternative B (no action), a lack of treatment.

Duration of Effects

Direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis described above in “Geographic and Temporal bounds”.

Cumulative Effects Analysis

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable
actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions.

Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much or more than human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. In addition, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”
Table 29. CWHR Tree Size and Density Class Crosswalk with Seral Stage and Canopy Closure Condition

<table>
<thead>
<tr>
<th>CWHR Size Class</th>
<th>CWHR Tree Sizes (average)</th>
<th>Description</th>
<th>Seral Stage</th>
<th>CWHR Density Class</th>
<th>CWHR Tree Canopy Cover</th>
<th>Description</th>
<th>Canopy Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt; 1” DBH</td>
<td>Seedlings, but definite forest habitat</td>
<td>Early Seral</td>
<td>n/a</td>
<td>&lt; 10%</td>
<td></td>
<td>Open canopy Stands</td>
</tr>
<tr>
<td>2</td>
<td>1 - 6” DBH</td>
<td>Sapling</td>
<td>Seral</td>
<td>S</td>
<td>10 - 24%</td>
<td>Sparse</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6 - 11” DBH</td>
<td>Pole-sized tree</td>
<td></td>
<td>P</td>
<td>25 - 39%</td>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11 – 24” DBH</td>
<td>Small Tree</td>
<td>Mid-serial</td>
<td>M</td>
<td>40 - 60%</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&gt; 24” DBH</td>
<td>Medium/Large tree</td>
<td>Later Seral</td>
<td>D</td>
<td>&gt; 60%</td>
<td>Dense</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>&gt; 24” DBH</td>
<td>Multilayered canopy with dense cover</td>
<td></td>
<td>n/a</td>
<td>&gt; 60%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Affected Environment

Forest Structure and Composition

As with many areas in the Sierra Nevada, the landscape in the analysis area has been heavily influenced over the last 150 years by past management activities that include mining, grazing, timber harvesting, fire exclusion, and large high-severity fires. However, higher elevation true fir forests within the analysis area have been less influenced by active management than mixed conifer forests. These stands have been less impacted by clearing for mining and timber harvesting because of their inaccessible terrain and excessive distance from lumber markets (Laacke and Tappeiner 1996).

Past harvest activities in the Bucks Lake area were primarily focused on overstory removal and sanitation or salvage harvest on easily accessible terrain of desirable timber species, namely ponderosa pine and sugar pine. Medium to large diameter shade-tolerant species trees exist in many stands with varying frequency as remnants of selective harvest activities. The current proportion of shade-tolerant species such as red and white fir is much higher as a result of preferential removal of shade-intolerant species (Figure 6). Fire suppression has created dense stands with high canopy cover that further inhibit the regeneration and establishment of desirable shade-intolerant species. Past use of these harvest systems is consistent with well-documented overall management practices that occurred over vast areas of the Sierra Nevada during the 20th century (UC 1996; Leiberg 1902). Even-aged Jeffrey pine plantations were established in the 1960s after fires burned the area and were intended for future harvest.

Currently, mixed conifer stands have varying levels of shade-tolerant versus shade-intolerant species. Those stands on lower elevation south and west facing slopes have greater amounts of shade-intolerant species, though these stands are still dominated by shade-tolerant species. Figure
6 displays the existing average species composition for all stands. Shade-tolerant species (white fir and red fir) account for 89 percent of tree species present, while desirable shade-intolerant species such as black oak, ponderosa pine, Jeffrey pine, sugar pine, and western white pine account for 11 percent of trees present. Pockets of inaccessible terrain found within the project area contain large diameter, overstory shade-intolerant species with little to no signs of past activity, potentially reflecting historic conditions in the project area and more desirable future conditions. The current shift in species composition to shade-tolerant dominated stands requires management activities that promote shade-tolerant species. Under current dense canopy conditions that favor shade-tolerants, shade-intolerant species would not be able to establish and develop into major overstory components.

**Figure 6. Existing Species Composition.**

Past management actions have resulted in 1) the reduction of large dominant and codominant overstory trees, 2) the retention of smaller diameter intermediate and suppressed trees and 3) a shift in species composition in mixed conifer stands from shade-intolerant pine dominated stands to shade-tolerant, white fir dominated stands; all of which have largely decreased landscape level forest heterogeneity (diversity). In addition, a near absence of landscape level, low-intensity surface fires has contributed to increased stand densities in smaller diameter classes, particularly in shade-tolerant species (Bouldin 1999). In areas where the lack of surface fires has resulted in heavy accumulations of surface fuels and an unreceptive fuel bed for seed germination, natural regeneration of seedlings has been hindered and stands remain even-aged with a single canopy.

At the stand level, similar to what has occurred at the landscape level, the combination of past management activities, fire exclusion, and extensive drought-related mortality has created relatively homogeneous areas typified by small even-aged trees existing at high densities. High-density stands are also more susceptible to density-dependent mortality driven by drought and insect and disease infestations. The high densities of small trees and high fuel loads contribute to:
overstocked stand conditions in which trees become stressed due to competition for water, light, and nutrients; this can lead to a higher potential for mortality due to drought, insects, or disease;

- Conditions that favor the recruitment of shade-tolerant species such as white fir, which promotes a shift in species composition from pine-dominated to fir-dominated forests; and

- large accumulations of ground fuels, ladder fuels, and canopy fuels which increase the potential for stand-replacing, high-severity fire events.

As a result of past management activities described above, forests in the analysis area are composed of smaller trees at higher densities resulting in a homogenized landscape. Such conditions are best characterized by CWHR size class 4 where diameter at breast height (DBH) ranges between 11 and 24 inches. Analysis of CWHR size class distribution for forest types in the analysis area shows a relative overabundance of CWHR size class 4, indicating a departure from desired distributions of seral stages (Figure 7). Taylor (2004) observed in his study of the Lake Tahoe Basin that “pre-settlement forests were more structurally diverse than contemporary forests” and consisted of larger trees at lower densities — these stands would be more characteristic of open canopy, later seral stands such as CWHR5P. In contrast, the relative dominance of CWHR size class 4 likely developed as a result of overstory removal and salvage harvest systems in concert with fire suppression policies.

Figure 7. Existing CWHR distribution within the analysis area.

Because such stand structure has increased vulnerability to high-severity fires, insect outbreaks, and landscape level drought-induced mortality, a homogenous (same species or structure) occurrence of this seral stage across the landscape is unstable. A more diverse distribution of seral stages, characterized by heterogeneous stand structures, may be more
ecologically resilient to disturbance events such as fire, drought, and insect and disease infestations and more characteristic of desired conditions. Ecological resilience, or resilience, is defined as the capacity of a plant community or ecosystem to maintain or regain normal function and development following disturbance (Helms 1998).

**Forest Insect and Disease**

Forest insects and disease currently occur in most stands in the analysis area and is well documented in the Forest Health Evaluation performed for the project (Cluck 2011). With the exception of white pine blister rust (*Cronartium ribicola*), an introduced disease, forest pathogens are endemic to forests as part of the natural disturbance regime. However, due to the interaction of past management activities (such as fire exclusion, unnaturally high stocking levels of shade-tolerant species, and drought) as well as climate change trends, populations of insects and disease may increase beyond endemic levels associated with forest health.

**Insects**

The fir engraver bark beetle is the primary insect of concern found in the analysis area. The fir engraver bark beetle attacks true fir species and is associated with direct and indirect tree mortality, in combination with drought and disease occurrences in high-density stands (Ferrell 1996). Infestations are usually associated with stressed trees from drought or root disease, and are best prevented by decreasing individuals’ susceptibility to attack through thinning to maintain healthy stand conditions.

Ponderosa and Jeffrey pines, are susceptible to the western pine beetle (*Dendroctonus brevicomis*), and bark beetles (*Ips* sp.). The western pine beetle is the most aggressive and contributes to direct tree mortality, particularly in moisture-stressed trees within high-density stands where density driven competition is greatest. The primary prevention measure for this species is to maintain healthy vigorous trees in low stand densities where competition for water, light, and nutrients is minimized. *Ips* breed in logging slash and may grow beyond endemic levels in areas where slash is not properly treated. When populations build to sufficient numbers, *Ips* can attack mature trees.

**Disease**

The primary pathogen of concern found in the analysis area is *Heterobasidion* root disease, caused by *Heterobasidion occidentale* and *Heterobasidion irregulare*. *Heterobasidion* root disease is known to occur throughout the forests of northern California and southern Oregon (Schmitt et al. 2000) and infects both true firs and pines. The occurrence of *Heterobasidion* root disease centers has been confirmed in true fir but is not expected to pose a threat to pines on the westside of the Plumas National Forest. Root disease centers exist throughout the project area and in combination with high stem densities and drought, can severely stress individual trees and continue spreading to nearby trees through root contact. Establishment of new cohorts is impaired by the presence of this disease as young conifers often die after their roots contact infected roots.
in the soil (Cluck 2011). There is the potential for new infection in any harvest area because spores can travel up to 100 miles (Goheen and Otrosina 1998).

While all western conifers are susceptible to this pathogen, ponderosa and Jeffrey pines and true fir tend to be most susceptible to adverse effects from the disease. This root disease is spread via spores infecting fresh wounds or stumps and from root-to-root contact (Sinclair et al. 1987). Stands with repeated entry in the analysis area have a higher incidence of the disease than un-entered stands. The effects of this disease range from reduced individual tree vigor, root and bole decay, windthrow, root mortality, and in the worst-case scenario, tree mortality. Tree mortality is best prevented by targeting individuals with signs of disease infection for removal and thinning to decrease competition and increase tree vigor. Treatment of freshly cut stumps with a borate compound such as borax would aid in preventing spread of new infections.

Dwarf mistletoes (*Arceuthobium* spp.) are parasitic, species-specific flowering plants that establish on live conifers but do not generally result in tree mortality. Dwarf mistletoe has been found in many stands throughout the project area, mostly on white and red fir, in conjunction with cytospora cankers (*Cytospora abietis*). Dwarf mistletoe spreads by means of seed discharge, and in this manner infects lower canopy trees of the same species. Thinning to remove infected trees, increase individual tree vigor and promote the establishment of other non-host species in the stand will help decrease the impact of dwarf mistletoe in the project area. Although not a direct cause of mortality, dwarf mistletoe in combination with cytospora canker, root disease, fir engraver bark beetle, and drought can result in tree mortality.

**Existing Conditions**

Existing conditions of forested stands within the analysis area range depending on factors such as ownership, past management activities, and CWHR size class and density. Forested stands proposed for mechanical thinning and wildlife emphasis treatments within the Bucks Lake Project are primarily CWHR 4 and CWHR 5 size class stands while Jeffrey pine plantations are CWHR 3. The average existing conditions and the range for each attribute are shown in Table 30, where the project area is categorized into the Jeffrey pine plantation stands, the wildlife emphasis stands, and the general mixed conifer stands.

Stands in the project area generally have high densities of trees as compared to historical conditions which consisted of fire-maintained open understories, especially in the 0-10 inch DBH range where trees per acre range on average from 192 to 435. Within the sawlog strata, tree densities of small diameter trees (10-20 inches DBH) range from 62 to 135 trees per acre, outnumbering intermediate and large diameter trees that historically dominated at low densities. These conditions are very prevalent throughout the project area, resulting in homogenous, closed-canopy conditions that do not match historical conditions. Stands proposed for mechanical thinning and wildlife emphasis treatment have a large component trees greater than 30.0” DBH. These trees are at high risk of mortality from inter-tree competition with smaller trees and the combination of bark beetles, root disease, and forest pathogens associated with stressed trees.
Additionally, periods of extended drought can exacerbate the risk of mortality by further stressing trees. The majority of stands are above the relative density threshold of 60 percent and currently show signs of competition-related mortality. Virtually all plantation stands exceed the suggested 150 square feet of basal area threshold for ponderosa pine, and 84 percent of the wildlife emphasis and mixed conifer stands exceed the 200 square feet threshold. As noted in Cluck 2011 and field visits, “elevated levels of fir engraver beetle caused mortality” are currently evident within forested stands as a result of drought, high densities, and *Heterobasidion* root disease infection. Mortality levels can fluctuate each year as a result of varying precipitation levels and other disturbances such as outbreaks of bark beetles, creation of new root disease centers, and windthrow events. However, the risk of mortality may increase in the future if current conditions persist. Stands “could experience unacceptable levels of tree mortality in the future” as a result of a combination of high tree densities, root disease, bark beetles, periodic drought, and the exacerbating effects of climate change on these factors (Cluck 2011).
### Table 30. Existing Conditions.

<table>
<thead>
<tr>
<th>Stand Attributes</th>
<th>Plantation Stands</th>
<th>Mixed Conifer Stands</th>
<th>Wildlife Emphasis Stands</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Range</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Trees per acre 0-10 inches DBH</td>
<td>317</td>
<td>229 - 478</td>
<td>435</td>
</tr>
<tr>
<td>Trees per acre 10-20 inches DBH</td>
<td>135</td>
<td>107 - 159</td>
<td>62</td>
</tr>
<tr>
<td>Trees per acre 20-30 inches DBH</td>
<td>15</td>
<td>10 - 21</td>
<td>26</td>
</tr>
<tr>
<td>Trees per acre &gt;30 inches DBH</td>
<td>1</td>
<td>1 - 2</td>
<td>14</td>
</tr>
<tr>
<td>Total trees per acre</td>
<td>477</td>
<td>377 - 653</td>
<td>538</td>
</tr>
<tr>
<td>Total basal area per acre (sq. ft./ac.)</td>
<td>254</td>
<td>230 - 295</td>
<td>291</td>
</tr>
<tr>
<td>Relative Density (%)</td>
<td>75</td>
<td>69 - 81</td>
<td>65</td>
</tr>
<tr>
<td>Quadratic Mean Diameter (inches)</td>
<td>10</td>
<td>9 - 11</td>
<td>12</td>
</tr>
<tr>
<td>Total Canopy Cover (%)</td>
<td>68</td>
<td>60 - 75</td>
<td>59</td>
</tr>
</tbody>
</table>

### Environmental Consequences

*Forest Vegetation*

**Direct and Indirect Effects**
### Table 31. Summary of Post-Treatment Stand Conditions Under All Alternatives.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-Treatment Average Trees per Acre</th>
<th>Post-Treatment Average Trees per Acre</th>
<th>% trees &gt;20 inches DBH retained</th>
<th>Pre-Treatment Basal area per acre (sq. ft./ac.)</th>
<th>Post-Treatment Basal area per acre (sq. ft./ac.)</th>
<th>Pre-Treatment Relative Stand Density (%)</th>
<th>Post-Treatment Relative Stand Density (%)</th>
<th>Pre-Treatment QMD (inches)</th>
<th>Post-Treatment QMD (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt A</td>
<td>Rx1</td>
<td>599</td>
<td>147</td>
<td>89</td>
<td>300</td>
<td>227</td>
<td>67</td>
<td>40</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>Rx2</td>
<td>363</td>
<td>124</td>
<td>88</td>
<td>352</td>
<td>249</td>
<td>68</td>
<td>41</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Rx3</td>
<td>471</td>
<td>117</td>
<td>85</td>
<td>257</td>
<td>114</td>
<td>75</td>
<td>29</td>
<td>10.1</td>
</tr>
<tr>
<td>Alt B</td>
<td>536</td>
<td>536</td>
<td>100</td>
<td>323</td>
<td>323</td>
<td>68</td>
<td>68</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Alt C</td>
<td>612</td>
<td>190</td>
<td>100</td>
<td>302</td>
<td>280</td>
<td>70</td>
<td>51</td>
<td>10.7</td>
<td>16.6</td>
</tr>
<tr>
<td>Alt D</td>
<td>Rx1</td>
<td>568</td>
<td>144</td>
<td>90</td>
<td>296</td>
<td>226</td>
<td>66</td>
<td>40</td>
<td>12.2</td>
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<tr>
<td></td>
<td>Rx2</td>
<td>363</td>
<td>109</td>
<td>85</td>
<td>352</td>
<td>223</td>
<td>68</td>
<td>37</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Rx3</td>
<td>471</td>
<td>117</td>
<td>85</td>
<td>257</td>
<td>114</td>
<td>75</td>
<td>29</td>
<td>10.1</td>
</tr>
<tr>
<td>Groups</td>
<td>466</td>
<td>21</td>
<td>35</td>
<td>272</td>
<td>66</td>
<td>68</td>
<td>11</td>
<td>11.5</td>
<td>28.7</td>
</tr>
</tbody>
</table>

### Table 32. Summary of Post-Treatment Species Composition In Treated Units Under All Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Existing Conditions</th>
<th>Alternative A</th>
<th>No Action</th>
<th>Alternative C</th>
<th>Alternative D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shade-Tolerants (%)</td>
<td>88.7</td>
<td>85.7</td>
<td>88.7</td>
<td>83.1</td>
<td>86.3</td>
</tr>
<tr>
<td>Shade-Intolerant (%)</td>
<td>11.3</td>
<td>14.3</td>
<td>11.3</td>
<td>16.9</td>
<td>13.7</td>
</tr>
</tbody>
</table>
No Action Alternative – Alternative B

Stand Structure
Existing stand conditions would persist and develop unaltered by active management, with the exception of continued fire suppression activities. Wildfire, drought, disease, and insect-related mortality and recruitment would continue to occur. Table 31 displays average stand attributes under the No action Alternative. Under alternative B, there would be no reduction in trees per acre, basal area per acre or relative stand density. Under alternative B, stands would have, on average, 536 trees per acre, 305 square feet of basal area and a relative stand density of 68 percent. Stands would remain dense, particularly in the smaller diameter classes in terms of trees per acre and basal area.

Under alternative B, 94 percent of mixed conifer stands would exceed the basal area threshold and pine species within these stands would continue to be at elevated risk of bark beetle mortality (Fiddler et al. 1989; Oliver 1995). At high stand densities, root disease and drought increase the susceptibility of true fir species to mortality caused by the Scolytus fir-engraver beetle (Oliver et al. 1996; Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994). All pine plantations would exceed the 150 square foot threshold and experience increased risk of mortality from bark beetles.

Under alternative B, approximately 85 percent of stands would be above the 60 percent threshold of the onset of competition-dependent mortality within 20 years. High stand densities would result in reduced tree vigor and growth rates and increased susceptibility to occurrences of root disease, dwarf mistletoe, cytospora canker, drought, fir engraver activity, and inter-tree competition for nutrients. High densities of small trees may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees (Dolph et al. 1995).

The increasing stand density under alternative B may have a major adverse effect on forest health by decreasing tree vigor and growth and increasing susceptibility to insects, disease, and drought. This effect would increase through time as mortality, pathogen infestations, and bark beetle attacks continued without intervention. The resulting stand structure would be characterized by a dense understory and overstory of trees with poor growth and vigor and high frequency of insects, pathogens, and mortality.

Compositional Structure: Species Composition
Under alternative B there would be no change in species composition (Table 32). The existing dense canopy cover strongly influences species composition by favoring the regeneration, growth, and development of shade-tolerant species such as white fir and red fir. Overall, shade-tolerant species collectively account for 89 percent of trees and shade-intolerant tree species such as Jeffrey pine and sugar pine account for 11 percent, on average; however, this varies by stand, aspect, and elevation. Within mixed conifer stands shade-tolerant species currently exist at high densities, particularly in trees less than 20 inches DBH while pine species (ponderosa/Jeffrey and sugar pines) generally occur as overstory trees (greater than 20 inches DBH); the number of pine
regeneration in the understory is much lower relative to shade-tolerant species. In some stands, pines are a major component of codominant trees in the canopy. Stands with large components of codominant pines and those with large dominant overstory pines may be more reflective of species composition in historical reference conditions. However, existing stand structure and high densities clearly favor the regeneration, growth, and development of shade-tolerant species. Currently, most mixed species stands in the analysis area are becoming more occupied by the shade-tolerant species mentioned above, and this trend would be expected to continue.

Such high densities of shade-tolerant species compete with shade-intolerant species for resources (nutrients, light, and water), increase shade in the understory, and discourage the regeneration of shade-intolerant pine species (Oliver et al. 1996). Consequently, over the longer temporal scale, a shift in species composition would be expected to occur, giving preference to regeneration of shade-tolerant species over shade-intolerant species and decreasing species diversity (Minnich et al. 1995; Ansley and Battles 1998; Oliver et al. 1996; McKelvey and Johnston 1992).

**Landscape Structure: Heterogeneity and Canopy Cover**

The majority of stands within the project area are currently exceeding or approaching the threshold (Table 30) for the onset of competition-dependent mortality and many are already experiencing increased mortality from combinations of competition, pathogens, and insects. Over time, diameter growth and an increase in trees per acre due to ingrowth would contribute to an increase in stand density. Small diameter trees that currently exist in the understory would grow into the mid- and upper-canopy to directly compete with larger diameter trees, increasing competition for nutrients and decreasing large diameter tree growth and vigor. Without management, stands approaching the 60 percent threshold would exceed the threshold and experience increased susceptibility to competition, pathogens, and insects. Stands already exceeding the 60 percent threshold would continue experiencing mortality from competition and forest health issues and trees would remain less vigorous. Pathogen and insect infestations would continue as new cohorts of trees are continually infected, preventing development into multistoried, resilient forests.

Distribution of seral stages across the analysis area is dominated by closed-canopy, mid-seral forest (CWHR size class 4, canopy cover moderate (M) and dense (D)). The abundance of this seral stage and the lack of early- and late-seral forest increase the homogeneity of the landscape. A homogenous landscape composed of stands of similar structure and composition is less resilient and more susceptible to insect and pathogen outbreaks, competition-related mortality, fire, and periodic drought.
### Table 33. Comparison of Alternatives Using Measurement Indicators for Mechanical Thinning Treatments

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Post-Treatment Retention of Trees &gt; 20 inches DBH</th>
<th>Post-Treatment Basal Area &lt;150 sq. ft./ac. (Pine Plantations)</th>
<th>Post-Treatment Basal Area &lt;200 sq. ft./ac. (Mixed Conifer)</th>
<th>Relative Stand Densities = 25-40%</th>
<th>Relative Stand Densities &lt;60% at 20 years</th>
<th>Post-Treatment % Shade-Intolerant Species Composition Improved</th>
<th>% Increase in Quadratic Mean Diameter @ 30 years</th>
<th>Increase in Open Canopy Stands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A</td>
<td>All stands would retain on average 88% of trees &gt;20 inches DBH</td>
<td>100% of plantations would meet desired conditions</td>
<td>23% of SMC stands would meet desired conditions</td>
<td>60% of stands would meet desired conditions</td>
<td>76% of stands would meet desired conditions</td>
<td>94% of stands would improve species comp</td>
<td>QMD would increase by 37%</td>
<td>190 acres would convert to open canopy conditions</td>
</tr>
<tr>
<td>Alternative B</td>
<td>All stands would retain 100% of trees &gt;20 inches DBH</td>
<td>0% of plantations would meet desired conditions</td>
<td>6% of SMC stands would meet desired conditions</td>
<td>0% of stands would meet desired conditions</td>
<td>15% of stands would meet desired conditions</td>
<td>0% of stands would improve species comp</td>
<td>QMD would decrease by 2%</td>
<td>0 acres would convert to open canopy conditions</td>
</tr>
<tr>
<td>Alternative C</td>
<td>All stands would retain 100% of trees &gt;20 inches DBH</td>
<td>0% of plantations would meet desired conditions</td>
<td>11% of SMC stands would meet desired conditions</td>
<td>19% of stands would meet desired conditions</td>
<td>43% of stands would meet desired conditions</td>
<td>100% of stands would improve species comp</td>
<td>QMD would increase by 51%</td>
<td>0 acres would convert to open canopy conditions</td>
</tr>
<tr>
<td>Alternative D</td>
<td>All stands would retain on average 88% of trees &gt;20 inches DBH</td>
<td>100% of plantations would meet desired conditions</td>
<td>25% of SMC stands would meet desired conditions</td>
<td>59% of stands would meet desired conditions</td>
<td>78% of stands would meet desired conditions</td>
<td>89% of stands would improve species comp</td>
<td>QMD would increase by 38%</td>
<td>171 acres would convert to open canopy conditions</td>
</tr>
</tbody>
</table>
**All Action Alternatives – Alternatives A, C, and D**

**Hand Thinning, Piling & Burning Only – Structure, Composition, and Landscape Heterogeneity**

Hand thinning treatments are analyzed for hand thinning, piling, and burning, as well as follow-up underburning where conditions permit. These treatments would reduce understory vegetation by removing trees up to 8 inches DBH and would result in incidental mortality in the midstory but would not be expected to change CWHR size class or density class. Hand thinning treatments are generally used in conjunction with mechanical thinning of trees greater than 10 inches DBH, but stands in steep terrain, sensitive areas, and close proximity to public facilities cannot support mechanical thinning treatment and would be treated with only hand thinning. Trees between 8 and 10 inches DBH would potentially be untreated, but this would occur on 78 acres in which the low density of trees of this diameter class would be retained for structural diversity. The effects of burning piles of thinned material would be highly localized and dispersed. These effects would include occasional scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments.

Hand thinning under all alternatives would decrease stand densities in terms of trees per acre by 38-81 percent and would decrease basal area by 1-14 percent. Because the majority of trees removed are small diameter, relative stand densities would not be affected significantly. Species composition would not be notably affected as mostly small diameter trees, which do not make up a large component of the basal area and would consist primarily of shade-tolerant species, would be removed. Growing conditions favoring shade-tolerant species would persist, limiting future shift in species composition to desirable shade-intolerant species. Hand thinning treatments would not immediately enhance development into the next size class or notably affect stand canopy cover. In the future, however, the accretion of small diameter trees into medium size trees that compete with larger diameter trees for nutrients would be reduced by treatment now.

Hand thinning treatments would be similar in intensity for all action alternatives, but the scale of these treatments would vary by alternative. Under Alternative A, 422 acres would be hand thinned, under alternative C, 501 acres would be hand thinned, under alternative D, 262 acres would be hand thinned, and under alternative B no acres would be hand thinned. Alternative D was designed to reduce the amount of service work in order to reduce total project costs, and as a result hand thinning treatments were proposed for critical areas requiring fuel treatment. Alternative C was designed to fulfill the fuels reduction purpose and need regardless of cost, and as a result included the most acres for hand thinning. Alternative A proposes to hand thin nearly all of the areas that would be treated under alternative C, and in those areas that are not proposed for treatment, mechanical thinning and biomass removal would achieve similar fuels reductions. Alternatives A and C would meet desired conditions more than Alternative D.
**Mastication – Structure, Composition, and Landscape Heterogeneity**

Mastication treatment would reduce understory vegetation by rearranging shrub fuels and conifer tree ladder fuels less than 10 inches in diameter. Post-treatment residual conifer tree spacing would be approximately 25 feet, resulting in approximately 70 trees per acre. Trees per acre would be reduced by approximately 40 percent, basal area per acre would be reduced by approximately 9 percent to 119 square feet per acre, and relative stand density would be reduced by approximately 6 percent to 27 percent. Primarily trees from the understory would be masticated. Species composition would not be changed as the unit proposed for mastication treatment is comprised almost 100 percent of white fir. Any species other than white fir that may be present would be preferentially retained. Mastication would increase open-canopy conditions within the stand and improve residual tree growth and vigor by removing competing trees and shrubs. This would enhance future development of the stand from CWHR size class 3 with moderate canopy cover to size class 4 with open and sparse canopy cover, but would not immediately affect seral stage. Open-canopy conditions would favor shade-intolerant species.

Mastication treatments would be similar in intensity and scale for all action alternatives in which it is proposed. Alternatives A and C propose 16 acres for mastication treatment. Alternatives D does not propose any mastication and thus would not experience any benefits associated with this treatment.

**Grapple Piling – Structure, Composition, and Landscape Heterogeneity**

Grapple piling treatments are analyzed for piling of fuels and burning of piles, as well as follow-up underburning where conditions permit. The effects of burning piles would be highly localized and dispersed. These effects would include occasional scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments.

These treatments would reduce existing surface fuels but would not directly affect live vegetation in terms of trees per acre, basal area, relative stand density, or species composition. Grapple piling treatments would not affect quadratic mean diameter or canopy cover. Reduction of surface fuels would decrease the likelihood of severe wildfire and fire-related mortality and allow the reintroduction of fire as an ecological process on the landscape. Fire, as a result, would slowly begin the shift towards desired conditions in terms of stand structure, species composition, and landscape heterogeneity through its regulation of density, selection for shade-intolerant, fire-adapted species, and dispersed effects on stand development. In addition, stands would become more resilient to insect and pathogen outbreaks with more vigorous trees, greater species diversity, and larger variety of seral stand structures.

Grapple piling treatment would be similar in intensity and scale for all action alternatives in which it is proposed. Alternatives A and C propose 104 acres of grapple piling. Alternative D does not propose any grapple piling and thus would not experience benefits associated with this treatment.
**Mechanical Thinning**

Mechanical thinning treatments are designed to meet the purpose and need for reducing hazardous fuels, improving forest health, and protecting and enhancing habitat for sensitive species. These treatments would be implemented in DFPZ areas, of which 12 percent of the stands are plantations (CWHR 3), 68 percent are classified as CWHR size class 4, and 20 percent are classified as CWHR size class 5. Trees between 10 and 30 inches DBH would be removed as sawlog product. Trees less than 10 inches DBH would be removed as biomass chips or hand thinned, piled, and burned in the vast majority of stands (93 percent). All trees greater than 30 inches DBH would be retained.

Mechanical thinning treatments under alternative A would occur on 746 acres and can be separated into three silvicultural prescriptions: residual canopy cover target thinning within mixed conifer stands and plantations, and radial thinning within wildlife emphasis stands. Residual canopy cover target thinning within mixed conifer stands would consist of thinning from below (removing smaller diameter trees first) to achieve a desired average residual canopy cover, ranging from 30 - 50 percent in the majority of stands to 50 - 60 percent in stands where higher canopy cover is desirable for wildlife. Residual canopy cover target thinning within Jeffrey pine plantations would include thinning from below to 30 to 40 percent canopy cover, or an approximate residual basal area target of 90 to 120 square feet per acre. Radial thinning within wildlife emphasis stands would consist of thinning around designated “legacy” trees to improve growth and vigor, and a general thinning from below in the matrix forest between “legacy” trees to a residual canopy cover of 40 – 60 percent. “Legacy” trees would be chosen based on species, size, crown health, and wildlife characteristics such as forks and nesting cavities, and would generally be the largest, healthiest, shade-intolerant individuals in a stand. All of these treatments would allow for a range of retention to increase horizontal heterogeneity. Existing clumps of larger trees would be retained for higher density and canopy cover, while gap openings would be thinned to a lower canopy cover to promote establishment and growth of shade-intolerant species.

Mechanical thinning under alternative C was designed to meet the fuels reduction purpose and need. These treatments would be implemented in 552 acres of DFPZ, of which 18 percent of the stands are classified as CWHR 3, 53 percent are classified as CWHR 4 and 29 percent as CWHR 5. Trees less than 10 inches DBH would be removed as biomass chips. All trees greater than 10 inches DBH would be retained. Residual density of trees less than 10 inches DBH would be approximately 70 to 110 trees per acre, or a spacing of 20 to 25 feet apart.

Mechanical thinning treatments under alternative D would occur on 749 acres and are similar to the those proposed under alternative A EXCEPT: wildlife emphasis areas (which account for 98 acres or 13 percent of the area) would have canopy cover reduced to 40 – 50 percent instead of 50 – 60 percent; and in radial thinning areas, the matrix between “legacy” trees would be thinned to 40 – 50 percent instead of 50 – 60 percent. All other aspects of thinning prescriptions would remain the same. Generally, more trees would be removed under alternative D than alternative A.

**Structure**
Between alternatives A and D, mechanical thinning treatments would differ on 98 acres, or 13 percent of the acres proposed for treatment, and thus any differences in meeting desired conditions would occur in these areas (Table 31). On those 98 acres, under alternative D, the residual canopy cover target would be lower than under alternative A by approximately 10 percent. The remaining 87 percent of acres would be treated the same under both alternatives. Under alternative D, 37 additional acres would be mechanically thinned that are not proposed under alternative A; however, 34 acres would be excluded from mechanical thinning because these areas would become group selections, resulting in a net increase of 3 acres. Group selections would take place within mechanical thinning units, reducing the acreage of radial thinning by 10 acres and mechanical thinning with mixed conifer stands and plantations by 24 acres. Groups would result in greater removal of trees than thinning treatments. Alternative D would be marginally more effective in meeting desired conditions.

Mechanical thinning would result in the reduction of stand densities under all action alternatives (Table 31). Alternative D would be slightly more effective at reducing stand densities, but this benefit would be restricted to the 98 acres in which thinning would be heavier under alternative D. Under alternatives A and D, density reductions would occur in the small and intermediate size classes as a result of the removal of trees from the understory as well as the midstory. The reduction in densities under both alternatives would not only reduce ladder fuels, but would also improve residual tree vigor, growth, and development into larger size classes. Alternative D would decrease stand densities in terms of trees per acre and basal area per acre more than alternative A by approximately 4 percent and 0.5 percent averaged across all treatment areas, respectively. However, within the 98 acres in which thinning would be heavier under alternative D, trees per acre removed would be approximately 10 percent more than under alternative A, and basal area per acre removed would be approximately 15 percent more than under alternative A. All pine plantations would be reduced to below the 150 square feet per acre threshold post-treatment under both alternatives. In mixed conifer stands, approximately 21-23 percent of stands would be reduced to below the 200 square feet per acre threshold. Although alternative D is less effective in reducing mixed conifer stand basal area to below the threshold than alternative A, average post-treatment basal area would be lower. This would bring stands closer to the desired basal area threshold but not below it. Competition would persist under both alternatives, and mortality could be expected to continue. Both alternatives would retain approximately 88 percent of trees greater than 20 inches DBH.

Forest insects and disease would continue to occur within mixed conifer stands on the landscape as not all of these stands would be thinned sufficiently to meet desired conditions. However, the significant reduction in tree densities (approximately 60-65 percent reduction in trees per acre) would increase available nutrients and growing space for residual trees, increasing their vigor and resilience to these disturbances. The movement towards desired conditions would still benefit the landscape even if desired conditions would not have been completely met.
Relative stand densities would be decreased below the 60 percent threshold immediately post-treatment in approximately 55-59 percent of stands under both alternatives, decreasing the risk of mortality from forest insects, pathogens, wildfire, and drought. Alternative D would reduce relative stand densities to desired levels in slightly more stands than alternative A. Within the 98 acres in which thinning would be heavier under alternative D, relative density would be decreased by approximately 10 percent more than under alternative A. Residual stands under both alternatives would be more resilient to disturbances in the future. Within 20 years, both alternatives would result in 73-78 percent of stands remaining below the 60 percent relative density threshold. Alternative D would maintain more stands under the threshold.

Alternative C would be least effective in meeting desired conditions. Stand densities would be reduced primarily in the understory, small diameter trees. Large and intermediate trees would not be treated, allowing forest health issues to persist and competition-related mortality to continue. All pine plantations would remain above the basal area threshold, and 11 percent of mixed conifer stands would meet desired conditions. One hundred percent of stands would remain above the 60 percent relative stand density threshold, and within 20 years 24 percent of stands would be below the threshold. Stand development would continue at a hindered rate, and landscape resilience would decrease as forest susceptibility to insect outbreaks, pathogen infections, wildfires, and drought increased.

Composition

Species composition would be beneficially affected under both Alternatives A and D (Table 32), as an increase in open-canopy conditions and the preferential retention of shade-intolerant species favor the establishment, growth, and development of shade-intolerant species. Under both alternatives A and D, the component of shade-intolerant species would increase by an average of 3 percent. Alternative A would be more effective in improving species composition as the greater range in canopy cover targets would allow more flexibility to retain desirable species. The higher amount of understory treatments, including mastication, hand thinning, and mechanical biomass removal, would allow for greater removal of shade-tolerant species which dominate the understory. Alternative C would be least effective in meeting desired conditions. Although shade-intolerant species composition would increase in alternative C the most, this would be due to the fact that the majority of removed trees would be shade-tolerant understory trees, keeping all overstory shade-intolerant species, and that some small to medium size shade-intolerant species would be removed in alternatives A and D. These trees contribute more to basal area than sapling size trees, and thus their removal would impact species composition (which is measured as a proportion of total basal area). As Table 33 shows, this increase in shade-tolerant composition would be limited to fewer acres as compared to alternatives A and D. Future shift in species composition would be limited by the continuation of growing conditions favoring shade-tolerant species.
Landscape Heterogeneity

Under both alternative A and D, a portion of the treated stands would be converted to open-canopy conditions. Alternative D would convert 8 percent more acreage to open-canopy conditions as compared to Alternative A. Quadratic mean diameter would increase by year 30 by an average of 35-38 percent (Table 33). Under alternative D, the additional 37 acres proposed for mechanical thinning are currently characterized as CWHR size class 4 with moderate canopy cover, and would remain the same after treatment. CWHR distribution would not differ greatly within mechanical thinning treatment areas between alternatives A and D. Large diameter trees would be enhanced under both alternatives, and development of later seral stand structures would be promoted. Alternative D would create more open-canopy conditions at the landscape scale, but would provide less heterogeneity in stand structure. Under alternative A, canopy cover within treatment units would range from 30 to 60 percent, allowing for adaptability when encountering differing stand conditions and resulting in a widely varying heterogeneous landscape. Under alternative D, canopy cover within treatment units would range from 30 to 50 percent, creating a more limited variety of stand conditions than under alternative A.

Alternative C would be least effective in meeting desired conditions. No open-canopy conditions would be created, and quadratic mean diameter would increase by 48 percent within 30 years as a result of maintaining closed canopy conditions that would prohibit development of a new age cohort (Table 33). Large diameter trees would continue to develop and eventually die but would not be replaced due to the lack of a younger cohort. Landscape heterogeneity would continue to be lacking as conditions favoring shade-tolerant species would persist and closed-canopy, mid-seral stand structures would continue to comprise the majority of the landscape.

Group Selection – Structure, Composition, and Landscape Heterogeneity

Only alternative D would implement group selection harvest as directed by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act)(USFS 1999a, b) to “test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and improve and maintain ecological health of the forest.”

The group selection silvicultural system is an uneven-aged management system designed to create small, even-aged patches to mimic natural disturbances such as insect outbreaks, root disease pockets, and windthrow. Each group represents a different age class, and all age classes are represented equally within a stand. This treatment converts the group to early seral stand structure with an open canopy of large trees. Open canopy conditions would favor establishment, growth and development of shade-intolerant species such as Jeffrey/ponderosa pine and sugar pine. Group selection size would vary between 0.5 acres and 2 acres, averaging 1.7 acres. Group selections are proposed on 35 acres of the project area, or approximately 4 percent of eligible areas. This amount increases to 9.5 percent of eligible areas when the 47 acres of group selections from other nearby projects are accounted for. Eligible treatment areas take into account sensitive
recreation areas such as homes, campgrounds, the PCT and surrounding areas where group selections would not be placed.

Trees less than 30 inches DBH would be removed; however, black oaks would not be removed, and healthy, vigorous shade-intolerant trees less than 30 inches, if available, may be retained. The increase in light reception on the ground would favor establishment and development of shade-intolerant species.

Site preparation and regeneration needs would be evaluated after harvest. Group selections requiring natural and activity slash treatment would undergo “site preparation” via machine piling, brush raking, hand piling, and/or underburning to clear any activity slash and debris that would prevent site regeneration.

Both artificial and natural regeneration would be used to reforest group selection units. A combination of natural and artificial would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. Those units requiring artificial regeneration would be planted with a mix of species native to the ecological forest type. Species to be planted would include Jeffrey pine, ponderosa pine, rust-resistant sugar pine, Douglas-fir, and incense cedar. Natural regeneration would be used for incense cedar, white fir, and red fir species. This regeneration method would have a major beneficial effect on enhancing desired species composition on both the stand and landscape scales.

After establishment of regeneration, release treatments (manual grubbing and/or pre-commercial thinning) would be used to reduce competing vegetation to favor the growth and development of desired species. Without release treatments, shrub and naturally regenerated tree species would likely compete with desired species and slow the growth and development into subsequent seral stages. Over time, these treatments would contribute to the development from seral stages CWHR SMC 1 and 2 to CWHR 3, represented by a quadratic mean diameter greater than 6 inches.

Group selection treatments would only occur under alternative D. Group selection treatments would occur in CWHR 4 stands and would total 34 acres. All other alternatives do not propose group selection treatments, but either propose thinning to 30 – 60 percent canopy cover or do not propose any treatment on these 34 acres. Generally, more trees would be removed under alternative D on these 34 acres. Effects on stand structure (Table 31) would be focused on a small localized scale but the major benefits of this treatment would be realized at the landscape scale. Group selections would increase structural and compositional diversity across the landscape by converting mid-seral closed-canopy conditions into early-seral open-canopy conditions favoring the establishment, growth, and development of a new age cohort of shade-intolerant species. These individuals would develop into seed sources to continue the shift in species to shade-intolerants beyond the scope of this analysis. This increase in landscape heterogeneity would be tempered by the existing group selections already present on the landscape from nearby vegetation management projects (Meadow Valley Project, Arrarat Project, Grizzly Project, On Top Project). Although alternatives A, B, and C do not propose group selections under the Bucks
Lake Project, the presence of group selections on the landscape and within the project area from nearby projects does not exclude the landscape from experiencing similar benefits. **Prescribed Fire - Structure, Composition, and Landscape Heterogeneity**

The effects of prescribed fire treatments in all action alternatives are expected to be the same. Prescribed fire treatments would reduce trees per acre by causing fire-induced mortality primarily in the 1 to 10 inch diameter classes and some mortality in the 10 to 20 inch diameter classes. Mortality in the larger diameter classes may occur as the result of torching and/or delayed conifer mortality as a result of fire-damage and subsequent bark beetle attack.

Implementation of prescribed burning treatments would have a negligible to minor effect on species composition and landscape heterogeneity. However, prescribed fire treatments are the first step in the process of re-introducing fire into landscapes that have not burned for decades. Multiple entries of prescribed or natural fire may favor fire adapted shade-intolerant species over decades if not a century. Creation of openings and gaps in the canopy also favor establishment of shade-intolerant species that may grow into overstory codominant/dominant trees in the future. According to the HFQLG Final Supplemental EIS (page 19), overall, the overstory canopy would not be affected by underburning, although torching of individual or small groups of trees would occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels can occur together. Torching may result in gaps in the canopy typically less than 0.5 acre in size. Localized torching from underburning would occur, thereby creating small openings in the overstory where shade-intolerant species may become established and grow, depending on size.

Prescribed fire treatments would be similar in intensity for all action alternatives, but the scale of these treatments would vary by alternative. Alternatives A and C propose to treat 704 acres with prescribed fire; alternative D proposes to treat 358 acres with prescribed fire. Alternative D would be least effective in meeting desired conditions and reintroducing fire as an ecological process on the landscape.

**Aspen Treatments**

Aspen treatments would occur under alternative A on approximately 11 acres, and would increase the component of aspen, a shade-intolerant species, on the landscape. Creation of aspen stands would also benefit the landscape by increasing the diversity of stand structures within the project area by converting conifer-dominated areas to aspen. Treatments would include a combination of piling existing downed material, underburning, and removing competing conifers via hand thinning or mechanical thinning. Reduction in stand densities would vary from stand to stand depending on existing conditions. Species diversity would be improved by the enhancement of aspen growing conditions. Effects would be highly localized and occur on a small scale. These treatments would occur in small patches varying in size from a fraction of an acre to three acres, resembling group selections and increasing landscape heterogeneity. Alternatives B, C, and D do not propose aspen treatments, and therefore would not experience the associated benefits. Group
selections under Alternative D would create small openings as well, but would be intended to regenerate conifers instead of aspen.

**Hazardous Tree Removal**

Removal of hazardous trees threatening designated roads and developed facilities would occur throughout the project area under Alternatives A and D. Determination of hazard trees would follow guidelines established in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2007). This would result in incidental removal of trees, potentially greater than 30 inches DBH within campgrounds, that exhibit signs of structural failure or potential for falling, including trees infected with root rot. The creation of single-tree openings may incidentally increase open-canopy conditions favorable to shade-intolerant species, but these effects would generally be limited to the immediate vicinity of tree removal. The incidental removal of trees would not noticeably affect forest vegetation structure, composition, or heterogeneity at the stand and landscape scale. Within inaccessible area, hazard trees would be dropped on the ground and left in the woods. Alternative D would leave 134 acres more of drop and leave, which would increase the number of hazard trees left on the ground. This would increase nutrient cycling rates, but would not noticeably influence vegetation structure, composition, or landscape heterogeneity. Under Alternatives B and C, hazard trees would not be removed, and the threat of injury to people and facilities would persist. Root rot infected trees would remain, serving as sources of future infections of root rot and other pathogens present in the tree, e.g. dwarf mistletoe.

**Borax Treatments**

Borax, a registered borate compound that helps reduce the chance of *Heterobasidion* root disease infection, would be applied in alternatives A and D to conifer stumps greater than 14 inches in diameter in fuel treatment areas within 24 hours of cutting. In developed recreation sites, borax would be applied to conifer stumps greater than 3 inches in diameter within 24 hours of cutting. Application of Borax would not affect stand structure, species composition, or landscape heterogeneity directly. It would help reduce future spread of *Heterobasidion* root disease and would help protect the development of desired conditions from adverse affects of root disease-related mortality. Alternative B and C do not propose applying borax. In alternative C, creation of stumps from thinning activities would create stump surfaces suitable for infection and spread of the root disease. This could result in potential negative effects to host species within treated areas, including mortality. The ability of *Heterobasidion* root disease to persist in infected sites for long periods of time may allow it to negatively affect forested stands into the future.

**Watershed Improvements**

Watershed improvements would be highly localized and might result in the incidental removal of trees. The treatments would not noticeably affect forest vegetation structure, composition, or landscape heterogeneity.
All Alternatives – Cumulative Effects

Cumulative Effects Common to All Alternatives

The cumulative effects of past management practices, including wildfire suppression, and natural disturbances, such as wildfires and insect and disease outbreaks, have largely influenced the forest vegetation that is present today. Past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. These activities have had major localized impacts at the stand level by converting mid to later seral forest to early seral structure; however, on the landscape scale, this has had for the most part a negligible impact due to the dispersed nature of these projects and their size relative to the analysis area. Cumulative effects of all alternatives are summarized in Table 34.

Past wildfires, on the other hand, have influenced a large proportion of the analysis area and greatly shaped the vegetation existing today. Wildfires that burned in the 1950s and 60s were salvage harvested, site prepped, and planted with Jeffrey pine and are now characterized by CWHR size class 3. Prescribed underburning within the analysis area as a component of other projects has occurred and would continue to occur in the future as part of fuel reduction projects.

Since the late 1990s, activities compliant with the Herger-Feinstein Quincy Library Group Act, including construction of Defensible Fuel Profile Zones, area thinning, and group selections, have been implemented within the analysis area. Because the Bucks Lake Project area is located near the District boundary between the Mount Hough and Feather River Ranger Districts, several present and future projects lie within the analysis area. Recent projects include the Meadow Valley Project and the Basin Project. Prior to the enactment of the HFQLG Act, even-aged silvicultural systems were utilized with a primary focus on overstory removal and sanitation or salvage harvest on easily accessible terrain of desirable timber species, namely ponderosa pine and sugar pine. These practices resulted in promoting closed-canopy, high-density stands of small trees dominated by shade-tolerant species. Medium to large diameter shade-tolerant species trees exist in many inaccessible stands with varying frequency as remnants of selective harvest activities.

Christmas tree cutting and firewood collection would likely have an adverse effect on regeneration and snag levels, particularly within localized areas around main roads. Levels of regeneration and snags outside of the main road corridors are unlikely to be affected due to recruitment in untreated areas and lack of access. Due to the seasonal and dispersed nature of these activities, there would be a negligible effect across the analysis area.

Resource-specific projects and activities such as wildlife, watershed, recreation, range, botanical, minerals, and special uses would have localized and dispersed effects that would be negligible at the landscape level. Wildlife and watershed improvement projects that would improve wildlife habitat or riparian characteristics would increase heterogeneity across the landscape. Cultural activities such as site preparation, planting, release, and mastication would
enhance early seral stand structures and encourage their development into mid and late seral structures.

Fuel reduction projects on private lands would include non-commercial thinning of understory trees. Effects from these small projects would be highly dispersed and localized, and would not affect overstory trees. They would promote open-canopy conditions with reduced stand densities of smaller diameter trees. Timber harvesting operations on neighboring private lands would also occur with higher potential to affect overstory trees. Approximately 10 percent of the landscape has been recently harvested on private lands. These activities would generally remove more overstory trees and result in open-canopy conditions. Herbicide use on private lands to control understory shrub component in plantations and noxious weed treatments decrease competition and increase tree growth.

Larger vegetation management projects would include the Meadow Valley Project and the Basin Project. These larger scale projects would include DFPZ construction, commercial thinning, group selections, as well as fuel reduction activities to reduce understory densities. These projects would have greater capacity to affect overstory trees within the analysis area, but occur on approximately 2 percent of the analysis area. Group selections would convert mid to late seral stands to early seral stands on less than 1 percent of the analysis area. These activities increase open-canopy conditions and heterogeneity on the landscape on a small scale.

Future DFPZ maintenance activities may occur within the analysis area as mandated by 2003 HFQLG Final Supplemental EIS and Record of Decision, in combination with the original HFQLG Act final EIS and Record of Decision. Activities would maintain an open understory with decreased amounts of brush, natural regeneration, and surface fuels. These activities may reduce incidental numbers of snags, but may also induce snag recruitment through incidental tree mortality, particularly in prescribed fire treatments. Cumulative effects of DFPZ maintenance activities would include reduced tree regeneration and no establishment of a new age cohort, but also maintenance of an open canopy stand dominated by large diameter trees.

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Cumulative Effects of Alternative A

The combinations of treatments discussed above are reflective of the land management values and guidelines that decision-makers rely on. An emphasis on large tree retention, species and structure diversity, resilience to disturbance and change, and restoration of ecologically important processes such as fire drive proposed activities under Alternative A.

Throughout the project area, large tree retention, growth, and vigor would be one of the main focuses of management activities and cumulative effects would include the maintenance and development of large trees. Thinning from below would remove smaller diameter trees, providing more growing space for the large residual trees and enhancing growth of codominant and intermediate trees into larger diameter classes. Radial thinning would highlight large diameter trees within stands resulting in increased growth and vigor. Retention of these large trees would allow for snag recruitment in the future through natural mortality; however, snag removal would also occur for operational and recreational safety as a main purpose and need within the Bucks Lake recreational setting. The cumulative effect would be a reduction in snag levels within treatment areas to minimum retention levels as directed by the 2004 SNFPA (USDA 2004b).

Preferential removal of shade-tolerant species and retention of shade-intolerant species would favor the establishment and growth of shade-intolerant species, which are lacking in the project area. Variable thinning prescriptions with more open canopy gaps between clumps of retained large trees and canopy openings would provide favorable conditions for the establishment and growth of shade-intolerant species. The cumulative effects would include maintaining and promoting species diversity, which would increase forest resilience to insect and pathogen outbreak, drought, and wildfire.

Actions proposed under alternative A would result in the reduction of small and intermediate size trees through thinning, masticating, and burning. The cumulative effects would include a reduction in stand densities, particularly of the smaller tree sizes. Decreased stand densities would allow more resources and growing space for residual trees, reducing competition-related stress.
Forest insect and pathogen infestations would continue to occur, but risk of mortality from these agents would be decreased by reducing densities and increasing residual tree vigor. Natural disturbances such as wildfire and drought would continue, with varying frequency due to continued wildfire suppression and climate change. The cumulative effect would include an increase in forest resilience to insects, pathogens, drought and wildfire.

Stand structure within treatment units would become less dense, have increased open canopy conditions (Table 34), and have increased horizontal and vertical heterogeneity. Open-canopy stands would promote vigor and growth of trees, enhancing development of these stands into later seral stages. Retention of clumps of large trees and areas with higher canopy cover coupled with areas of lower canopy cover and openings around legacy trees result in a cumulative effect of increased heterogeneity across the landscape. Removal of smaller diameter trees to enhance large tree growth and the promotion of regeneration by opening the canopy would result in a cumulative effect of increased structural heterogeneity within stands. The majority of the CWHR change would be the result of converting moderate- and dense-canopy cover stands to open-canopy stands, and would amount to 190 acres. The majority of the landscape would remain unchanged (Table 34).

**Cumulative Effects of alternative B**

Alternative B would not meet the purpose and needs discussed in Chapter 1. No treatments would be implemented, and the current stand structure, composition, and landscape structure would remain unchanged (Table 34).

High densities of stands would persist and become exacerbated over time as density further increases through growth. Tree vigor and health would decline as competition for nutrients and growing space increased. Susceptibility to insects, disease, and drought would increase and risk of large scale mortality would increase. Forest health issues, such as root disease, dwarf mistletoe, cytospora canker, and bark beetles, would continue to cause mortality and prevent the development of multistory, all-aged forest stands. Shade-tolerant species currently dominate both true fir and mixed conifer stands in the project area. The high stand densities and closed-canopy further shift species composition towards shade-tolerants by favoring the regeneration of these species. Species diversity would decrease and stand resilience to forest insects, pathogens, fire, and drought would be diminished.

Mid-seral, closed-canopy stands, typified by CWHR size class 4 and moderate canopy cover, currently dominate the landscape (Figure 7). This homogenization of stand structure across the landscape would be maintained by alternative B. Development of early seral stand structure would rely on natural occurrences of density-dependent mortality caused by fire, insects, pathogens, and competition. Late seral stand structure would develop slowly, retarded by competition-related forest health issues. Overall, the landscape under alternative B would not be shifted towards desired conditions.

**Cumulative Effects of alternative C**
The cumulative effects of alternative C would include reduced stand densities; however, due to the diameter limit of 10 inches DBH, density reduction would be limited to the understory trees. Cumulative effects would include the maintenance and development of large trees as all intermediate and large diameter trees would remain. Development of residual trees into larger size classes would be limited by high residual stand densities that decrease growth and vigor. Forest health purpose and needs would not be met completely, as stand densities would remain high and competition-related mortality would continue. Insects, pathogens, wildfires, and drought would persist within the stands and contribute to mortality. Conditions favorable to the establishment and growth of shade-intolerant species would not be promoted as canopy cover would remain closed (moderate and dense) and overstory seed sources for shade-tolerant regeneration would remain. Snag retention and recruitment would be maintained by the 10 inch DBH limit and the continuing mortality throughout the stands. Enhancement of horizontal and vertical heterogeneity across the landscape and within stands would be limited as Alternative C would prevent creation of gaps, openings, and clumps of large trees. Stand structure of intermediate and large trees would remain unchanged, not addressing forest health objectives nor creating a landscape resilient to disturbance. As Table 34 shows, CWHR distribution would not be changed, continuing the imbalance of seral stages across the landscape.

**Cumulative Effects of alternative D**

An emphasis on large tree retention, species and structure diversity, resilience to disturbance and change, and restoration of ecologically important processes such as fire drive proposed activities under Alternative D.

Throughout the project area, large tree retention, growth, and vigor would be one of the main focuses of management activities and cumulative effects would include the maintenance and development of large trees. Thinning from below would remove smaller diameter trees, providing more growing space for the large residual trees and enhancing growth of codominant and intermediate trees into larger diameter classes. Radial thinning would highlight large diameter trees within stands resulting in increased growth and vigor. Retention of these large trees would allow for snag recruitment in the future through natural mortality; however, snag removal would also occur for operational and recreational safety as a main purpose and need within the Bucks Lake recreational setting. The cumulative effect would be a reduction in snag levels within treatment areas to minimum retention levels as directed by the 2004 SNFPA (USDA 2004b).

Preferential removal of shade-tolerant species and retention of shade-intolerant species would favor the establishment and growth of shade-intolerant species, which are lacking in the project area. Variable thinning prescriptions with more open canopy gaps between clumps of retained large trees and canopy openings would provide favorable conditions for the establishment and growth of shade-intolerant species. Group selection treatments would create open-canopy conditions favorable to the establishment, growth, and development of shade-intolerant species. Retention of healthy, vigorous shade-intolerant trees and the planting of native shade-intolerant
species would further enhance this desirable species component. The cumulative effects would include maintaining and promoting species diversity, which would increase forest resilience to insect and pathogen outbreak, drought, and wildfire.

Actions proposed under Alternative D would result in the reduction of small and intermediate size trees through thinning and burning. The cumulative effects would include a reduction in stand densities, particularly of the smaller tree sizes (Table 31).

Forest insect and pathogen infestations would continue to occur, but mortality from these agents would be decreased by reducing densities and increasing residual tree vigor. Group selection treatments would immediately remove unhealthy declining trees and increase species diversity with non-host species, reducing future impacts of insects and pathogens. These natural and endemic disturbances would continue, with varying frequency due to continued wildfire suppression and climate change. The cumulative effect would include an increase in forest resilience to insects, pathogens, drought and wildfire.

Stand structure within treatment units would become less dense, have increased open canopy conditions (Table 34), and have increased horizontal and vertical heterogeneity. Open-canopy stands would promote vigor and growth of trees, enhancing development of these stands into later seral stages. Group selection treatments would increase seral stand structure distribution across the landscape by increasing the early seral stage component. This would increase the early seral stage component on the landscape by 35 acres (Table 34). Retention of clumps of large trees and areas with higher canopy cover coupled with areas of lower canopy cover, openings around legacy trees, and group selections result in a cumulative effect of increased heterogeneity across the landscape. Removal of smaller diameter trees to enhance large tree growth and the promotion of regeneration by opening the canopy would result in a cumulative effect of increased structural heterogeneity within stands. The majority of the CWHR change would be the result of converting moderate- and dense-canopy cover stands to open-canopy stands, and would amount to 206 acres. The majority of the landscape would remain unchanged (Table 34).

Comparison of Alternatives

The effects of all alternatives are examined through changes in stand structure, species composition, and vegetation distribution as characterized by CWHR size and density classes and are presented in Table 31, Table 32, and Table 34. Measurement indicators used to compare alternatives are presented in Table 33. Past activities are encapsulated in the existing conditions and present and future projects on the landscape are expected to have a minor effect on vegetation distribution. These effects would most represent the cumulative effects of alternative B. All treatments under action alternatives would follow all safety and resource protection measures, and no treatments are proposed within the Bucks Lake Wilderness Area.

Under alternative B no actions would occur and current trends of stand structure and composition would continue. Minor changes in CWHR distribution would come as the result of present and future projects that occur on the landscape. Closed-canopy conditions coupled with
high stand densities and a lack of shade-intolerant species would persist in the majority of the landscape on federal lands (Table 33), though a large portion of the private lands have been converted to open-canopy conditions. Tree vigor would continue to decline, leading to risk of competition-related mortality from insects, pathogens, and drought. Growing conditions favoring shade-tolerant species establishment and growth would perpetuate these stand characteristics, homogenizing the landscape and increasing susceptibility to natural disturbances such as insect outbreaks, pathogen infections, drought, and wildfire. The landscape would not shift towards desired conditions in terms of stand structure, species composition, and landscape heterogeneity.

Alternative C would meet the fuels reduction purpose and need, but would not address forest health issues. Conditions would be shifted towards desired conditions in terms of species composition and QMD, but other aspects of the landscape would not experience any shift towards desired conditions. CWHR distribution would not change as compared to Alternative B, as treatments under alternative C would be designed to reduce understory vegetation and ladder fuels, affecting overstory trees very little. These treatments may modify stand-level vertical heterogeneity, but without the ability to remove intermediate size trees, the opportunity to increase landscape-level horizontal heterogeneity would be limited. Closed-canopy conditions would persist, creating understory conditions favoring establishment, growth, and development of shade-tolerant species. Stand densities would be decreased, but this decrease would be limited to understory trees. Overcrowded conditions of mid and overstory trees would continue (Table 33). Forest health issues such as insect attacks and pathogen infections would continue to cause mortality and hinder development of the trees into larger size classes. These effects prevent alternative C from fully meeting the forest health purpose and need. Although alternatives A, C, and D reduce fuels and the risk of high severity wildfire within the project area and the WUI, a mosaic of fire severity patches (including high severity fire) may still occur on the landscape as much of it remains untreated.

Alternatives A and D have the largest effect on vegetation distribution as a result of the ability to remove intermediate size trees. Treatments would allow for the creation of more open canopy conditions as well as the maintenance of closed-canopy, late seral stand structures. The flexibility in prescriptions would increase stand-level vertical heterogeneity through the retention of intermediate and large trees, as well as landscape-scale horizontal heterogeneity through various levels clumps and openings. Under alternative D, canopy cover post-treatment would range from 30 – 50 percent across all stands, while under alternative A, the range would be 30 – 60 percent. This increased retention range would be implemented on 13 percent of the treatment units, resulting in a greater diversity of canopy conditions in those designated stands, but would not greatly influence landscape-level diversity. Both alternatives would increase conditions favoring shade-intolerant species establishment, growth, and development. Reduction of stand densities in the under and midstory would meet the fuels reduction as well as the forest health purpose and need (Table 33). Increased tree vigor would encourage growth into larger diameter sizes and reduce risk or mortality from insects, pathogens, drought, and wildfire. Greater structural
diversity would create a landscape resilient to changes that might occur in the future. Although snags may be removed under both alternatives for safety or fuels reduction, snag levels would meet minimum retention levels as directed by the 2004 SNFPA (USDA 2004b), and the retention of medium and large diameter trees would allow for future recruitment.

Alternative D would result in slightly more removal of intermediate size trees on 13 percent of the mechanical thinning units and much more removal within group selections. This would decrease canopy cover slightly more than under alternative A. Group selection treatment under alternative D would create open canopy, early seral stand structure, resulting in a large increase in CWHR 1 component. This effect is the major difference between alternative A and D. Under alternative A, no group selection treatments were proposed because of public comments received and the recreational and aesthetic values of the project area; however, aspen treatments would closely resemble group selections despite their intent to promote conversion to aspen stands. Present and future projects on the landscape that propose group selections have already been completed or are currently under contract, and would result in 47 acres of CWHR 1 creation. The 35 additional acres under the Bucks Project would increase CWHR 1 component by 75 percent. The majority of the CWHR change would be the result of converting moderate- and dense-canopy cover stands to open-canopy stands, and would amount to 190-206 acres (Table 33). The majority of the landscape would remain unchanged. Alternative D would be more effective at creating a more balanced distribution of seral stages across the landscape; however, under Alternative A the presence of group selections on the landscape and within the project area from nearby projects does not exclude the landscape from experiencing similar benefits though at a lower scale.

Compliance with the Forest Plan and Other Direction

All action alternatives were designed to fully comply with the Plumas National Forest LRMP (USDA 1988) as amended by the Herger-Feinstein Quincy Library Group FSEIS and ROD (USDA 1999a, b; USDA 2003a, b) and the Sierra Nevada Forest Plan Amendment FSEIS and ROD (USDA 2004a, b). All prescriptions comply with table 2 (page 69) of the Sierra Nevada Forest Plan Amendment ROD (USDA 2004b) which provide the standards and guidelines applicable to the HFQLG pilot project area for the life of the pilot project. In addition, prescriptions under all action alternatives are designed to comply with the National Forest Management Act (NFMA) of 1976.

Hydrology and Soils

Introduction

A cumulative impact, as defined in 40 CFR 1508.7 is

the impact on the environment which results from the incremental impact of the action when added to other past, present, and foreseeable future actions regardless of what
agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ, 1971).

Cumulative impacts may occur off-site and, in the case of the water resource, may affect downstream beneficial uses of water. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple management activities within a watershed (USDA, 1988a).

Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation, and domestic water supplies. New information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects (Menning, 1996; McGurk & Fong, 1995), as well as the downstream physical effects.

Soil quality indicators analyzed are soil productivity and soil hydrologic function. Several soil quality measures have been developed to support analysis of these indicators, including effective soil cover, soil porosity and compaction, and surface organic matter. The geographic scope of the soil quality analysis is generally limited to the footprint of the proposed vegetative treatment units. Changes to soil productivity are not expected to occur outside of the proposed treatment units. To a limited extent, effects associated with changes to soil hydrologic function could potentially extend outside of the units.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Direction Relevant to the Project as it Affects Soil Resources

National Forest Management Act (NFMA) of 1976 (which amended The Forest and Rangeland Renewable Resources Planning Act of 1974)

As described in Forest Service Manual Chapter 2550 (USDA, 2009b), this authority requires the maintenance of productivity and protection of the land and, where appropriate, the improvement of the quality of soil and water resources. NFMA specifies that substantial and permanent impairment of productivity must be avoided.

Plumas National Forest Land and Resource Management Plan (LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA, 1988a) establishes standards and guidelines to prevent significant or permanent impairment of soil productivity, including:

- During project activities, minimize excessive loss of organic matter and limit soil disturbance according to Erosion Hazard Rating (EHR): for low to moderate EHR, conduct normal activities; for high EHR, minimize or modify use of soil disturbing activities; for very high EHR, severely limit soil-disturbing activities.
• Determine adequate ground cover for disturbed sites during project planning on a case-by-case basis. Suggested levels of minimum effective cover are: for low EHR, 40 percent; for moderate EHR, 50 percent; for high EHR, 60 percent; and for very high EHR, 70 percent. These suggested levels are adopted as the LRMP ground cover standard for the Bucks Project.

• To avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Permanent landings and skid trails do not exist within the project area and the Bucks Project does not propose such permanent features.

Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)
The SNFPA ROD (USDA, 2004) amends the Plumas National Forest LRMP and includes a standard and guideline for large down wood and snags:

• Determine retention levels of large down woody material on an individual project basis. Within westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large wood per acre. Within eastside vegetation types, generally retain an average of three large down logs per acre. For the Bucks Project, the retention level of large down woody material is 10-15 tons of large wood per acre (refer to the Affected Environment or Existing Condition sections below).

National Forest Service Manual for Soil Management
Forest Service Manual 2550 (USDA, 2010a) establishes the management framework for sustaining soil quality and hydrologic function while providing goods and services outlined in Forest land and resource management plans. Primary objectives of this framework are to inform managers of the effects of land management activities on soil quality and to determine if adjustments to activities and practices are necessary to sustain and restore soil quality. Soil quality analysis and monitoring processes are to be used to determine if soil quality conditions and objectives have been achieved. Generally, soil management standards and guidelines are not applied to administrative sites or dedicated use areas such as roads and campgrounds.

Forest staff is to determine soil quality indicators and measures that are appropriate for the proposed activities. Most soil quality indicators are observations and measurements taken at the soil surface and in the upper mineral soil since this region of the soil profile strongly influences soil hydrology and long term soil productivity. Forest staff is directed to estimate the type, amount, and degree of change to soil indicators that the proposed activity may produce by using appropriate analysis methods, scientific literature, past monitoring results, and knowledge of local site and soil characteristics. In most cases, qualitative estimates of the effects of management activities on soils are considered sufficient to meet analysis objectives.

The major objective of soil quality monitoring is to ensure that ecologically sustainable soil management practices are applied. Soil quality monitoring is to be used to validate and refine
management decisions. Monitoring information collected allows land managers to determine if land management plan desired conditions are being achieved. The focus of project level monitoring is observation and documentation of the implementation of soil protection prescriptions.

Management Indicators and Measurements

For this soil quality analysis, Forest Service staff has developed soil quality indicators and measures that are appropriate for the proposed activities and the site conditions and soil characteristics of the Bucks Lake Hazardous Fuels Reduction Project area. Soil quality indicators analyzed are soil productivity and soil hydrologic function. Several soil quality measures have been developed to support analysis of these indicators. While qualitative estimates of the effects of management activities on soils are generally considered sufficient to meet project analysis objectives, quantitative field survey results are used in this project analysis to support description of the existing condition of soils.

Indicator 1: Soil Productivity

Soil productivity is the inherent capacity of a soil to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses (USDA, 2010a). Important measures of soil productivity include: soil cover, soil porosity, and surface organic matter.

Measure 1: Effective Soil Cover

Effective soil cover consists of low-growing vegetation (grasses, forbs and prostrate shrubs), plant and tree litter (fine organic matter), surface rock fragments, and may also include applied mulches (straw or chips). Without effective soil cover, an intense storm can generate large quantities of sediment from hillslopes (Cawley, 1990). Vegetative cover mitigates accelerated soil erosion by dissipating the energy of falling raindrops through interception. Rain and canopy drip can detach and mobilize soil particles when overland flow occurs. Effective soil cover was measured in field surveys, and the Erosion Hazard Rating (EHR) system was used to quantify the amount of soil cover necessary to prevent detrimental accelerated soil erosion.

Measure 2: Soil Porosity and Compaction

Soil porosity is the volume of pores in a soil that can be occupied by air, gas, or water and varies depending on the size and distribution of the particles and their arrangement with respect to each other. A monitoring strategy was developed in the EIS for the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act (USDA, 1999) and the subsequent monitoring plan has been applied to projects conducted under the HFQLG pilot project, such as the Bucks Project. Implementation of the HFQLG monitoring plan for soil quality measures utilizes a tile-spade sample test that is correlated with measured changes in soil bulk density samples and soil
porosity, with a 10 percent reduction in total soil porosity indicating detrimental soil compaction (USDA, 2008a). For the Bucks Project, this same field survey methodology was used to assess the existing areal extent of detrimental soil compaction at a depth of 4 to 8 inches.

The use of heavy forestry equipment and frequent stand entries increases bulk density and decreases the porosity of soils, which increases the potential for detrimental compaction (Powers et al., 1998). To prevent excessive overland flow and erosion, soil structure and macro-porosity in the top 8 inches of mineral soil for most of the stand area should be similar to the undisturbed, natural condition for the soil type and should provide sufficient infiltration and permeability for the given climate. The degree and extent of susceptibility to compaction is primarily influenced by soil texture, soil moisture, coarse fragments, depth of surface organic matter, ground pressure weight of the equipment, and whether the load is applied in a static or dynamic fashion. Soil compaction and increased soil strength can cause slowed plant growth, impeded root development, poor water infiltration, restricted percolation, increased overland flow during high precipitation events, and can cause plant nutrients to be relatively immobile or inaccessible (Poff, 1996). Recent research suggests that the effect of severe compaction on biomass productivity is highly dependent upon soil texture (Powers et al., 2005).

**Measure 3: Surface Organic Matter**

Soil organic matter consists of living biomass (plant roots, microorganisms, invertebrates, and vertebrate fauna) and dead biomass (dead bark, large woody debris, litter, duff, and humus materials). Soil organic matter is the primary source of plant-available nitrogen, phosphorous, and sulfur; provides habitat for the diverse soil biota that carry out energy transformation and nutrient cycles; contributes to soil structure and porosity of soils; protects soils from erosion; and enhances infiltration and hydrologic function (Neary et al., 1999). Two measures of surface organic matter are analyzed for the Bucks Project: fine organic matter and large down wood. Fine organic material consists of plant litter, duff, and woody material less than 3 inches in diameter. Large woody material consists of down logs that are at least 12 inches in diameter and 10 feet long.

**Indicator 2: Soil Hydrologic Function**

Soil hydrologic function is the ability of the soil to absorb, store, and transmit water, both vertically and horizontally (USDA, 2010a). Infiltration is the rate of water movement into the soil and is determined by soil; texture, cover, and porosity (USDA, 1990). Permeability is the rate at which water percolates or moves down through the soil and is primarily based on soil porosity (USDA, 1990).

Two measures used for the soil productivity indicator (effective soil cover and soil porosity and compaction) are also used as measures for the soil hydrology indicator. The litter layer of soil cover absorbs water, increases storage capacity, and slows the velocity of overland flow. Soil compaction can cause poor water infiltration, restricted percolation, and increased overland flow during high precipitation events (Poff, 1996). The Region 5 Cumulative Watershed Effects Analysis method (USDA, 1995), which utilizes a model for Equivalent Roaded Acres (ERA), is
also used to analyze cumulative effects to soil hydrologic function for the Bucks Project, at a
geographic scale beyond the proposed treatment unit footprints..

**Direction Relevant to the Project as it Affects Water Resources**

**Clean Water Act of 1948 (as amended in 1972 and 1987)**
The Clean Water Act of 1948 establishes as federal policy the control of both point and non-point source pollution and assigns to the states the primary responsibility for control of water pollution.

**State Water Quality Management Plan**
Non-point source pollution on Plumas National Forest has been managed for the past 11 years through the water quality management program contained in *Water Quality Management for Forest System Lands in California* (USDA, 2000). The Best Management Practices (BMPs) contained in that document have recently been improved and replaced by the BMPs presented in a Region 5 amendment to the Forest Service Handbook (see below). The 2000 State Water Quality Management Plan contains the 1981 Management Agency Agreement (MAA) between the California State Water Resources Control Board and the USDA, Forest Service. The State Board has designated the Forest Service as the management agency for all activities on National Forest lands and the MAA constitutes the basis of regional waivers for non-point source pollution.

**Region 5 2011 Amendment to the Forest Service Soil and Water Conservation Handbook**
The Pacific Southwest Region (Region 5) of the USDA-Forest Service has recently adopted an amendment to the Forest Service Handbook, Section 2509.22, Chapter 10 (Water Quality Management Handbook)(USDA, 2011a). This handbook improves and replaces the Best Management Practices presented in *Water Quality Management for Forest Service Lands in California*. The Forest Service water quality protection program relies on implementation of prescribed BMPs. These best management practices are procedures and techniques that are incorporated in project actions and have been determined by the State of California to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. Improvements to Forest Service BMPs, as presented in the 2011 Handbook amendment, include more detailed descriptions of individual BMPs (section 12), a requirement that site-specific BMPs be included in timber sale contracts (section 13), and direction that legacy sites (sites disturbed by previous land use that is causing or has potential to cause adverse effects to water quality) within timber project boundaries will be restored or improved. Additionally, the 2011 Handbook amendment establishes an expanded water quality management monitoring program (section 16). BMPs applicable to the Bucks Project are presented in Appendix G of this EA.
Section 303(d) of the Clean Water Act
This section requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The list of affected water bodies, and associated pollutants or stressors, is provided by the State Water Resources Control Board and approved by the United States Environmental Protection Agency. The most current list available is the 2010 303(d) list (SWRCB, 2010). No water bodies on this list are located within the Bucks Project area. However, the principal watershed (at the HUC-5 scale) affected by the project is Bucks-Grizzly (HUC ID-1802012107), which contains 128,633 acres of the North Fork Feather River watershed. The North Fork Feather River is included on the 2010 303(d) list for mercury and water temperature impairments. The Bucks Project is not expected to affect water temperature, nor legacy deposits or concentrations of mercury in the North Fork Feather River. The 303(d) list describes hydropower modifications, flow regulation and modification as the potential sources for water temperature impairments.

Beneficial Uses identified by the CA Water Resource Control Board (Central Valley Region)
Beneficial uses are defined under California State law in order to protect against degradation of water resources and to meet state water quality objectives. The Forest Service is required to protect and enhance existing and potential beneficial uses (SWRCB, 1998). Beneficial uses of surface water bodies that may be affected by activities on the Forest are listed in Chapter 2 of the Central Valley Region’s Water Quality Control Plan (commonly referred to as the “Basin Plan”) for the Sacramento and San Joaquin River basins (SWRCB, 1998), and are described below for the Bucks Project area.

California Regional Water Quality Control Board Conditional Waiver of Waste Discharge
In January of 2003, the Regional Water Quality Control Board (RWQCB)—Central Valley Region adopted Resolution No. R5-2003-005 that provides for a conditional waiver of the requirement to file a report of waste discharge and obtain waste discharge requirements for timber harvest activities on National Forest System lands within the Central Valley Region. Additional provisions were added in the 2005 Resolution No. R5-2005-0052. This project complies with the Clean Water Act through use of “Best Management Practices” designed to minimize or prevent the discharge of both point and non-point source pollutants from National Forest System roads, developments, and activities. Prior to initiation of any of the Bucks Project action alternatives, the Plumas National Forest would comply with RWQCB waiver requirements per Resolution R5-2005-0052.
The Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)

Appendix E of the SNFPA ROD (USDA, 2004) describes management direction applicable to the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project area. The ROD directs that Scientific Analysis Team (SAT) Guidelines (USDA, 1993) be applied to vegetation management projects in the Pilot Project area per the HFQLG FEIS and ROD (USDA, 1999). No standards and guidelines specific to riparian areas, hydrology, or water resources are presented in Appendix E of the SNFPA ROD. Fuel and vegetation management activities are designed to comply with the standards and guidelines as described in the SNFPA FSEIS and ROD (USDA, 2004)

Herger – Feinstein Quincy Library Group (HFQLG) Forest Recovery Final Environmental Impact Statement (FEIS) and Record of Decision (ROD)

The HFQLG ROD changed direction in the Plumas NF LRMP by requiring application of specific SAT guidelines for riparian management. These SAT guidelines include:

- Application of the following minimum buffer widths for riparian protection and delineation of riparian habitat conservation areas (RHCAs): 300 feet for perennial, fish-bearing streams and lakes; 150 feet for perennial, non fish-bearing streams, ponds and wetlands greater than 1 acre, and lakes; and 100 feet for intermittent and ephemeral streams and wetlands less than 1 acre.
- Prohibition of scheduled timber harvest in RHCAs except for salvage harvest or to meet SAT guidelines for resource management objectives.
- Management of fire and fuel treatments to meet resource management objectives and minimize disturbance of riparian ground cover and vegetation.

The SAT guidelines include ten riparian management objectives (RMOs) for RHCAs. To describe how this project’s proposed timber harvest and fire and fuel treatments meet these objectives, an RMO analysis is provided in Appendix E of this EA.

Plumas National Forest Land and Resource Management Plan (PNF LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA, 1988a) establishes standards and guidelines for protection and maintenance of Forest watersheds, water quality, and water supply, including:

- Implementation of BMPs.
- Establishment of Streamside Management Zones (SMZs) per guidelines in Appendix M of the LRMP. These guidelines were mostly replaced by the SAT guidelines, RHCA width requirements mandated by the HFQLG ROD. However, ephemeral channels without evidence of annual scour and deposition are not addressed by the SAT guideline buffer widths. Therefore, SMZ widths defined in Appendix M of the LRMP are applied to these channels. Recommended SMZ widths for these ephemeral swales range from 0 to 50 feet, depending upon the stability of the swale channel and sideslope.
An SMZ plan is necessary for any activities that will occur within an SMZ, including a description of vegetation management objectives, needed erosion control measures, and an analysis of SMZ areas with over-steepened slopes or very high EHR. The SMZ plan for this project is included Appendix G of this EA.

Effects Analysis Methodology

**Cumulative Watershed Effects Analysis Methods and Assumptions**

There are numerous methods for assessing the effects of land use activities on the landscape (Berg et al., 1998; USDA, 1988a; Reid, 1998). For the purpose of this CWE analysis, the effects of past, present, and reasonably foreseeable future actions were assessed using the Region Five Cumulative Off-site Effects Analysis (USDA, 1988c). Within each subwatershed in the watershed analysis area, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to a theoretical area of road surface, resulting in a measure of Equivalent Roaded Acres (ERA). Numeric disturbance coefficients were used to convert these management effects to ERA effects in terms of the pattern and timing of surface runoff. Coefficients vary by management activity, silvicultural prescription, site preparation method, type of equipment utilized, and fireline intensity.

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. ERA model values are used to track general changes to hydrologic function of watersheds in terms of alteration of surface runoff patterns and timing. In this way, ERA values can serve as an index to assess effects on downstream water quality. An increase in ERA for a watershed indicates increased concentration of surface runoff, which could result in detrimental changes to sedimentation rates and stream channel condition and subsequently have effects on downstream water quality and beneficial uses.

As the amount of land use increases within a watershed, the susceptibility of that watershed to cumulative watershed effects (CWE) increases. There is a point where additive or synergistic effects of the land use activities will cause the watershed to become highly susceptible to CWE. Natural watershed sensitivity is an estimation of a watershed’s natural ability to absorb land use impacts without increasing CWE to unacceptably high levels. Upper limits of watershed “tolerance” to land use are estimated for the ERA model and this upper limit is called the Threshold of Concern (TOC).

For the ERA model analysis, the TOC for each subwatershed is expressed in terms of the percent of the area in a hypothetically roaded condition. The TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. As ERA disturbances approach the TOC, there is an increased risk that soil hydrologic function and downstream water quality and beneficial uses would be impaired. For example,
stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged.

A closer look at the activities planned within an analyzed watershed would be important where ERA values exceed or are approaching the TOC. The TOC for this project was developed by considering the natural sensitivity of the Bucks Lake Hazardous Fuels Reduction Project subwatersheds and the sensitivity of downstream beneficial uses to changes in watershed hydrologic function. Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in Appendix N the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA, 1999). The HFQLG Pilot Project watershed applicable to this project received a ‘low’ sensitivity rating. Examples given in the R5 Soil and Water Conservation Handbook estimate the TOC for watersheds of low sensitivity to be 16 to 18 percent. For this project, the TOC is conservatively estimated to be 14 percent of the watershed area.

**Assumptions:** In calculating the ERA contribution by the proposed harvest activities, all areas of the treatment units were assumed treatable. For example, no compensations were made for rock outcrops, roaed areas, or small-scale slope limitations that would restrict harvest activities. In most cases, such site-specific information was not available. Coefficients were applied to similar activities regardless of soil type, slope conditions, season of operation, or specific equipment characteristics. In calculating ERA contributions due to roads, all roads were considered equally, regardless of surface material (pavement, gravel, or native soil surface). Acres of roads were calculated by assuming that temporary and unclassified roads are 20 feet wide, and all other roads are 25 feet wide. The linear recovery curve (Figure 8) used in this analysis is not necessarily reflective of recovery patterns on the ground. Linear recovery models tend to under-predict effects in the very early stages of recovery, and over-predict effects in later stages of disturbance recovery.
Soil Analysis Methods and Assumptions

In the summer of 2011, the soil and hydrology field crew, under the direction of the District soil scientist, assessed soil productivity measures for all soil types in the proposed treatment units. Linear transects that roughly traversed the slope were drawn on a map, the azimuth of that line was measured and used to navigate across the unit. A minimum of 25 points along the transect were sampled; with intensive data (soil structure/texture, LWD, snags, canopy cover, and coarse fragments) gathered at every fifth point. Though not all units were quantitatively surveyed, site visits were made to all units to verify existing conditions and confirm that the survey units chosen as surrogates had similar soil texture, cover, and condition. For the 9 proposed mechanical harvest units—predominantly hazard tree removal units that could have very little ground disturbance—that were not field surveyed, existing condition information is ascertained by correlating those units with nearby units that were field surveyed. The primary factor in making that correlation is that surveyed and non-surveyed units are situated within the same soil map unit (USDA, 1988b). Past management activities within the surveyed and non-surveyed units were also considered since similar past treatment actions would likely result in similar existing conditions for soil measures such as effective ground cover, large woody material, and detrimental compaction.

The fuel treatment units and area thinning units were sampled using similar methods. Due to the potential ground disturbance, units proposed for mechanical harvest were given the highest priority for soil assessment. Soil-related information was collected in 20 of the proposed Defensible Fuel Profile Zone (DFPZ) units and five of the radial thinning units described in the proposed action. The fuel treatment units were sampled more intensively because the proposed treatments are expected to affect a larger proportion of each treatment unit and there are substantially more of them. The proposed treatments in the radial thinning units are expected to be more dispersed. When implementing group selection, the typical management unit or stand in which growth is regulated consists of an aggregation of groups, not individual groups. To assess soil conditions at an appropriate scale for group selection management, soil surveys were conducted at the scale of the area thinning unit in which the groups are proposed.

Implementation of the HFQLG monitoring plan for soil quality measures utilizes a tile-spade sample test that is correlated with measured changes in soil bulk density samples and soil porosity, with a 10 percent reduction in total soil porosity indicating detrimental soil compaction (USDA, 2010a). For the Bucks Project, this same field survey methodology was used to assess the existing areal extent of detrimental soil compaction at a depth of 4 to 8 inches. The 'spade method' consists of measuring compaction from the resistance felt from sticking a spade shovel at the transect point into the ground. Soil bulk density samples were collected and analyzed on soils found in the project area to calibrate the spade method and assure that the person performing the test properly correlated the resistance felt with threshold soil bulk densities. Subsequently, an 8-
12 inch deep and 6-12 inch wide hole was excavated with the spade to assess whether detrimental compaction exists based upon field indicators of soil compaction.

**Geographic and Temporal Bounds**

**Watershed**

The geographic region defining the watershed analysis area (Figure 9) encompasses four Bucks Project subwatersheds, most of which are contained by the Bucks Creek HUC_6 watershed. Just over 400 acres of analysis subwatershed spill over into the neighboring Grizzly Creek HUC_6. The watershed analysis area is flanked by Bucks Summit on the northeast to McFarland Ravine at the southeast corner. The Mt. Hough Ranger District boundary makes up the southern edge, running along the ridge between Granite Basin (Middle Fork Feather River) and the Bucks Lake Basin, progressing west to Grizzly Creek Campground where it heads north along the ridge above Thompson Lake to the outlet of Lower Bucks Lake. Bucks Mountain above Pat Maloy Ravine is the northwestern corner, the boundary heads southeast to Mill Creek Campground and along the shoreline of Bucks Lake to the confluence of Bucks Creek. The project watershed boundary makes one final ascent north around Whitehorse Creek towards Spanish Peak and finally ties back in to Bucks Summit. Of the 10,675 acre watershed analysis area, 1,872 acres are surface water in the form of Bucks, Lower Bucks, and Thompson Lakes.

Short-term effects would likely be realized within one to two years providing that rainfall is sufficient enough to saturate the soil and potentially initiate overland flow. Long-term effects are projected to last decades, depending on climate variability and other environmental factors. As part of the cumulative watershed effects model, a recovery period of 25 years is assigned to all mechanical treatments (Figure 8), whereas recovery from prescribed fire is usually only 5 years.
Figure 9. Watershed and Soil Analysis Areas

Soil
The scope of the analysis for direct, indirect, and cumulative effects to the soil productivity indicator for all proposed activities is limited to the proposed treatment units (Figure 9). The soil analysis area is made up of the greatest footprint of all proposed treatment units, and totals 1,724 acres. Changes to soil productivity are not expected to occur outside of the proposed treatment units. The scope of the analysis for direct and indirect effects to the soil hydrology indicator is also limited to the proposed treatment units. The geographic scope of the cumulative effects analysis for the soil hydrology indicator extends beyond the treatment unit boundaries, as soil hydrologic function is also analyzed by the cumulative watershed effects analysis.

The current soil conditions observed reflect the cumulative effects of past activities, regardless of when they took place, so there is no definite time frame or limit for the analysis. For example, if multiple activities have occurred in a given treatment unit over the past 50 years, it is not necessarily possible to separate the effects of older treatments from more recent ones. As a result, it is not practical to set a time constraint on those effects. The future timeframe for the soils analysis must extend until the resource has recovered from the impact of the proposed activities. The persistence of soil effects into the future can vary widely. For example, soil cover may
recover within one to two years following a treatment. Soil compaction effects, however, may last for decades (Poff, 1996).

**Affected Environment**

**Watershed Condition**

The existing conditions reflect the aggregate impact of prior human actions and natural events such as wildfire that have affected the environment and might contribute to cumulative effects. The ERA model attempts to accurately account for the cumulative effects of past, present, and reasonably foreseeable actions and combine such effects into a single aggregate ERA value that represents the current condition of each subwatershed. The following discussion does not attempt to recount all possible factors that contributed to the cumulative watershed effects (CWE) ERA analysis or list all human or natural impacts that occurred within the soil analysis area during the analysis timeframe. Instead, it simply focuses on some of the major contributing factors used to calculate the current condition ERA values and assess future effects. The current conditions in the analysis subwatersheds have been impacted by many actions over the last century—specifically mining, grazing, and timber harvesting.

Tractor logging during the 20th century has left noticeable effects on the composition of the timber stands remaining today, including effects on tree species composition, age, and diameter classes. Silvicultural prescriptions included clear cutting, overstory removal, group selection, sanitation, shelterwood, and area thinning, as well as associated activity fuel burning.

There are 1,864 acres in the watershed analysis area that were burned in wildland fires between 1926 and 2011. Both fires occurred in 1926, the same year that construction began on the Bucks Lake dam.

Historically, livestock grazing occurred throughout a large portion of the watershed analysis area. The active Bucks Lake grazing allotment overlaps with 3 out of the 4 subwatersheds, only the Haskins Creek drainage is presently un-grazed.

A legacy of historic logging, mining, and grazing effects are common to many of California’s forested watersheds (Cafferata et al., 2007). More recent forest activities, including fire suppression and development of the transportation system, continue to affect the watershed conditions in this area. Unpaved roads are often considered the primary source of sediment to stream channels (MacDonald & Coe, 2007). Total road density in the watershed analysis area is calculated to be 3.8 miles per square mile of terrestrial land.

Generally, recreational activities occur throughout the entire Bucks Lake Hazardous Fuels Reduction Project area, with concentrated use around and on Bucks Lake and the neighboring wilderness. Dispersed recreational impacts of undeveloped camping areas, firewood cutting, and user-created roads and trails are evident. Off-highway vehicle (OHV) use may contribute to compacted soil conditions where these activities occur. The locations of many user-created features have recently come to light under the national OHV route designation process. The
selection of alternative 5 of the Travel Management EIS allows many of these routes to be incorporated into the ERA assessment for future projects, with actions planned to improve and maintain selected trails (USDA, 2010c). Other recreational activities, such as Christmas tree cutting, hiking and hunting, have negligible effects on the soils or ERA assessment.

**Beneficial Uses**
Existing beneficial uses of surface waters in the Bucks Project area are found in the Central Valley Region Water Quality Control Plan (SWRCB, 1998). The Bucks Project drains to the North Fork Feather River, for which existing beneficial uses include municipal and domestic water supply, hydropower generation, recreation, freshwater habitat, habitat suitable for fish reproduction and early development, and wildlife habitat.

**Forest Vegetation**
Mixed conifer and true fir are the two most common forest types present within the watershed analysis area. Much of the existing forest contains dense ladder fuels and fuel loading up to 100 tons per acre. High fuel loads occur in stands that experienced deadfall of mortality due to a region-wide drought in the late 1980s. High densities of small trees and high fuel loads contribute to high accumulations of ladder fuels and canopy fuels. These fuel conditions are conducive to crown fire initiation and propagation, and increased potential for stand-replacing high-severity fire events. Conditions within riparian habitat conservation areas (RHCAs) are similar to those described above. This includes conifer encroachment within the RHCAs, which has lead to a decline in riparian species that cannot tolerate a completely shaded environment. The high density of small trees makes many RHCAs within the Bucks Project area vulnerable to the effects of severe wildfire because drainages can rapidly funnel hot air upslope, contributing to fire spread. For example, thousands of acres of RHCAs within the Stream Fire of 2001 and the Moonlight Fire of 2007 were severely burned.

**Stream condition**
According to the PNF corporate GIS stream layer, there are 68.6 miles of stream channel; 31.4 miles are ephemeral, 26.5 miles are intermittent and 10.7 miles are perennial. Ephemeral and intermittent streams are seasonal—surface water is present during some portion of the year but are typically dry by late summer. Ephemeral streams only flow in response to storm events or snowmelt, and do not necessarily flow every year. Intermittent streams are seasonally connected to the underlying water table and may flow during all but the driest months, whereas perennial streams typically flow year round. Streams are further classified by their slope—response reaches have low-gradient (less than three percent slope) alluvial conditions. The morphology of response channels reflects depositional processes associated with flowing water. Transport reaches have higher gradient (3 to 12 percent slope), non-alluvial conditions and the morphology of transport channels is generally resilient to change partly due to the presence of exposed bedrock.
As mentioned in the “watershed condition” section above, historic land management activities have noticeably impacted the landscape. This is evident in many of the stream channels that drain the Bucks Project area. Both Bucks Creek and Pat Maloy Ravine show signs of degradation likely associated with historic—and to a lesser extent, present day—grazing practices. Peat accumulations supported by springs or seeps, known as fens, are present throughout the analysis area and support several obligate wetland species, some of which are considered to be rare plants. These special aquatic features, compared to upland forest habitat, are much more susceptible to cattle grazing related impacts.

Riparian vegetation in the Bucks Creek subwatershed is fairly well established and has excellent diversity: willow, alpine knotweed, lady fern, red-osier dogwood, aspen, and alder are all abundant. 1,262 acres were burned in a 1926 fire and subsequently reforested; now 85 year old overstocked pine plantations dominate the northeastern portion of the subwatershed. Prior to the Bucks Lake Wilderness being designated in the early 1980’s, a jeep trail still visible on aerial photos traversed the headwaters of Bucks Creek and provided access to the historic Spanish Peak lookout. Much of this jeep trail is now the Pacific Crest Trail tread.

The Haskins Creek subwatershed has a moderate proportion of private and leased lands with nearly a hundred homes near the valley bottom, most of which are only seasonally inhabited. The south fork of Haskins Creek is a relatively high gradient, alder dominated, tributary with a man-made pond and historic cabin site at the headwaters. Conversely, lodge pole pine and spirea are present in a, nearly 200 acre, low-gradient wetland flat that is the eastern portion of the subwatershed. Willow, aspen, lady fern, and alder are also common riparian species.

The Lakeshore and Pat Maloy Ravine subwatersheds possess all of the lake shoreline within the analysis area, totaling approximately 12 miles of waterfront. Perennial streams support dense alder thickets and isolated aspen stands, as well as spirea and alpine knotweed. Over 90 percent of the private land timber management activities within the watershed analysis area have occurred in the Lakeshore subwatershed. Grazing continues to be a significant factor in shaping existing stream channel stability and associated water quality.

There are roughly 52 miles of existing roads within the watershed analysis area. Although the road network is generally in good condition, a number of poorly located roads contribute to substantial resource damage. These roads generally run parallel to and extremely close to stream channels. Rainfall can run off of road surfaces, carrying sediment into the stream network thus reducing water quality. Culverts can prevent fish from accessing upstream habitat by creating depth, leap, and velocity barriers.

**Precipitation**

Average annual precipitation data from the Bucks Lake weather station, located 3 miles southwest of Bucks Lake at an elevation of 5,750 feet, averaged 88.5 inches of rain between 2004 and 2011 and is representative of the entire watershed analysis area (DWR, 2011).
Precipitation falls primarily as snow above 6,500 feet and as a combination of snow and rain below that elevation. The majority of annual rainfall is characteristic of the Mediterranean climate, with most precipitation occurring between October and May with isolated thunderstorms common during the summer months. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

**Soil Condition**

Forest productivity in the analysis area ranges from moderately productive to non-productive sites (USDA, 1988a). Forest survey site class (FSSC) is a measure of site productivity in cubic feet of wood per acre per year. Site class 1 is the most productive, while FSSC 7 is the least. Site class 7 lands are considered non-productive, and occur in 132 acres of treatment units along ridge tops and steep rocky slopes. Both site class 5 and 6 lands are interpreted as having low productivity, while site class 4 is slightly more productive. Site class 6 occurs on 607 acres, with the majority along Bucks Creek. Site class 5 lands are predominantly found between Bucks and Haskins Creeks and make up roughly 500 acres of treatment unit. There are 421 acres of site class 4 lands across the proposed units, and only 31.7 acres of site class 3 lands—present near the confluence of Pat Maloy Ravine and Lower Bucks Lake.

The maximum erosion hazard ranges from moderate to very high in the soil analysis area ( ). This erosion hazard rating (EHR) predicts the potential for sheet, rill, and gully erosion under existing conditions if vegetation and litter are removed. Moderate EHR exists on 499.5 acres of DFPZ and area thinning units, high EHR makes up 1,068.3 acres, while 132.5 acres are rated as having a very high EHR.

Soils in the project area are primarily derived from igneous parent materials. Igneous rock can be formed in two ways; below ground as an intrusive or plutonic occurrence, or at the earth’s surface as an extrusive or volcanic formation. Small inclusions of metamorphic parent material are also present. These were once igneous, metamorphic, or sedimentary rocks that have been subjected to extreme heat and pressure causing physical and or chemical changes. Glacial activity has also shaped the existing soil conditions in the Bucks Project area.

Weathered granodiorite is prevalent throughout the project area and is responsible for the abundance of well-drained sandy loams. Glacial moraines introduced andesitic basalt deposits that have settled in the Bucks Creek subwatershed. This soil mapping unit is of limited extent in the Plumas National forest and is located primarily in the Bucks project area and extends north towards the Three Lakes area (USDA, 1988b). Greenstone, schist, and andesitic basalt parent material are limited to the southeastern portion of the watershed analysis area, primarily south of Haskins Creek. These metamorphosed parent materials weather to form relatively fertile cobbly loam soil textures.
### Table 35. Soil Productivity Results from Field Surveys

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<tr>
<th>Unit</th>
<th>Average percent soil cover</th>
<th>Average areal extent of detrimental compaction</th>
<th>Average number of large down logs/acre</th>
<th>Average number of snags/acre</th>
<th>Average percent cover of fine organic matter</th>
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<td>Average percent cover of fine organic matter</td>
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### Effective Soil Cover

Effective soil cover is necessary to prevent accelerated soil erosion. Soil cover ranges from 84 to 100 percent for the surveyed units. PNFLRMP standards and guidelines for effective ground cover vary by the soil erosion hazard rating— for the Bucks project, ground cover shall be maintained at 70 percent for units with very high erosion hazard rating (EHR), 60 percent for soils with a high EHR, and 50 percent soil cover for moderate EHR.

### Soil Compaction

The extent of detrimental soil compaction should not be of a size or pattern that would result in a significant change in production potential for the activity area and should not result in common occurrences of overland flow and erosion within treated units (indicating that the infiltration and permeability capacity of the soil has been exceeded for the local climate). For the 24 units surveyed, the average existing spatial extent of detrimental compaction ranges from 0 to 13.3 percent (Table 35), with the mean and median both being 4 percent. The area of detrimentally compacted ground is primarily occupied by skid trails and landings, although not all skids and landings were deemed compacted.

### Down Woody Material

The applicable standard for large down wood is in the PNF LRMP as amended, which states that large down woody material retention levels should be determined on an individual project basis. For the Bucks Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained. The existing number of large down logs per acre in the surveyed units ranged from 15 to 102.5, with an average of 49 logs per acre. Since every 5 down logs would comprise a weight of 3
to 10 tons, the project units are generally well over the project standard for down woody material under the existing condition.

**Fine Organic Matter**
Organic cover helps maintain site fertility and prevent soil loss from erosion. Fine organic matter consists of plant litter, duff, and woody material less than three inches in diameter. The desired condition for this project area is at least 50 percent fine organic matter well distributed over the unit, with less than 30 percent areal extent of fine organic matter representing a poor condition. Cover consisting of fine organic matter ranged from 37.5 to 100 percent in surveyed units (Table 35), which equates to an average of 89.3 percent and a median of 94 percent.

**Environmental Consequences**
Chapters 1 and 2 of the EA provide detailed information about the design criteria for each alternative. All mechanical harvest operations would adhere to standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15) and the best management practices as delineated in the Region 5 Amendment to the Forest Service Water Quality Management Handbook (USDA, 2011a). Timber sale contracts contain many standard provisions that help ensure protection of soil and water resources. These include provisions for an erosion control plan, road maintenance, and skid trail spacing.

Proposed management activities in RHCAs are expected to contribute to improving or maintaining watershed and aquatic habitat conditions described in the riparian management objectives (Appendix E). RHCA widths are consistent with the Scientific Analysis Team (SAT) guidelines set forth in Appendix L of the HFQLG Final EIS. Where RHCAs would be treated, prescriptions and protection measures have been designed to address the RMOs. Where RHCAs would be mechanically treated, ground-based equipment would only be used on slopes less than 30 percent and on stable soils. To provide a buffer between streams and mechanically treated areas, an equipment exclusion zone would be established. The buffer width would vary by stream type and the steepness of the side slope, as shown in Table 36. For example, all mechanical equipment would be excluded from within 100 feet (horizontal) of perennial fish-bearing streams with sideslopes of 0 to 30 percent. These streamside zones would serve as effective filter and absorptive zones for potential sediment originating from upslope treatment areas. Fuel reduction in these equipment-exclusion zones would be allowed and would be determined on a site-by-site basis to protect the sensitive attributes associated with the riparian area.

**Table 36. Equipment exclusion zones and burn pile exclusion zones in RHCAs**

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Equipment exclusion zones by slope class</th>
<th>Burn pile exclusion zones</th>
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</thead>
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<tr>
<td></td>
<td>0%–30% (feet)</td>
<td>Greater Than 30%</td>
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<tr>
<td>Perennial</td>
<td>100</td>
<td>No mechanical</td>
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Hydrology Analysis

Effects Common to Action Alternatives

Direct and Indirect Effects

Prescriptions for the Bucks Lake Hazardous Fuels Reduction Project include product removal, underburning, and mastication. Harvest activities may locally alter soil moisture regimes, canopy cover, and subsequent water yield due to altered interception and evapo-transpiration. Vegetative treatments within RHCAs would consequently increase the size of residual trees. In order to help maintain favorable microclimates in RHCAs, hardwoods would be retained in all units. This is especially important in Bucks Creek, where trout and Kokanee salmon are known to spawn. In-stream flows would be assessed during equipment operations, with respect to drafting requirements.

The harvest operations (product removal) would cause associated disturbance from skid trails, site preparation, and transportation needs, such as temporary roads. Underburning would result in reduced ground cover and increased exposure of bare soil. Following implementation, the remaining canopy and vegetative recovery would contribute to rebuilding forest floor materials. Erosion and sedimentation that may result from the activities could decrease the quality of coldwater fish habitat by infilling pools and embedding spawning gravels. Due to ground disturbance, harvested areas would be more susceptible to erosion and sediment transport to the channel network. However, implementation of best management practices would help mitigate and prevent increased compaction. Recent results of BMP monitoring on the Plumas National Forest demonstrate that BMPs are effective at preventing erosion and sedimentation (USDA, 2009a). In the 2007-2009 monitoring seasons, 186 evaluations of BMPs were conducted for practices associated with timber and fuel management activities. BMPs were rated as effective for over 88 percent of those evaluations (USDA, 2009a). The BMP deficiencies observed were predominantly due to legacy effects associated with the original design or location of system haul roads.

Short-term sediment delivery to streams could potentially occur after prescribed burning due to loss of ground cover. Based on 28 prescribed fire BMP evaluations completed on the Plumas
National Forest from 2007-2009, no short-term sediment delivery to streams after prescribed burning was documented (USDA, 2009a). Scorched conifers often drop needles following low or moderate-severity fires and this needle cast would provide ground cover that may help reduce rill and inter-rill erosion and sediment delivery (Pannkuk & Robichaud, 2003). Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short-term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. The main objective is to reduce the potential for catastrophic wildfire, and thus, retain the RHCA’s desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges.

Legacy road designs often incorporated in-sloped road surfaces that drained to an inside ditch rather than current design practices that utilize, as often as practicable, out-sloped road surfaces that disperse runoff. In-sloped designs concentrate road runoff in the inside ditch and the legacy design roads—most constructed prior to the Clean Water Act amendment of 1972—did not include sufficient frequency of drainage structures to disperse road runoff and prevent the ditches from delivering sediment to streams at road crossings. Legacy designs that located roads at mid-slope locations typically have higher road-intercepted runoff volumes than roads near ridgetops and mid-slope locations also result in frequent stream crossings. When the 2007-2009 timber BMP evaluations are considered without the road evaluations, the resulting set of 67 evaluations had a 95 percent effectiveness rate. Road reconstruction activities are proposed for all action alternatives to reduce sedimentation impacts associated with legacy road designs.

The road treatments would consist of measures to improve road drainage, reduce erosion caused by road drainage, and reduce sedimentation from roads into the stream network. Roughly 13 miles of unpaved roads will be considered for treatment (Appendix C). Most roads in the affected subwatersheds have an in-sloped roadbed that is drained by an inside ditch. Culverts occur at varying intervals to drain the ditch, resulting in concentrated flows from the culvert outlets. The road treatments would largely include obliterating the ditch, where possible, and reshaping the roadbed so that it is out-sloped. This would allow for dispersed road drainage that is not concentrated by culverts. Where ditch obliteration is not possible, armored rolling dips would be constructed to disconnect reaches of ditch and road surface from stream systems. Culvert outlets would be armored as needed to reduce erosion downstream of the culvert. This armoring would provide roughness to reduce the energy of the water flowing from the culvert and would encourage sediment deposition near the culvert, rather than traveling on toward a stream channel.

Road construction would create new sources of sediment and disrupt the hydrologic continuity on affected hillslopes. However, state-of-the-art road design BMPs would be followed for new road construction, including out-sloping of the road template and installation of frequent road drainage structures to minimize delivery of sediment to adjacent streams. Road reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing or upgrading culverts where needed. Road drainage improvements would be designed to disperse
runoff and eliminate the occurrence of road drainage being hydrologically connected to adjacent stream channels. Short-term increases in sediment production and transport during road reconstruction would be minimized by BMPs and would be offset by long-term improvements to water quality as a result of amelioration of hydrologically connected road segments.

Temporary roads established for the Bucks project to facilitate product removal would be obliterated following implementation. Road obliteration would entail culvert removal, subsoiling of the roadbed, fully recontouring the hillslope, installing barriers to discourage vehicle traffic, and or seeding the affected area. Road obliteration would promote vegetative recovery, which can decrease compaction, increase infiltration into the roadbed, and increase soil stability and limit concentrated flow as well as surface erosion. Over time, obliterated roads would produce less sediment and surface runoff to adjacent watercourses. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff, and sediment production compared to subsoiling or cover cropping.

Figure 10. Two non-system trails that will not be obliterated

Figure 10 displays two existing non-system trails that will be used for the Bucks project and will not be obliterated based on comments received during the scoping period—one heads southwest from the Bucks Lake Lodge, the other heads southeast from the Timberline Lodge just north of the Haskins Campground. No Forest Service System (FSS) roads are proposed for decommissioning or obliteration under the Bucks project.
Figure 11. Two non-system trails that will not be obliterated

Within fuel treatment units, The Bucks Project also proposes to apply borax, a fungicide to be applied to conifer stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease. Within recreation areas, stumps greater than 3 inches would be treated with borax. The average application rate for borax in thinning areas would be less than 1 pound per acre (approximately 0.5 pounds per acre) with a range of 0.1 lbs/acre to 1.1 lbs/acre. There is a considerable body of information describing the potential effects on soil and water resources associated with borax. Much of this information is contained in the risk assessment completed by Syracuse Environmental Research Associates, Inc. (SERA, 2006), under contract to the Forest Service, and in the HFQLG Act Final Supplemental EIS (USDA, 1999). These documents are incorporated by reference into this effects analysis for the Bucks Project. The agent of toxicologic concern in borax, i.e. boron, occurs naturally and exposures to this element are unavoidable. The use of borax is not expected to substantially contribute to concentration of boron in water or soil beyond those that are associated with the normal occurrence of boron in the environment (SERA, 2006).
The borax risk assessment states “in water, boron compounds transform rapidly into borates, no further transformation is possible, with borate speciation dependent upon pH. Those compounds may be transported by percolation, sediment, or runoff from soil to ambient water. Borate compounds are adsorbed to soils to varying degrees, depending on several factors, including soil type and water pH” (SERA, 2006). A study by the Southeastern Forest Experiment Station in 1971 showed that borax “persisted uniformly at a toxic concentration 5.1 cm below the stump surface for at least 8 weeks. Twenty six months after treatment, borax had leached to subtoxic levels throughout the upper 0.3 cm of stumps, but toxic amounts were measured at a depth of 1.2 cm” (Koenigs, 1971). Borates are effective fungicides and some non-target soil microorganisms could be affected by exposure to boron in soil. “However, information to adequately assess risk in this class of organisms is not available” (SERA, 2006). Due to the application method and rates, widespread exposure to soil microorganisms are not likely. No direct effects on soil productivity are predicted from the proposed fungicide treatments. The potential for adverse effects of fungicide residues in soil and water would be minimized or eliminated by incorporating the proposed design criteria and applying BMPs for herbicide application. Design criteria include carefully planned fungicide use according to the label and other relevant requirements, spill contingency plans, proper disposal of containers and cleaning equipment, adequate buffer strips, spray drift control, and restricted use of fungicide near water bodies with sensitive amphibian species.

Cumulative Effects

ERA model values and a discussion of the ERA results relative to TOC for each of the action alternatives is presented below in the section titled “ERA Analysis–Cumulative Watershed Effects.” Higher ERA values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment loads off-site. Stream channels in poor condition tend to be more sensitive to increases in peak flows because the channels frequently lack an effective root mass to bind streambanks and large organic debris to retain bedload materials. These channels are frequently downcut (have eroded down into the bottom of their channels), and all flow is confined to the channel rather than to a broader floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream. Construction of temporary roads would increase ERA values due to the addition of roaded acres on the landscape, but all new roads constructed for the Bucks Project would be obliterated after implementation and result in long-term beneficial effects on water quality. For each of the proposed action alternatives, total ERA in each subwatershed would remain well below the TOC. Implementation of project BMPs and design features would assure that significant impacts to water quality and beneficial uses would not occur in these subwatersheds.

The effects of entering RHCAs with vegetative treatments would be similar to those described directly above. Despite the risk of erosion, the greater long-term benefit of treating the RHCAs
would be the potential protection from catastrophic wildfire. Other effects would include increasing the size of residual trees within RHCAs, preventing potential catastrophic wildfire, reducing future losses of large diameter trees and large woody debris (LWD) to fire, and increasing future LWD recruitment of intermediate to large logs. In forested stream systems, debris would help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg et al., 1998). Within the immediate riparian areas, the physical effects derived from in-channel LWD would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers.

**ERA Analysis–Cumulative Watershed Effects**

**Alternative A–Proposed Action**

Alternative A proposes to construct 1,511 acres of Defensible Fuel Profile Zones (DFPZs) through a combination of mechanical or radial thinning (ground-based or skyline yarding), hand thinning, piling and burning or chipping; grapple piling and burning; mechanical biomass removal; masticating, and prescribed underburning treatments; enhance wildlife habitat through a combination of radial thinning around large trees (156 acres) and thin conifers within aspen stands (9 acres); abate hazard trees within 552 acres of NFS land through mechanical removal (545 acres) or fell and leave (7 acres); improve water quality by augmenting road drainage systems along 13 miles of priority NFS roads through installation of road dips, 2-3 inch diameter rock armor, outsliping road segments, or replacing culverts; stabilize stream banks on 1,000 feet of Bucks Creek and 500 feet of Pat Maloy Ravine through a combination of planting native riparian vegetation by hand and or placement of log and boulder vanes.

Under alternative A, the project-induced increases in ERA values, expressed as a percentage of subwatershed areas, are predicted to range from 0.58 percent (Pat Maloy Ravine) to 3.11 percent ERA (Bucks Creek). This would result in cumulative ERA values ranging from 3.56 percent (Haskins Creek) to 10.45 percent ERA (Pat Maloy Ravine). Riparian area ERA value increases induced by alternative A, expressed as a percentage of the total riparian area in each subwatershed, would range from 0.56 (Haskins Creek) to 3.11 percent (Bucks Creek). Treatment activities would not cause any subwatersheds to exceed the TOC. Even though it is projected to experience the smallest increase in ERA (0.58 percent), the subwatershed closest to its threshold is Pat Maloy Ravine, which is rated at 74.6 percent of TOC (ERA totals 10.45 percent of subwatershed area and TOC is 14.0 percent)–refer to Figure 12 for a graphical relationship.
Figure 12. Percent ERA comparison by alternative (Pat Maloy Ravine)

**Alternative C—Non Commercial**

Alternative C includes DFPZ and non-commercial fuels treatments, which would be implemented to accomplish the purpose and need for modifying fire behavior only. No other treatments proposed under any other action alternative would be proposed under this alternative. Approximately 1,477 acres of DFPZs would be constructed.

Under alternative C, the project-induced increases in ERA values are predicted to range from 0.15 percent of subwatershed area (Pat Maloy Ravine) to 2.73 percent (Bucks Creek). This would result in cumulative ERA values ranging from 3.33 (Haskins Creek, Figure 13) to 10.01 percent of subwatershed area (Pat Maloy Ravine). Riparian area ERA value increases induced by alternative C would range from 0.15 (Pat Maloy Ravine) to 2.24 percent of the riparian area in the subwatershed (Bucks Creek). Treatment activities would not cause any subwatersheds to exceed the TOC.
Alternative D—Alternative

Alternative D includes Defensible Fuel Profile Zones, Group Selections, and hazard tree removal would be implemented to accomplish the purpose and need. However, alternative D incorporates and removes specific activities to both increase sawlog net value and reduce implementation costs, respectively. Watershed improvements would be proposed under alternative D because appropriated funding is expected for these proposed treatments. Approximately 1,596 acres of DFPZs would be constructed through the previously mentioned mechanisms.

Under alternative D, the project-induced increases in ERA values, expressed as a percentage of the subwatershed area, are predicted to range from 0.43 (Pat Maloy Ravine) to 2.14 percent (Bucks Creek). This would result in cumulative ERA values ranging from 3.57 (Haskins Creek, ) to 10.30 percent of subwatershed area (Pat Maloy Ravine).
Alternative B – No Action Alternative

Direct and Indirect Effects

Under the No Action alternative, ERA values would slowly decline to a baseline level over time. Surface, ladder, and crown fuels would not be treated on upslope areas or in RHCAs. Road drainage improvements and decommissioning activities would not occur, so watershed benefits and reductions in ERA values due to road decommissioning would not be realized. Fuel treatment activities would not occur, leaving subwatersheds at a greater risk of wildfire. A future severe wildfire could greatly increase ERA values within and across subwatersheds.

In the short-term, water quality and downstream beneficial uses would remain unchanged. As watersheds recover from past management activities, there may be small improvements in water quality. However, in the absence of road improvements, decommissioning, or obliteration, the transportation system would continue to be a large contributor of sediment to the stream network. The high density of roads and stream crossings would continue to affect the hydrologic regime in these subwatersheds.

Cumulative Effects

None of the subwatersheds that are contained by the greater watershed analysis area exceed the threshold of concern (TOC). Private harvests are expected to continue within the overall watershed analysis area, though it is difficult to predict the location, type of harvest treatments, or number of acres that would be affected. In alternative B, surface, ladder, and crown fuels would
not be treated on upslope areas or in RHCAs. Historically, fire has been an integral disturbance agent in riparian systems (Dwire & Kauffman, 2003; Everett et al., 1995; Skinner, 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor & Skinner, 1998). During wildfires, drainages can behave like chimneys, rapidly directing fire upslope through the drainage area. Under alternative B, watersheds would remain vulnerable to the effects of a future severe wildfire. In the event of a future severe wildfire, affected areas may be highly susceptible to erosion, and generate large pulses of sediment to stream channels (Elliot & Robichaud, 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

**Soil Analysis**

This section is organized by the four soil indicator measures: effective soil cover, soil compaction, large down woody material, and fine organic matter. Effects to each measure are first discussed for all action alternatives, followed by alternative B, the No Action alternative. In terms of the soil indicator measures, effects from each individual action alternative are very similar, with the effective difference between action alternatives being the number of units, unit specific prescriptions, and total acres to be treated. However, these differences would exist at small, localized scales and differences in effects to soil productivity, hydrologic function, and buffering capacity at the scale of the project area would be difficult to discern. Soil capacity to buffer and filter chemical compounds and excess nutrients is not specifically analyzed because the project does not involve significant application of chemicals such as herbicides, pesticides or other amendments.

**Effective Soil Cover—Effects Common to the Action Alternatives**

**Direct Effects**

Harvest operations may increase soil cover by adding activity fuels to the forest floor, but can also decrease cover due to organic displacement during yarding operations. Mastication would generally increase soil cover because materials are shredded and then broadcast into the unit away from the machine. Prescribed fire activities, including pile burning and underburning, would consume organic materials and reduce the amount of effective soil cover. Recent BMP evaluations demonstrate that prescribed fires on the Plumas National Forest are effective in terms of leaving sufficient soil cover after implementation (USDA, 2009a). Pile burning would remove soil cover locally, and underburning is expected to occur under prescribed conditions that would not result in complete consumption of the duff and litter layers. Alternative A proposes more pile and underburning than alternative D—consequently, more organic material would be consumed by prescribed fire under alternative A, potentially increasing the amount of exposed mineral soil at the project level.
Beginning in 2001, effective soil cover has been monitored on HFQLG project units for both the pre- and post-project condition per the Monitoring Plan prescribed in the 1999 HFQLG FEIS. Post-project monitoring began in 2004. The 2010 HFQLG Soil Monitoring Report presents effects to soil parameters for over 100 units treated on the 3 National Forests that are implementing the HGQLG pilot project (USDA, 2011b). For effective soil cover monitoring, differences between silviculture methods are apparent as the 66 thinning units averaged 82 percent soil cover post-project and the 37 group selection units averaged 64 percent effective cover post-project, suggesting that group selection units are more prone to losses of effective soil cover. All but one of the mechanical thinning units had at least 50 percent cover post-treatment but nine of the 37 group selection units were found with less than 50 percent soil cover post-treatment. However, of those 9 units, two units were also lacking cover pre-treatment, due to shallow rocky soils with sparse vegetative productivity and little duff. Another 6 of the 9 units were located on the same project and were noted as lacking cover due to extensive subsoiling activity to reduce compaction. It therefore appears that many of the group selection units with low post-treatment ground cover had legitimate reasons for that result and the loss of soil cover was not due to lack of operational controls.

The HFQLG Soil Monitoring Reports demonstrate that mechanical treatments such as those proposed under Alternative A are likely to cause reductions in the areal extent of effective soil cover, with losses averaging 8 percent for thinned units and group selection units perhaps being more prone to losses of soil cover. Field survey data indicates that existing soil cover is robust for all units proposed for treatment under the project action alternatives. Average existing effective cover for thinning units proposed by the Bucks Project ranges from 84 percent to 100 percent, well in excess of the project standard. Group selection (GS) units would occur within thinning units so this range is also an accurate description of the existing soil cover reported above for GS units. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to assure project compliance with soil standards (USDA, 2008b). These techniques include utilization of post-logging slash and designation of skid trails in group selection units. These techniques would assure that the project standard for effective cover would be met in all proposed treatment units under the action alternatives. For the units with areas indicated as having potentially very high EHR (units 4, 78, 79, and 97), monitoring by District watershed staff would occur to assure that adequate cover is retained. District staff would visit units during and after mechanical treatments and make ocular estimates of effective soil cover retained. Where units are observed to be lacking effective cover, consultations will occur with the timber sale administrator or contract administrator to refine the operator’s techniques (e.g. raising the brush rake or piling less material) to assure that adequate cover is retained.

Indirect Effects

Increases in effective soil cover due to mastication or other operations would further reduce the risk of erosion by providing a physical buffer against wind and rain drop displacement of soil. A
reduction in effective soil cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of forest floor or other cover material across a large area would be more effective at intercepting surface water than large areas devoid of cover. The effect of short-term reductions in soil cover for action alternatives would generally be well distributed across treated units. Concentrated removal of soil cover is most likely to occur in areas such as landings, skid trails, temporary roads, and equipment tracks. Soil erosion will be minimized by the installation of erosion control structures (cross ditches and waterbars) which are standard timber sale contract practices.

After the initial reduction in effective soil cover due to mechanical treatments, effective soil cover would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Soil cover is expected to meet the project standard (60 to 70 percent), protecting soil hydrologic function and preventing accelerated erosion. Local reductions in soil cover may have local effects on soil temperature. Larger reductions may result in greater temperature extremes in the soil. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson et al., 1985).

**Cumulative Effects**

The treatments proposed in the action alternatives are generally expected to reduce effective soil cover, with the exception of the mastication treatment. The cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in soil cover conditions that remain in compliance with the PNFLRMP standards. A reduction in ground cover would likely be short lived if overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. Due to proposed fuel reduction treatments proposed, the risk of a high-intensity wild fire occurring in the near future would be less under the action alternatives than under alternative B. A severe wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone.

**Effective soil cover—Alternative B**

**Direct Effects**

Under the No Action alternative, soil cover can be expected to increase as organic materials accumulate on the forest floor. Existing levels of soil cover are shown in (Table 35). Soil cover ranges from 84 to 100 percent for the surveyed units and would likely increase, over time, under this alternative.

**Indirect Effects**

As a result of increased soil cover, the risk of soil erosion may decline on forested hill slopes. However, since the field survey data indicates that existing soil cover is more than adequate, the
change in risk of soil erosion is likely negligible. Soil cover dissipates the energy of falling raindrops by intercepting them before they strike the soil surface. Reduced soil erosion would help retain soil nutrients and a favorable growth medium on site. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

**Cumulative Effects**

Due to fuel reduction treatments proposed for the action alternatives, the risk of a high-intensity wild fire occurring in the near future would be higher under alternative B. If soil cover were reduced to bare soil following a wildfire, the soil would be more susceptible to erosion. In addition, fire can create a non-wettable layer below the surface known as hydrophobicity (Everett et al., 1995). During a precipitation event, soil above the non-wettable layer can become saturated and erode down slope due to rill formation and raindrop splash. Immediately following a moderate-intensity wildfire, the affected stand would likely not meet the PNF LRMP standards for effective soil cover. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk & Robichaud, 2003). Needle cast has been observed by district watershed staff following numerous recent fires including: Cold (2008), Rich (2008), Moonlight (2007), and Silver (2009).

**Soil Compaction—Effects Common to the Action Alternatives**

*Direct Effects*

Timber harvest and biomass removal would require the use of skid trails and landings. A number of skid trails and landings exist within the treatment units, and it is predicted that some of these will be re-used to implement the proposed activities. The use of heavy forestry equipment and frequent stand entries would increase the potential for soil compaction (Powers et al., 1998). For any mechanical harvest, the extent and degree of compaction would depend on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations, and harvest equipment features. Project design criteria include implementation of BMPs and other soil protection measures, such as wet weather standards, to minimize soil compaction (Appendix G). Erosion control and compaction remediation measures for landings and skid trails are addressed by BMP 1-16 (“log landing erosion prevention and control”) and BMP 1-17 (“erosion control on skid trails”).

Soil porosity and compaction monitoring results reported in the 2007 HFQLG Soil Monitoring report stated that a review of monitoring data indicates that legacy compaction is commonplace (USDA, 2008a). Most of the detrimental compaction observed post-project also existed pre-project (USDA, 2011b). The 2010 report stated that the observed overall change in compaction levels was not large. For the 107 sets of pre- and post-treatment data available, only 10 units were below the report’s analysis threshold for areal extent of detrimental compaction in the pre-treatment condition and then over that threshold in the post-treatment condition (USDA, 2011b).
Statistical analysis presented in the 2007 report determined that, for 40 thinned units and 11 group selection units (the total number of pre- and post-treatment data sets available at that time) the mean post-project areal extent of detrimental compaction was not statistically different from the pre-project mean. Confidence intervals indicated broad ranges that suggested both a trend toward increasing the extent of detrimental compaction and a trend toward decreasing extent.

**Indirect Effects**

A growing body of recent research suggests that compaction is not always detrimental to forest productivity. For example, after 10 years of growth, the North American Long-Term Soil Productivity (LTSP) experiment has found that soil productivity was both positively and negatively affected by compaction treatments (Powers et al., 2005). In this comparison of 26 study sites, the effects of compaction depended on soil texture. In general, sandy soils showed improved productivity in compacted soil, clayey soils had reduced growth, and loams showed no apparent trend. Soils in the Bucks Project treatment units are largely dominated by sandy loam soil textures, often with a moderate amount of coarse fragments present at a depth of 4 to 8 inches. The risk of compaction in these texture classes is generally low to moderate. However, compaction of soils in these texture classes may not necessarily reduce site productivity. The wet weather operation soil protection measure would reduce compaction effects. It is important to note that the LTSP study utilizes extreme levels of soil compaction; a mechanical roller, typically used for compaction of highway subgrades, was used to compact the test plots at optimum moisture for compaction. Tree growth is influenced by many factors, including the climate regime, soil aeration, moisture and nutrient availability, soil strength, root-soil interactions, soil mass flow and diffusion properties, and numerous other factors.

Soil hydrologic function is not expected to be significantly impacted under any of the action alternatives. Visually, soil structure and macro-porosity in the top 8 inches of soil would predominately be unchanged from natural condition for the area of each treatment unit. Localized areas of overland flow and signs of erosion such as pedestals, rills, or gullies are not expected within treatment units. Exceptions could occur along skid trails and landings but erosion on these features would be controlled by implementation of Best Management Practices. Unless otherwise agreed to by the District watershed specialist and the sale administrator, landings, skid trail approaches to landings (to a distance of 200 feet), and new temporary roads would be subsoiled through the full depth of compaction to restore soil infiltration and permeability capacity (see Appendix G). Subsoiling activities would be conducted per the recommendations stated in a 2006 review of subsoiling treatments by the Regional soil scientist (USDA, 2006).

**Cumulative Effects**

The extent of detrimental compaction, as defined by the Forest Service Manual for Soil Management, is difficult to predict due to the environmental and operational variables discussed above. With the incorporation of the design criteria for this project, and the fact that a large number of the units have a low to moderate compaction potential, it is reasonable to expect that
only a portion of the new skid trails would contribute to the cumulative amount of detrimental compaction. Monitoring of detrimental soil compaction has occurred within the HFQLG Pilot Project area. These data suggest that each harvest entry into an area will add a little bit of compaction (USDA, 1995). The cumulative effect of the mechanical operations proposed in the Bucks Project is likely an increase in the extent of detrimental compaction. This increase, however, may not result in any measurable change to soil productivity for the reasons discussed above. In the LTSP study, an extraordinary effort was used to compact the soil for research purposes. The expected extent of detrimental soil compaction for each of the action alternatives would not be of a size or pattern that would result in significant change to production potential for the activity area.

**Soil Compaction—Alternative B**

**Direct Effects**

Table 35 shows the extent of detrimental compaction assessed in the field. Under this alternative, the extent and degree of compaction is expected to decline slowly over time. This process may take several decades in forested environments (Grigal, 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals, would contribute to an increase in soil porosity and decrease compaction. In addition, incorporation of organic matter into the soil by biological processes, such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

**Indirect Effects**

As the degree and extent of soil compaction is reduced slowly over time, soil physical conditions would return to their pre-compacted state. Soil infiltration would be enhanced as porosity is increased. Increased infiltration may reduce surface runoff and subsequent erosion and sedimentation at localized scales.

**Cumulative Effects**

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity.

**Down Woody Material—Effects Common to the Action Alternatives**

**Direct Effects**

Mechanical operations would likely rearrange large down woody material on the forest floor. Some new woody debris may be created if hazardous snags are felled and left on site. Mastication would add woody material to the forest floor, but these would occur as shredded materials and not logs. Prescribed burning would consume some of the heavy wood loadings known to exist in the project area. If prescribed burning occurs in the fall, rotten logs may be more susceptible to
consumption by fire compared to spring burning, however this would largely depend on the precipitation patterns preceding the burn period.

The HFQLG soil monitoring program counts larger logs as large down wood (a minimum diameter of 20 inches) than the field surveys performed for this project (a minimum diameter of 12 inches) and uses an analysis threshold of 3 logs per acre (a minimum of approximately 3 tons per acre). Large woody material monitoring results from the 2010 HFQLG Soil Monitoring report stated that large woody material decreased from levels observed during pre-treatment monitoring, particularly for group selection units. Overall, units averaged 3.4 logs per acre, but only 43 percent of units met the threshold of 3 logs per acre after treatment and 69 percent met the threshold before treatment. Twenty percent of the units had no down wood at all pre-treatment. The data demonstrate that, when evaluated at the unit scale, large down wood is a highly variable metric. Large down logs are distributed unevenly across the landscape and commonly occur in clumps, in both natural and managed stands (USDA, 2011b). The 2009 HFQLG Soil Monitoring Report states that some of this wood was likely removed to meet fuel reduction objectives. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to bring Forests into compliance with soil standards, including the standard for large down wood (USDA, 2008b). These techniques include coordination between sale administration personnel and fuel treatment personnel to reduce the loss of large down wood during harvest and burning operations and would be applied on the Bucks Project to assure that the project standard for large down wood would be achieved under action alternatives.

*Indirect Effects*

Reductions in large woody material would cause minor, localized changes to soil microhabitat. Decaying logs can retain moisture longer during the summer season compared with litter and duff materials. A loss of logs and subsequent change in moisture conditions could result in changes in nutrient cycling and microbial activity at the location of the log. This change is expected to be insignificant at the stand scale. Areas of high wood loads in the Bucks Project are often “jack-strawed,” with woody materials accumulated atop each other. When wood is not in direct contact with the ground, its decomposition rate is greatly reduced. As a result, areas with heaviest wood loads are unlikely to have a large increase in moisture-retention abilities because much of the wood is relatively sound and elevated off of the soil surface. Alternative D proposes to drop and leave hazard trees on up to 134 acres compared to just over 7 acres under alternative A. This potential increase in down logs under alternative D may result in isolated patches of high soil burn severity in the event of a wildfire. Underburning areas of heavy wood loadings could result in localized effects to the underlying soils. The underlying soils are heated during combustion of woody materials. Prescribed burning is designed to occur when soils are moist, which reduces heat transfer and the resulting changes to soil chemical and biological properties.

*Cumulative Effects*
Reductions in large woody material are expected as a result of the treatments. Currently, many units have wood loadings that are well above the project standard. The Bucks Lake area landscape likely supports a much higher level of large wood now than during the pre-fire suppression era. These woody fuels currently contribute to a heavy fuel loading and increased potential severity during a wildfire. Wildfires tend to occur during late summer when fuels and soils are at their driest. These conditions result in high levels of heating and chemical, physical, and biological alterations of the soil environment, and high losses of large wood. The proposed treatments are designed to reduce fire behavior in the event of a wildfire. By reducing the heavy wood fuel load during prescribed conditions, the resulting changes to the soil will be greatly reduced. Where it exists, 10-15 tons per acre of the largest woody materials would be retained by the project activities.

**Down Woody Material—Alternative B**

**Direct Effects**

The applicable standards for large down wood are in the LRMP as amended, which states that large down woody material retention levels should be determined on an individual project basis. For the Bucks Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained.

Table 35 shows the level of down woody material measured during field sampling. Many units have well over the recommended threshold level. Under the No Action alternative, snags are expected to fall, and the number of logs per acre are expected to increase. However, in the event of a future wildfire, some large down logs are likely to be consumed, particularly those in later decay stages. Large down wood comprises 1000-hour fuels, which can severely impact soils underneath when they burn. While rotten logs can retain moisture late in the summer season, some years are quite dry and rotten logs could easily be consumed by fire.

**Indirect Effects**

In the absence of fire, the increase in large down woody material could alter the microclimate and microhabitat at the forest floor. If large down wood does retain moisture late in summer (compared with litter and duff materials), this could result in very small-scale changes in nutrient cycling and microbial activities. For example, rates of net nitrogen mineralization may be increased near the logs due to the increased moisture. However, these changes are unlikely to have significant influences over stand productivity because large down wood generally covers only a very small proportion of the forest floor.

**Cumulative Effects**

Under the No Action alternative, large down wood would continue to accumulate. Overall, levels of large down wood are currently very high in the sampled units. This is due largely to heavy deadfall following a drought period. At a localized scale, the wood load may alter nutrient
cycling, but this is likely inconsequential in terms of soil productivity. If a wildfire were to enter the units, much of the wood may be consumed. Heavy fuels such as logs contribute large amounts of heat to the soil during the glowing combustion phase of a fire. In the event of a fire, this intense heat load could produce localized areas of non-wettable soils and strong alterations of mineral soil properties (Moghaddas & Stephens, 2007). This could result in long-term reductions in soil carbon and other stored nutrients that contribute to long-term soil productivity.

**Fine Organic Matter—Effects Common to the Action Alternatives**

*Direct Effects*

Existing levels of fine organic matter are robust throughout the surveyed units, generally well exceeding the desired condition of 50 percent (except for unit 64, which had fine organic matter over an estimated 37.5 percent of the area). Existing organic matter would be rearranged due to harvesting and yarding equipment. Accurate prediction of treatment effects on surface fine organic matter is difficult but trends would likely be consistent with those observed for effective soil cover in the HFQLG Soil Monitoring Reports (described above). For example, the 2007 HFQLG Soil Monitoring Report presented a statistically significant difference between the pre- and post-project means for effective soil cover on 39 mechanical thinning units, with the 95 percent confidence level describing a post-project reduction in the areal extent of soil cover ranging from 9 percent to 15 percent. The 2010 HFQLG Soil Monitoring Report reported an average decrease of extent of effective cover for thinning units of 8 percent, with group selection units perhaps being more prone to losses of soil cover. Similar reduction of fine organic matter can be expected for the thinning units under this project, indicating that a few of the units may, in the short-term, be below 50 percent.

After the initial reduction in fine organic matter due to mechanical thinning treatments, fine organic matter would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Mastication would contribute to fine organic matter increases because shredded materials are broadcast into the unit away from the masticator. Pile burning and underburning would reduce cover of fine organic matter. Pile burning would remove forest floor materials locally, and underburning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers.

*Indirect Effects*

Changes in the cover of fine organic matter will affect the risk of erosion, as discussed for effective soil cover, discussed above. Increases in fine organic materials, where units are not subsequently underburned, would add to the total nutrient pool stored in the forest floor. These nutrients are largely unavailable to plants in their organic forms, and are slowly decayed and recycled by soil organisms. As a result of the decomposition process, nutrients are released in available form for uptake by plants and other organisms. When prescribed burning activities consume fine organic matter, essential nutrients can be transferred downward into the soil.
(Moghaddas & Stephens, 2007) or to the atmosphere through volatilization and ash convection (Khanna & Raison, 1986). Terrestrial cycling pathways return some nutrients relatively quickly. Burn prescriptions are designed to prevent total consumption of fine organic materials. For example, District watershed staff observed that during underburn operations on the Green Flat Project, the duff layer was left largely intact despite the prescribed fires. As discussed above, scorched needles contribute new inputs of fine organic matter shortly after prescribed fire operations.

The Long-Term Soil Productivity study described above is investigating how substantial removal of forest organic matter affects site productivity. The national ten year results indicate that bole only and whole tree organic matter removals, similar to the thinning treatments proposed for this project, have had no detectable effects on soil nutrition or biomass productivity. Significant reductions in soil carbon and nutrient availability were observed only for the extreme case of whole tree removal plus complete removal of all surface organic matter on the forest floor. However, the data trend indicated no general decline in biomass productivity across any of the organic matter removal levels. Given the modest and short-term reductions of fine organic matter that are expected due to the proposed treatments, those reductions would not significantly change the soil production potential within the proposed units.

Cumulative Effects

The mechanical harvest treatments proposed in the action alternatives and the prescribed burning activities would cause reductions in fine organic matter. Overall, the cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in fine organic matter conditions that meet the project-defined desired condition of 50 percent. Increases in fine woody materials on the forest floor due to mastication may cause short-term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift et al., 1979). Microclimate changes at the forest floor due to reduced canopy cover could alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Erickson et al., 1985). Any reductions below the 50 percent level are only expected in the underburn units, however these would also be expected to quickly increase due to litter inputs from scorched vegetation. The extent of fine organic matter reductions due to proposed activities for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential for the activity area.

Fine Organic Matter—Alternative B

Direct Effects
Under the No Action alternative, fine organic matter can be expected to increase as organic materials accumulate on the forest floor. Existing levels of fine organic matter are shown in (and are expected to steadily accumulate over time.

**Indirect Effects**

As a result of increased cover of fine organic matter, the risk of soil erosion may decline on forested hill slopes. However, since the field survey data indicates that existing fine organic matter is generally more than adequate, the change in risk of soil erosion is likely negligible. Fine organic matter functions as effective soil cover, which has been discussed above. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

**Cumulative Effects**

If fine organic matter were consumed during a wildfire, the soil would be more susceptible to erosion. During a precipitation event, soil can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a fire, the affected stand may not meet the desired condition of 50 percent cover of fine organic matter. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk & Robichaud, 2003).

Fires short circuit the decomposition pathway by rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. Terrestrial cycling pathways return some nutrients relatively quickly. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils would experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren & Ahlgren, 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et al., 1999). Such changes in the soil temperature regime would affect the rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

**Comparison of Alternatives**

Alternative specific differences in cumulative watershed effects are most observable when compared at the subwatershed scale. Figure 15 shows a comparison of alternatives for the Lakeshore subwatershed, including the No Action alternative (existing condition). Project induced ERA increases by alternative for the Lakeshore subwatershed are very similar to those of the other 3 project subwatersheds, the main difference being the baseline or existing condition values. Intensity of treatment coupled with acres treated would be most intensive under alternative A, least intense in alternative C, and somewhere in between the previous two alternatives under alternative D. Based on this hydrology and soils analysis; none of the alternatives would result in significant cumulative effects. For each of the proposed action
alternatives, total ERA in each subwatershed would remain well below the TOC. Implementation of project BMPs and design features would assure that significant impacts to water quality and beneficial uses would not occur in these subwatersheds. The extent of detrimental soil disturbances due to proposed activities for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential or soil hydrologic function for the activity area.

One aspect that is not reflected in the CWE analysis is the proposed stream restoration and road drainage improvements that would benefit water quality and aquatic habitat. There is a clear need to improve stream condition in the Bucks watershed analysis area that is not addressed under the Non Commercial alternative.

![Figure 15. Percent ERA comparison by alternative (Lakeshore)](image)

In terms of the soil indicator measures, effects from each individual action alternative are very similar, the effective difference between action alternatives being the number of units, unit specific prescriptions, and total acres to be treated. However, these differences would exist at small, localized scales and differences in effects to soil productivity, hydrologic function, and buffering capacity at the scale of the project area would be difficult to discern.

Compliance with the Forest Plan and Other Direction

**Clean Water Act**

The Forest Service is complying with the provisions of the Clean Water Act as it pertains to the Bucks Lake Hazardous Fuels Reduction Project. Section 208 of the Clean Water Act requires States to prepare nonpoint source pollution plans that are to be certified by the State and approved by the United States Environmental Protection Agency (EPA). In response to this law, and in coordination with the State of California Water Quality Resources Control Board and EPA, the Forest Service, Region 5, began developing best management practices (BMPs) in 1975 for water quality management planning on National Forest System lands in California. This process
identified the need to develop a BMP for addressing the cumulative off-site watershed effects of forest management activities on the beneficial use of water.

The Bucks Project meets this through the incorporation of project design features (EA, Chapter 2, Alternative Considered in Detail, Design Criteria Common to All Action Alternatives), Scientific Analysis Team (SAT) Guidelines for RHCAs (USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in Appendix G. Refer to the Hydrology and Soils Environmental Consequences section for a discussion of environmental consequences.

Alternative A includes treatments for improving National Forest System (NFS) roads. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Refer to Chapter 3, Hydrology and Soils, Environmental Consequences section for a discussion of effects.

**Floodplain Management, Executive Order 11988 of May 24, 1977**

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating project riparian management objectives (Appendix E); adhering to the Scientific Assessment Team guidelines (Appendix G), as set forth in the HFQLG FEIS and ROD; and implementing best management practices, standard management requirements (Appendix G), and project design criteria.

**Protection of Wetlands, Executive Order 11990 of May 24, 1977**

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating project riparian management objectives (Appendix E); adhering to the Scientific Assessment Team guidelines (Appendix G), as set forth in the HFQLG FEIS and ROD; and implementing best management practices, standard management requirements (Appendix G), and project design criteria.

**Special Area Designations**

**Municipal Watersheds (FSM 2540)**

Thompson Lake is a municipal water supply for the Bucks Lake Summer Home Tract. The activities proposed in the Bucks Project are expected to have a neutral effect on this municipal water supply. Incorporation of the following project design features will protect water quality; Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (Appendix G)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in Appendix G.
Wildlife – Terrestrial and Aquatic

Introduction
This section presents a summary of the biological assessment / biological evaluation (BA/BE) and Management Indicator Species (MIS) Report for the Bucks Project and includes complete discussions of possible effects of the proposed project and alternatives on federal Threatened and Endangered species, Proposed species, Forest Service Sensitive species and Management Indicator Species (MIS). The BA/BE and MIS report (and appendices) are on file at the Mt. Hough Ranger District office and available upon request.

**Threatened and Endangered Species.** Those species listed under the federal Endangered Species Act. Threatened species are likely to become endangered throughout all or a significant portion of their range (16 United States Code [USC] 1532). Endangered species are in danger of extinction throughout all or a significant portion of their range (16 USC 1532).

**Candidate Species.** A candidate species is a species for which the U. S. Fish and Wildlife Service has enough information on file to warrant or propose listing the species as Endangered or Threatened.

**Proposed Species.** A proposed species is any species that is proposed in the Federal Register to be listed as a threatened or endangered species under the Endangered Species Act (ESA) (50 CFR 402.03).

**Forest Service Sensitive Species.** Those species, generally federal Candidates for listing or Species of Concern, that have been designated by the Forest Service as needing special management attention because of viability concerns. The Forest Service manages for these species to ensure they will not require listing as Threatened or Endangered.

**Management Indicator Species (MIS) and Neotropical Migratory Birds.** The MIS are used in project analysis because it is believed their population changes indicate whether management activities are having an effect on the viability and diversity of animal and plant communities. The proposed activities in the Bucks Project area may affect the habitat for MIS and neotropical migratory bird species. There is one MIS that is also listed as a Forest Service Sensitive species—the California spotted owl. This species is addressed in the “Forest Service Sensitive Terrestrial Species” section of this Environmental Assessment.

Analysis Framework

**Guiding Regulations**
The Bucks Project is designed to fulfill wildlife management direction specified in the National Forest Management Act of 1976 and the 1988 Plumas National Forest LRMP, as amended. Additional management direction for Threatened, Endangered, Candidate, Sensitive, Management Indicator, and migratory bird species on the Plumas National Forest can be found in the following documents:
• Code of Federal Regulations (23, 36, 50 CFR)
• Forest Service Manual and Handbooks (FSM/H 1200, 1500, 1700, 2600)
• Endangered Species Act of 1976
• National Environmental Policy Act of 1969
• National Forest Management Act of 1976
• USDA Forest Service Region 5 Best Management Practices
• Regional Forester (Region 5) Sensitive Animal Species List (June 10, 1998), updated October 2007
• Bald and Golden Eagle Protection Act of 1940
• MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination (2006)
• Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment ROD (2007)
• Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report (2008)
• Migratory Bird Treaty Act of 1918
• Memorandum of Understanding between the US Department of Agriculture Forest Service and the US Fish and Wildlife Service to promote the conservation of migratory birds (2008)

Effects Analysis Methodology

**Geographic Area Evaluated for Impacts on Wildlife**

**Aquatic Wildlife.** The “aquatic wildlife species analysis area” geographic boundary was delineated based on the potential direct, indirect, and cumulative effects on aquatic resources. The Analysis Area for aquatic wildlife species is the same as the “Watershed Analysis Area” used for the cumulative watershed effects analysis as described in the “Soils and Hydrology” section of this chapter, encompassing four sub-watersheds. All potential direct, indirect, and cumulative effects on aquatic species would occur within the Watershed Analysis Area.

**Terrestrial Wildlife.** The “Wildlife Analysis Area” boundary for terrestrial wildlife was delineated based on the potential direct, indirect, and cumulative effects on California spotted owl Protected Activity Centers (PACs) and Home Range Core Area (HRCA) distribution. The average home range of the owl is representative of the home range of other terrestrial species analyzed in this document using similar habitats (CWHR 4M, 4D, 5M, 5D, and 6), and therefore effects to the owl at this spatial scale would be indicative of the effects to other late seral stage species. The wildlife analysis area extends to a point at which no direct or indirect effects would be discernable and would not act cumulatively with other actions. The wildlife analysis area (15,914 acres) extends beyond the Bucks Project Area (areas of proposed treatment). Of these 15,914 acres, 1,817 acres are reservoir. Of the remaining 14,097 terrestrial acres, 12,824 acres (87 percent) are National Forest System lands and 1,787 acres (13 percent) are private lands within
the wildlife analysis area. Direct, indirect, and cumulative effects discussed in this section would occur within the wildlife analysis area boundary; the analysis area was expanded only for the 4500-acre spotted owl home range areas, because those areas extended beyond the wildlife analysis area boundary.

**Duration of Impacts**

The direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis. Cumulative effects are based on past actions that have occurred in the Bucks Project area since 1979 (for which there is some information available on the effects on wildlife). For the purpose of the wildlife analysis, the temporal bounds include a 30-year horizon for future effects because modeling indicates that, within that timeframe, the treated stands would approach stocking levels corresponding with forest development (i.e. young forested stands could develop within this timeframe). General trends and trajectories of stand development that extends beyond 30 years are discussed in this analysis to document when habitat conditions suitable for specific species will likely be reached.

Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWRH) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). Existing updated Vestra maps were used to generate the vegetation map used for this analysis, referred to as AsVeg. All vegetation information is displayed using the CWRH vegetation codes and serves as the baseline acres for analysis. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

**Indicator Measures**

**Issue:** Proposed ground-disturbing activities may degrade riparian conditions for Forest Service sensitive aquatic species (i.e. mountain yellow-legged frog) and Forest Service management indicator species (i.e. aquatic macroinvertebrates).

**Indicator Measure:** Acres of treatment within Riparian Habitat Conservation Areas (RHCAs) and the resulting percent of Threshold of Concern (TOC) in relation to stream condition. Implementation of ground-disturbing activities in watersheds that are approaching or over the TOC could increase the risk of adverse effects and cumulative watershed effects.

**Issue:** Proposed mechanical treatments (DFPZ, group selection, area thinning, biomass removal) may be detrimental to old forest conditions and the wildlife species that depend on these conditions.

**California Spotted Owl—Indicator Measure:** Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable California spotted owl habitat.
**Northern Goshawk—Indicator Measure:** Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable northern goshawk habitat.

**Mesocarnivores—Indicator Measure:** Acres of suitable habitat and habitat connectivity were the indicator measures used to show the effects of the proposed action and alternatives on Pacific fisher and American marten habitat and connectivity.

### Affected Environment

**Federally Threatened and Endangered Species**

A list of T&E species for Plumas County was provided by the Sacramento Fish & Wildlife Office updated September 18, 2011, accessed via United States Fish and Wildlife Service (USFWS) county list web page (http://sacramento.fws.gov/sacramento/y_old_site/es/spp_lists/auto_list.cfm). Based on this list, and information regarding range of species, presence of species or presence of species suitable habitat within project area, it is determined that the Bucks Project would have no affect on the two Federally listed species present on the Plumas National Forest. There are no Federally Proposed species identified by the USFWS as occurring on the PNF. Table 37 displays Federally-listed species affects determinations.

**Table 37.** Determination of effects for federally-listed species

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Suitable Habitat in area</th>
<th>Observed in Project area (Y/N)</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Desmoceras californicus</em></td>
<td>Valley Elderberry</td>
<td>No</td>
<td>No</td>
<td>No effect</td>
</tr>
<tr>
<td><em>dimorphus</em></td>
<td>Longhorn Beetle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Rana aurora</em></td>
<td>California Red-legged Frog</td>
<td>No</td>
<td>No</td>
<td>No effect</td>
</tr>
<tr>
<td><em>draytonii</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**USDA Forest Service R5 Sensitive Species**

The Bucks Project: Biological Assessment / Biological Evaluation Terrestrial and Aquatic Wildlife” (USDA 2011) provides a discussion of the affected environment for all sensitive wildlife species analyzed for the Bucks Project. The BA/BE is located in the Bucks Project record, and the analysis of effects on the species identified in are incorporated by reference. The bald eagle, California spotted owl, northern goshawk, American marten, Pacific fisher, and Mountain yellow-legged frog are highlighted in this Bucks Project EA because of the potential direct, indirect, and cumulative impacts of the proposed action and alternatives on habitat for these species.
Table 38. Forest Service Sensitive Wildlife Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
</tr>
<tr>
<td>Bald Eagle (<em>Haliaeetus leucocephalus</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>American peregrine falcon (<em>Falco peregrinus anatum</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Northern goshawk (<em>Accipiter gentilis</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>California spotted owl (<em>Strix occidentalis occidentalis</em>)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Great gray owl (<em>Strix nebulosa</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Willow flycatcher (<em>Empidonax trailii brewsteri</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Greater sandhill crane (<em>Grus canadensis tabida</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Swainson's hawk (<em>Buteo swainsoni</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
</tr>
<tr>
<td>Sierra Nevada red fox (<em>Vulpes vulpes necator</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>American marten (<em>Martes americana</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Pacific fisher (<em>Martes pennanti pacifica</em>)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Sensitive</td>
</tr>
<tr>
<td>California wolverine (<em>Gulo gulo luteus</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Pallid bat (<em>Antrozous pallidus</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Townsend’s big-eared bat (<em>Corynorhinus townsendii</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Western red bat (<em>Lasiurus blossevillii</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Amphibians and Reptiles</strong></td>
<td></td>
</tr>
<tr>
<td>Mountain yellow-legged frog (<em>Rana muscosa</em>)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Foothill yellow-legged frog (<em>Rana boylii</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Northern leopard frog (<em>Rana ppienis</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td>Northwestern pond turtle (<em>Clemmys marmorata marmorata</em>)</td>
<td>Sensitive</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
</tr>
<tr>
<td>Hardhead (<em>Mylopharodon conocephalus</em>)</td>
<td>Sensitive</td>
</tr>
</tbody>
</table>

**Notes:**

a. Plumas National Forest Management Indicator Species

b. The West Coast population of the Pacific fisher (*Federal Register*, April 8, 2004, vol. 69, no. 68), the Sierra Nevada population of the mountain yellow-legged frog (amended 12-month finding, *Federal Register* June 25, 2007, Vol. 72, No 121), and the wolverine (*Federal Register*, December 14, 2010, vol.75, no. 68) were designated as a Candidate species by the USFWS, but listing under the *Endangered Species Act* is precluded by other higher priority listing actions.

**Bald Eagle**

The bald eagle was federally listed as threatened but has now been removed from the list effective August 8, 2007 (*Federal Register* Vol.72, No. 130/Monday, July 9, 2007/Rules & Regulations). It is now considered a USFS Region 5 Sensitive Species (R5 Sensitive species list, October 15, 2007). This species is found at lakes, reservoirs, rivers, offshore islands, and some rangelands and
coastal wetlands in California. Bald eagles are considered a permanent resident in Plumas County.

Bald eagles generally require large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches. This species swoops from hunting perches, or soaring flight, to pluck fish from water. Bald eagles are also known to scavenge dead fish, water birds, and mammals. Individual eagle’s perch high in large, stoutly limbed trees, on snags or broken-topped trees, or on rocks near water and will roost communally in winter in dense, sheltered, remote conifer stands.

Bald eagles nest in large, old-growth, or dominant live trees with open branch work, especially ponderosa and sugar pine that supports some foliage available to shade the nest. Nests are usually located near a permanent water source with 87 percent of nest sites in California located within 1.6 km (1 mile) of water (CDFG 2006).

There is one known nesting territory at Bucks Lake. This nesting territory is not included in the wildlife analysis area; the territory and nest stand is located north of the lake, north and east of the proposed Bucks Project treatment units in the Bucks Lake Wilderness. Bald eagles have been present at Bucks Lake since at least 1975 but nesting was not documented until 1979. Since 1979 nesting chronology has been well documented by monitoring activity conducted by California Department of Fish and Game, Pacific Gas and Electric, and U.S. Forest Service biologists. Between 1979 and 2010, nesting activity has been documented annually, although the heavy snow loads in 2011 prevented eagles from even attempting nesting activity. This territory has produced 15 fledglings during that period. At least three different nest trees have been used in this span, but all have been in the same general locale on the Bucks Lake peninsula, within the Bucks Lake Wilderness. It is suspected, based on 31 years of monitoring this site that the adult eagles are non-migratory, staying within the Bucks Lake area year round. When the lake freezes up, American Valley and the North Fork Feather River probably become important forage areas.

None of the proposed actions of the Bucks Project would occur within the Bucks Lake bald eagle nesting territory.

**California Spotted Owl**

*Habitat Use and Management Direction*—Habitat suitability standards for the California spotted owl have been described in a number of sources, including the CASPO Interim Guidelines (USDA 1993a), the 1999 HFQLG final EIS (USDA 1999a), the 2001 SNFPA final EIS (USDA 2001a), the 2004 SNFPA final supplemental EIS (USDA 2004a), and the 2004 SNFPA Record of Decision (USDA 2004b).

Stands suitable for nesting and roosting have (1) two or more canopy layers; (2) dominant and codominant trees in the canopy averaging at least 24 inches diameter at breast height (DBH); (3) at least 70 percent total canopy cover (including the hardwood component); (4) higher than average levels of very large old trees; and (5) higher than average levels of snags and downed woody material (USDI 2006). The CWHR size classes 5M and 5D (M = moderate; D = dense)
and 6 (two-storied stands) have the highest probability of providing stand structures associated with preferred nesting, roosting, and foraging. The threshold canopy cover value that contributes to or detracts from occurrence and productivity is a value near 50 percent (USDA 2001a, Hunsaker et al. 2002). For the Bucks Project, all of the CWHR 5M size-density classes are considered spotted owl nesting habitat.

Suitable foraging habitat is found in the same forest types listed above for nesting habitat (CWHR classes 5D and 5M), as well as class 4D (trees 11 to 24 inches DBH with dense canopy 60 to 100 percent), and class 4M (trees 11 to 24 inches DBH and moderate canopy cover between 40 and 59 percent). The stands considered to be suitable for foraging have at least two canopy layers, dominant and co-dominant trees in the canopy averaging at least 11 inches DBH, at least 40 percent canopy closure, and higher than average levels of snags and downed woody material (15- to 30-square-foot basal area in snags, 10 to 15 tons per acre downed woody debris) (Verner et al. 1992). Although canopy cover down to 40 percent is suitable for foraging, it appears to be marginally so (based on owl occurrence and productivity threshold at around 50 percent canopy cover [ibid.]). In its most recent notice concerning the California spotted owl, the USFWS states that owl foraging habitat “is generally described as stands of trees 30 centimeters (12 inches) in diameter or greater, with canopy cover of 40 percent or greater” (USDI 2006), with no other habitat parameters for foraging habitat described. Thus, there appears to be an element of uncertainty associated with what constitutes foraging habitat. For this Bucks Project analysis, all class 4M are considered owl foraging habitat.

Table 39 summarizes the potential acres of suitable spotted owl habitat on National Forest System lands in the wildlife analysis area. Suitable CWHR types (USDA 2001a) are Sierra mixed conifer, white fir, red fir, montane hardwood-conifer, montane hardwood, ponderosa pine, montane riparian, lodgepole pine, and eastside pine.

**Table 39. Potential acres of suitable spotted owl habitat in the Bucks Project Wildlife Analysis Area.**

<table>
<thead>
<tr>
<th>CWHR Type</th>
<th>Habitat Type</th>
<th>National Forest System Acres in Wildlife Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M</td>
<td>Foraging</td>
<td>3,772</td>
</tr>
<tr>
<td>4D</td>
<td>Foraging</td>
<td>415</td>
</tr>
<tr>
<td>5M</td>
<td>Nesting</td>
<td>2,424</td>
</tr>
<tr>
<td>5D/6</td>
<td>Nesting</td>
<td>370</td>
</tr>
<tr>
<td>Total</td>
<td>Suitable</td>
<td>6,981</td>
</tr>
</tbody>
</table>

The SNFPA Record of Decision (USDA 2004b) management strategy and direction for the California spotted owl recognizes two land allocations with discretely mapped areas, the nest area, or PAC, and the HRCA. Land allocation direction for HRCAs on the Plumas National Forest include the 300-acre PAC, plus an additional 700 acres of the best habitat available within a 1.5-mile radius of the activity center for a total of 1,000 acres. The direction in the 2004 SNFPA Record of Decision allows for full implementation of HFQLG Pilot Project activities within
HRCAs that are established in the HFQLG Pilot Project area until the conclusion of the HFQLG Act in 2012. Therefore, this analysis assesses the impacts of the proposed action and alternatives on HRCAs and suitable spotted owl habitat.

The comprehensive adaptive management strategy to investigate the effects of fuels treatments and group selection silviculture on California spotted owl viability is referred to as the Plumas-Lassen Administrative Study (PLAS). The Administrative Study is being conducted as a collaborative effort by the Forest Service Pacific Southwest Research Station (at Sierra Nevada Research Center); the Universities of California at Berkeley and Davis; and Point Reyes Bird Observatory to determine the long-term effects from forest management practices on spotted owl, song birds, and small mammals. The study will identify the response of these old-forest-dependent species to changes in vegetation composition, structure, and distribution over space and time. When the PLAS began in 2003, the study areas chosen to collect CSO data were all located on the Plumas National Forest. In 2005, the Lassen Demographic Study Area and Plumas NF Survey Areas were fully integrated to define the overall PLAS project area and provide consistent CSO survey effort across the HFQLG project area.

Portions of two PLAS study areas (SAs) are located in the Bucks Project analysis area. Study areas SA-4 and SA-5, located in the east and southeast portion of the analysis area, have been surveyed since 2003; SA-5 was surveyed up to and including 2005 but was deleted from the study in 2006.

Spotted owl surveys have occurred in the wildlife analysis area and project area. Some PACs/SOHAs in the analysis area have been surveyed more frequently than others. Portions of the project area were surveyed annually for owls as part of the Plumas Lassen Administrative Study (PLAS) between 2002-2005 (4 years). In 2008 and 2009 the southern part of the project area was surveyed for owls for the Basin Project (Klamath Wildlife Resources 2009). These call stations are currently being re-surveyed in 2010 and 2011 for the On-Top Project for the Feather River Ranger District (Eric Mathews and Associates 2010).

**Protected Activity Centers and Home Range Core Areas** — There are a total of 7 PACs and associated HRCAs within or adjacent to the wildlife analysis area (Figure 1). For PL267, the HRCA is in the analysis area but the PAC is not. For PL015 and PL143, the PACs are within the analysis area but the HRCAs are not. Both the PAC and the HRCA are within the analysis area for PL028, PL113, PL305, and PL373. Acreages, best detection dates, and current status (based on the most recent surveys to date) for all 7 PACs and associated HRCAs within the analysis area can be found in Tables 8 and 9 of the Bucks Project BE/BA.
Areas of Concern—The CASPO Technical Report (Verner et al. 1992) identified Areas of Concern (AOC) within the range and distribution of the California spotted owl. These AOC's are identified simply to indicate potential areas where future problems may limit owl populations and where future problems may be greatest if the owl's status were to deteriorate. Two AOC's identified in the CASPO Report are adjacent to the Plumas National Forest (page 46-49 of CASPO Report):

- **Area of Concern 1:** In Lassen County, within the Lassen National Forest and adjacent to the Plumas National Forest. The reason for the concern is that the habitat in this area is discontinuous, naturally fragmented, and poor in quality due to drier conditions and lava-based soils.

- **Area of Concern 2:** In Northern Plumas County, within the Lassen National Forest. The reason for the concern is a gap in known distribution, mainly on private lands, which extends east to west in a band almost fully across the width of the owl's range.

The Bucks Project area is located 25 miles southeast of the nearest AOC and does not support habitat conditions associated with these AOC’s; thus habitat conditions and subsequent associated impacts from actions implemented with the Bucks Project would have no bearing on AOC’s.
Northern Goshawk

The latest published information regarding the goshawk, in terms of population status, distribution, population and habitat trends, and species requirements can be found in the 2001 SNFPA final EIS (USDA 2001a), and in the 2004 SNFPA final supplemental EIS (USDA 2004a). A total of 588 northern goshawk breeding territories have been reported from Sierra Nevada National Forests. The Plumas National Forest supports approximately 149 goshawk territories—this is approximately 25 percent of the total number of breeding territories in the Sierra Nevada. These numbers represent goshawks that have been found as a result of both individual project inventories following standardized protocols, as well as nest locations found by other incidental methods. The 1988 Plumas National Forest Land and Resource Management Plan (USDA 1988) calls for a network of 60 nesting territories to provide for the viability of the goshawk. It is uncertain as to whether this figure is accurate. The Plumas National Forest has been developing territories (pre-SNFPA), and now there are 200-acre PACs (USDA 2004a) designated for all newly discovered goshawk breeding sites. Therefore, it is believed that the current density of goshawk territories is contributing to goshawk viability within the Plumas National Forest.

The population trends of northern goshawks in the Sierra Nevada are unknown, although numbers are suspected to be declining due to habitat reductions and loss of territories to timber harvest (Bloom et al. 1986 in (USDA 2001a). Based on numerous studies (Bloom et al. 1986; Reynolds et al. 1992; Kennedy 1997; Squires and Reynolds 1997; Smallwood 1998; DeStefano 1998—all citations are in (USDA 2001a), there is concern that goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality.

Goshawk surveys were conducted in portions of the Bucks Project area in 2004 for the Basin Project by contractors (Klamath Wildlife Resources, TerraMar, and Steve Holmes) using protocols for one year stand-search method surveys as described in the Forest Service Regions 5 Northern Goshawk Survey Protocols (USDA 2000b). In 2010 and 2011 spot surveys were conducted by Rotta in selected habitat areas within all proposed units and within known PACs. A total of four goshawk PACs are present on National Forest System lands within the wildlife analysis area.

The goshawk requires mature conifers and deciduous forests with large trees, snags, and downed logs; dense canopy closure for nesting and forests with moderately open overstories; open understories interspersed with meadows, brush patches, or other natural or artificial openings; and riparian areas for foraging (USDA 2001a). Recent studies indicate that goshawks typically select canopy closures greater than 60 percent for nesting (Hall 1984, Richter and Calls 1996, Keane 1997). The following affected CWHR types provide high nesting habitat capability: Sierra mixed conifer, white fir, montane hardwood-conifer, lodgepole pine, montane riparian, ponderosa pine, and montane hardwood conifer (CWHR size and density classes 6, 5D, 5M, 4D, 4M). The following CWHR types are rated as providing moderate nesting habitat capability: red
There are approximately 6,942 acres of northern goshawk habitat in the wildlife analysis area that provide high nesting habitat capability and an additional 39 acres that provide moderate nesting habitat capability.

<table>
<thead>
<tr>
<th>CWHR Size/Density Class</th>
<th>Nesting Habitat Capability</th>
<th>National Forest System Acres in Wildlife Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M</td>
<td>High</td>
<td>3,756</td>
</tr>
<tr>
<td>4D</td>
<td>High</td>
<td>392</td>
</tr>
<tr>
<td>5M</td>
<td>High</td>
<td>2,424</td>
</tr>
<tr>
<td>5D / 6</td>
<td>High</td>
<td>370</td>
</tr>
<tr>
<td><strong>subtotal</strong></td>
<td>High</td>
<td><strong>6,942</strong></td>
</tr>
<tr>
<td>Red Fir 4M/4D</td>
<td>Moderate</td>
<td>39</td>
</tr>
<tr>
<td><strong>subtotal</strong></td>
<td>Moderate</td>
<td><strong>39</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>All Nesting</td>
<td><strong>6,981</strong></td>
</tr>
</tbody>
</table>

Mesocarnivores (Pacific Fisher and American Marten)

The Plumas National Forest has mapped a forest carnivore network across the Forest that consists of scattered known marten sightings, large habitat management areas, and wide dispersal or connecting corridors. The SNFPA standards and guidelines for mesocarnivore habitat do not speak to carnivore networks, allowing each National Forest to decide on the management need for the network. The Plumas National Forest carnivore network is not incorporated into the Forest Plan as a land allocation with standards and guidelines; rather, it is a plan to evaluate impacts of specific projects on habitat connectivity. The management intent of the network is to provide a continuously connected system of habitats focused on the needs of marten and fisher. This corridor is designed to provide a habitat connectivity corridor linking the Tahoe National Forest with the Lassen National Forest. However, there is concern for corridors between these reserves that allow immigration and emigration to maintain healthy populations. Approximately 11,241 acres (4.1 percent) of the forest connectivity network is within the wildlife analysis area, while 71 percent of the analysis area is composed of this connectivity corridor. The Bucks Project area is a connectivity link with high potential for mesocarnivores on the PNF. A potential limiting factor for carnivore connectivity is the existing road density within the Bucks Project Area, approximately 2.8 miles per square mile within the terrestrial acres of the wildlife analysis area. This high level of road density could restrict movement for carnivores, regardless of suitable habitat (Freel 1991).

Approximately 50 percent of the Plumas National Forest has been systematically surveyed to protocol using track plates and camera stations (Plumas GIS database). To date, there have been no fisher, Sierra Nevada red fox, or California wolverine detections associated with these surveys.

On the Plumas National Forest, all but about five sightings of marten occurred within the Lakes
Basin-Haskell Peak area or around Little Grass Valley Reservoir. The additional five sightings are unverified reports (verified report consists of photograph, tracks, hair sample, and sighting by a reputable biologist). None of these were in the Bucks Analysis area.

Portions of the wildlife analysis area have been surveyed several times for mesocarnivores, beginning in the mid-1980’s, using both camera stations and track plates. This includes survey efforts by private contractors, Pacific Gas and Electric Biologists, PSW research crews and Forest Service crews. A total of 76 stations have been surveyed with no mesocarnivores detected to date in and adjacent to the wildlife analysis area, including portions of the Bucks Lake Wilderness. The most recent mesocarnivore surveys in the wildlife analysis area were in 2002, conducted by PG&E for a FERC Relicensing project.

**Pacific Fisher**—The USFWS completed an initial 90-day review of a petition submitted by 20 groups seeking to list the Pacific fisher as Endangered in Washington, Oregon, and California. After reviewing the best available scientific information, the USFWS found that substantial information indicated that listing the Pacific fisher as Endangered in its West Coast range may be warranted (USDI 2004). After a 12-month status review, the West Coast population of the fisher was designated as a Candidate species by USFWS (ibid), but listing under the Endangered Species Act is precluded by other higher-priority listing actions.

The current distribution of Pacific fisher in California suggests that the once continuous distribution is now apparently fragmented into two areas separated by a distance that greatly exceeds reported fisher dispersal ability. The methods used to detect fisher in numerous survey efforts have failed to detect this species in an area between Mount Shasta and Yosemite National Park (Zielinski et al. 1995). These authors strongly suggest that the absence of fisher detections within this large 240-mile area is because they do not occur in the areas surveyed. This gap in distribution may be effectively isolating the southern Sierra Nevada population from the rest of the fisher range in Northern California. Since 1990 there have generally been no detections or confirmed sightings of fisher within this 240-mile gap of the Sierra Nevada (note: gap equates to 240 miles as identified in the 2001 SNFPA and 260 miles in the April 8, 2004, Federal Register). The Bucks Project Area is located within this “gap.”

A joint partnership between the California Department of Fish and Game, Sierra Pacific Industries (SPI), U.S. Fish and Wildlife Service, and North Carolina State University has embarked on a fisher re-introduction effort within the distribution gap discussed above, specifically within SPI’s Sterling Management Tract (Butte County). The Forest Service Pacific Southwest Region supports this reintroduction and is actively pursuing partnerships in this effort as a feature of the SNFPA management strategy (USDA 2004a). This re-introduction effort began during November 2009 with a total of 13 animals being released onto SPI lands. In 2010, an additional 15 animals were released. The SPI lands in which these fisher re-introductions have taken place are approximately 20 miles to the west of the Bucks wildlife analysis area. Monitoring data shows the majority of all fisher detections have been on private lands. Detections of released fishers on public lands (on both the Lassen and Plumas National Forests) have
primarily been from dispersing males, all of which have been documented returning back to private land (A. Facka, personal communication, March 2011). These male movements onto public lands are not considered relevant from a population establishment standpoint. As of 2011, one fisher has moved onto the Plumas NF based on tracking information provided by the joint partners (ibid). It appears the fisher is within the Feather River Canyon near Cresta and Merlin, approximately 8-10 miles west of the Bucks Analysis area.

The 2004 SNFPA Record of Decision (USDA 2004b) identifies large trees, large snags, large down wood, and higher than average canopy closure as habitat attributes important to fisher. CWHR size classes 4M, 4D, 5M, 5D, and 6 are identified as being important to fisher. A vegetated understory and large woody debris appear important for their prey species. The fisher’s preferred forest types include montane hardwood conifer, mixed conifer, montane riparian, ponderosa pine, lodgepole pine, eastside pine, and possibly red fir. The higher-elevation forests are less suitable for fishers because of deep snow packs (USDI 2004). Table 41 displays the acres of denning (CWHR size-density classes 4D, 5D, and 6) and foraging (CWHR size-density classes 4M and 5M) habitat present in the wildlife analysis area.

Table 41. Suitable Pacific Fisher habitat in the wildlife analysis area (FS System lands)

<table>
<thead>
<tr>
<th>Habitat Use</th>
<th>CWHR Type</th>
<th>National Forest System Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denning</td>
<td>4D/5D/6</td>
<td>785</td>
</tr>
<tr>
<td>Foraging</td>
<td>4M/5M</td>
<td>6,196</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>6,981</strong></td>
</tr>
</tbody>
</table>

The physical structure of the forest and the prey associated with forest structures are thought to be the critical features that explain fisher habitat use. Powell (in USDI 2004) states that forest type is probably not as important to fishers as the vegetative and structural aspects, and fishers may select forests that have low and closed canopies. Numerous studies (as referenced in the 2004 SNFPA final supplemental EIS) indicate that canopy closure over 60 percent is important, and fisher preferentially select home ranges to include high proportions of dense forested habitat. Stands with greater canopy cover, greater variation in tree size, and more hardwood and large snag components provide suitable resting habitat where fishers seek refuge during periodic resting bouts (Zielinski et al. 2010). The fisher’s need for overhead cover was well documented in the April 8, 2004, Federal Register. Fishers select stands with continuous canopy cover to provide security cover from predators. The dense canopy increases snow interception, lowers the energetic costs of traveling between foraging sites, and preferred prey species may be more abundant and vulnerable in areas of higher canopy closure (ibid). A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and prefers large areas of contiguous interior forest (ibid).

American Marten —In the Sierra Nevada, marten are most often found above 7,200 feet, but the species’ core elevation range is from 5,500 to 10,000 feet (USFS PSW 2001). A recent study (Zielinski et al. 2005), which compared historical and contemporary records of martens, strongly
indicates that populations now appear to be discontinuous in the northern Sierra Nevada. This reduction in their distribution is likely the result of several factors, including timber harvest on public lands, road building, and trapping.

There are over 40 records of marten observations/detections on the Plumas National Forest dating back to 1975. Extensive surveys using both soot-covered track plates and baited photo stations have been conducted since the mid-1990s across the majority of the Mt. Hough Ranger District landscape; no marten have been found (documented survey results are on file). Marten have not been detected during surveys conducted within and adjacent to the Bucks Project area, including the Bucks Lake wilderness; therefore, it is suspected that marten are likely not present in the wildlife analysis area. The closest verified marten detection is on the Lassen National Forest in the area surrounding Humbug Summit, approximately 15 miles northwest of the Bucks Project area (K. Moriarty, personal communication with G. Jehle, September 2011).

Martens prefer coniferous forest habitat with large-diameter trees and snags, large down logs, moderate-to-high canopy closure, and interspersion of riparian areas and meadows (Zielinski et al. 2005). Martens generally avoid habitats that lack overhead cover; rather, they select stands with 40 percent canopy closure for both resting and foraging and usually avoid stands with less than 30 percent canopy closure (ibid.). Foraging areas are generally in close proximity to both dense riparian corridors (used as travel ways) and forest meadow edges and include an interspersion of small (less than 1 acre) openings with good ground cover used for foraging (USDA 2001a).

Important forest types include mature mesic (moderately moist) forests of red fir, Sierra mixed conifer-fir, lodgepole pine, and eastside pine (USDA 2001a). The CWHR size-density classes 4M, 4D, 5M, 5D, and 6 are identified as moderately to highly important for the marten (ibid.). The red fir zone forms the core of marten occurrence in the Sierra Nevada (ibid.). Table 42 displays the acres of denning (4D, 5D, 6) and foraging (4M, 5M) habitat present in the wildlife analysis area.

Table 42. Suitable marten habitat in the wildlife analysis area (FS System lands).

<table>
<thead>
<tr>
<th>Habitat Use</th>
<th>CWHR Type*</th>
<th>National Forest System Acres in Wildlife Analysis Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denning</td>
<td>4D/5D/6</td>
<td>772</td>
</tr>
<tr>
<td>Foraging</td>
<td>4M/5M</td>
<td>6,173</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>6,945</td>
</tr>
</tbody>
</table>

*CWHR forest types RFR, SMC, LPN and WFR are included

**Mountain Yellow-legged Frog**

The Mountain yellow-legged frog (MYLF) is seldom far from water. They prefer well illuminated, sloping banks of meadow streams, riverbanks, isolated pools, and lake borders with
vegetation that is continuous to the water's edge (Martin 1992, Zeiner et al. 1988). MYLF prefer open stream and lake margins that gently slope up to a depth of 12-20 inches. Tadpoles and adults of this species overwinter in deep pools with undercut banks that provide cover (Martin 1994). Since the adults and tadpoles overwinter underwater, in high elevations they are restricted to relatively deep lakes (over 5 feet deep) which do not freeze solid in winter (Knapp 1994, per. comm.).

Suitable breeding habitat for MYLF’s is considered to be low gradient (up to 4 percent) perennial streams and lakes. Streams in this category generally have the potential for deep pools and undercut banks which provide the habitat requirements of this frog. In high elevations, breeding occurs between May and August as soon as the meadows and lakes are free of snow and ice. In lower elevations, breeding occurs between March and June once high water in streams subsides. Sierra Nevada yellow-legged frogs usually lay their eggs in clusters submerged along stream banks or on vegetation. Tadpoles require at least one year before metamorphosis to the adult stage. Tadpoles in some high elevation populations may require up to three years before metamorphosis (Knapp 1994).

Adults primarily feed on aquatic and terrestrial invertebrates favoring terrestrial insects such as beetles, flies, ants, bees, and true bugs (Jennings and Hayes 1994). They are also known to feed on Yosemite toad and pacific treefrog tadpoles (Zeiner et al. 1988). Tadpoles graze on algae and diatoms along rocky bottoms in streams, lakes and ponds. Garter snakes and introduced trout prey upon mountain yellow-legged frog tadpoles (Zeiner et al. 1988). Due to the adults' overwintering underwater and the tadpoles' long metamorphosis, this species is very vulnerable to introduced fish (Knapp 1994).

Dispersal studies are in their infancy for stream dwelling MYLF. A radio-telemetry study was conducted in Lone-Rock Creek (30+ miles from Bucks Project area), with 20 frogs tracked from July through September of 2003. The objective of the study was to determine the dispersal behavior of MYLF in relation to steams and adjacent terrestrial habitat. This study continued in Bean Creek near Meadow Valley, California (about 10 miles from Bucks Project area). Current findings are that adult frogs have territorial pools and stay near these pools throughout the summer. In the fall, as temperatures decline, female frogs have been found to move downstream within the stream channel towards male frogs. The lateral movement of MYLF away from the channel is no greater than 23 meters (MGW 2006).

There are no detections of MYLF’s in the project area or the analysis area. This species does occur north of the analysis area within the Bucks Lake Wilderness north of the crest, within isolated lakes in the Silver Lake area. No detections occur within Bucks, Whitehorse, Mill or Haskins Creek. Large numbers of fish, primarily resident rainbow trout, as well as migrant brown, brook trout and Kokanee salmon are present in portions of these streams. The presence of such fish populations lowers the suitability of streams for MYLFs.
**USDA Forest Service R5 Management Indicator Species**

MIS for the PNF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA 2007b). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in Table 7. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column).

Table 43 discloses whether or not habitat for each MIS is potentially affected by the Bucks Project (4th column).

**Table 43. Selection of MIS for project-level habitat analysis for the Bucks Project.**

<table>
<thead>
<tr>
<th>Habitat or Ecosystem Component</th>
<th>CWHR Type(s) defining the habitat or ecosystem component</th>
<th>Sierra Nevada Forests Management Indicator Species Scientific Name</th>
<th>Category for Project Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riverine &amp; Lacustrine</td>
<td>lacustrine (LAC) and riverine (RIV)</td>
<td>aquatic macroinvertebrates</td>
<td>3</td>
</tr>
<tr>
<td>Shrubland (west-slope chaparral types)</td>
<td>montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)</td>
<td>fox sparrow <em>Passerella iliaca</em></td>
<td>3</td>
</tr>
<tr>
<td>Oak-associated Hardwoods &amp; Hardwood/conifers</td>
<td>montane hardwood (MHW), montane hardwood-conifer (MHC)</td>
<td>mule deer <em>Odocoileus hemionus</em></td>
<td>2</td>
</tr>
<tr>
<td>Riparian</td>
<td>montane riparian (MRI), valley foothill riparian (VRI)</td>
<td>yellow warbler <em>Dendroica petechia</em></td>
<td>3</td>
</tr>
<tr>
<td>Wet Meadow</td>
<td>Wet meadow (WTM), freshwater emergent wetland (FEW)</td>
<td>Pacific tree frog <em>Pseudacris regilla</em></td>
<td>2</td>
</tr>
<tr>
<td>Early Seral Coniferous</td>
<td>ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures</td>
<td>mountain quail <em>Oreortyx pictus</em></td>
<td>3</td>
</tr>
<tr>
<td>Mid Seral Coniferous</td>
<td>ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures</td>
<td>mountain quail <em>Oreortyx pictus</em></td>
<td>3</td>
</tr>
<tr>
<td>Late Seral Open Canopy Coniferous</td>
<td>ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P</td>
<td>sooty (blue) grouse <em>Dendragapus obscurus</em></td>
<td>3</td>
</tr>
<tr>
<td>Late Seral Closed Canopy Coniferous</td>
<td>ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and</td>
<td>California spotted owl <em>Strix occidentalis</em></td>
<td>3</td>
</tr>
<tr>
<td>Habitat or Ecosystem Component</td>
<td>CWHR Type(s) defining the habitat or ecosystem component¹</td>
<td>Sierra Nevada Forests Management Indicator Species Scientific Name</td>
<td>Category for Project Analysis ²</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>tree size 6.</td>
<td>northern flying squirrel <em>Glaucomys sabrinus</em></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Snags in Green Forest</td>
<td>Medium and large snags in green forest</td>
<td>hairy woodpecker <em>Picoides villosus</em></td>
<td>3</td>
</tr>
<tr>
<td>Snags in Burned Forest</td>
<td>Medium and large snags in burned forest (stand-replacing fire)</td>
<td>black-backed woodpecker <em>Picoides arcticus</em></td>
<td>2</td>
</tr>
</tbody>
</table>

¹ All CWHR size classes and canopy closures are included unless otherwise specified; Canopy Closure classifications: S= Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); Tree size classes: 1 (Seedling)<1” DBH); 2 (Sapling)1”-5.9” DBH); 3 (Pole)6”-10.9” DBH); 4 (Small tree)11”-23.9” DBH); 5 (Medium/Large tree)24” DBH); 6 (Multi-layered Tree) [In PPN and SMC]

² Category 1: MIS whose habitat is not in or adjacent to the analysis area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to analysis area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

Project-level effects on MIS habitat are analyzed and disclosed in the Bucks Project MIS Report (incorporated by reference). This analysis involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area.

These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The project-level effects analysis for the MIS on the Plumas NF is informed by available distribution population monitoring data, which are gathered at the bioregional scale. As a result of the Bucks project-level analysis conducted for MIS and the relationship of project-level habitat impacts to bioregional-scale trends, it was concluded that for all Category 3 MIS and associated habitats considered in the Bucks analysis, that the habitats would either not change from the existing condition, or would change so minimally with implementation of action alternatives, that habitat in the Bucks Project analysis area would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of any Category 3 MIS across the Sierra Nevada bioregion (USDA 2011b).

**Migratory Landbirds**

Under the National Forest Management Act (NFMA), the Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service Landbird Conservation Strategic Plan (USDA 2000a) followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan reference goals and objectives for integrating bird conservation into forest management and planning.

The Plumas National Forest utilizes the U.S. Fish & Wildlife Service 2008 Birds of Conservation Concern for the Sierra Nevada as its framework for analyzing effects to migratory
birds. Of this list of eleven (11) birds, Buck Project level reports (e.g. BA/BE, MIS) address nine (9) of the species either directly or by using a surrogate species that utilize the same or similar habitat attributes. The following table highlights how and where these nine migratory birds are addressed directly or by using a surrogate species.

Table 44. 2008 Birds of Conservation Concern analyzed for the Bucks Project.

<table>
<thead>
<tr>
<th>Birds of Conservation Concern (Sierra Nevada - BCR 15)</th>
<th>Forest Service Sensitive Species (S) or Management Indicator Species (MIS)</th>
<th>Project Level Report (BA/BE or MIS)</th>
<th>Critical Habitat component or threat as defined by Sierra Nevada Bird Conservation Plan (PIF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald Eagle</td>
<td>Bald Eagle (S)</td>
<td>BA/BE</td>
<td>Designated as a non-land bird by DeSante</td>
</tr>
<tr>
<td>Flammulated Owl</td>
<td>Mule Deer (MIS)</td>
<td>MIS</td>
<td>Depends critically on oaks or oak woodlands, Loss of snags</td>
</tr>
<tr>
<td>California Spotted Owl</td>
<td>California Spotted Owl (S)</td>
<td>BA/BE</td>
<td>Depends critically on old growth</td>
</tr>
<tr>
<td>Calliope Hummingbird</td>
<td>Sooty (Blue) Grouse (MIS)</td>
<td>MIS</td>
<td>Open Forested habitats, and moist habitats on the East Slope</td>
</tr>
<tr>
<td>Lewis’ Woodpecker</td>
<td>Hairy Woodpecker (MIS)</td>
<td>MIS</td>
<td>Loss of snags</td>
</tr>
<tr>
<td>Williamson’s Sapsucker</td>
<td>Hairy Woodpecker (MIS)</td>
<td>MIS</td>
<td>Loss of snags</td>
</tr>
<tr>
<td>Olive-sided Flycatcher</td>
<td>California Spotted Owl (S)</td>
<td>BA/BE, MIS</td>
<td>Utilize late successional/old growth forest, but does not depend on it critically, Loss of snags</td>
</tr>
<tr>
<td>Willow Flycatcher</td>
<td>Willow Flycatcher (S)</td>
<td>BA/BE</td>
<td>Depends critically on montane meadow habitat</td>
</tr>
<tr>
<td>Cassin’s Finch</td>
<td>California Spotted Owl (S)</td>
<td>BA/BE</td>
<td>Depends critically on old growth</td>
</tr>
</tbody>
</table>

The remaining two species, the Peregrine Falcon and Black Swift, occur in known established sites or have habitats that are very localized and limited in extent on the Plumas NF.

**Peregrine Falcon:** Plumas NF biologists have reviewed habitat for the Peregrine Falcon on the Plumas NF extensively since the early 1980’s. Documented eyries for the Peregrine falcon consists of three rock cliff sites on the Forest, located at Bald Rock (Feather River RD), Pulga (also Feather River RD), and North Fork of the Feather River, just west of Canyon Dam. Disturbance to these habitats is limited, as most activities do not impact these rock cliff sites. Projects that fall within a ½ mile vicinity of these three sites would require an analysis of impacts to Peregrine Falcon, whereas projects outside of a ½ mile vicinity of these sites would not require further analysis. All of these known peregrine sites exist at least 10 miles away from the proposed Bucks Project activities. No direct or indirect effects are expected to occur to any territory with implementation of the Bucks Project so further analysis is not required.

**Black Swift:** Based on surveys and work by the Plumas County Audubon Society the Black Swift is a rare spring and fall migrant across the PNF and has not been confirmed as a resident on the PNF. However suitable wet cliff/waterfall habitat does occur at selected sites on the Forest. Two sites appear to be suitable for Black Swifts, Feather Falls on the Feather River RD and Frazier Falls on the Beckwourth RD. Both sites fall within recreation areas or recreation sites, and
do not receive ground disturbing activities that would modify or alter habitat values for the Black Swift. No known sites occur in or are within a 10 miles of the Bucks Project area.

**Fisheries**

Bucks Lake supports a coldwater fisheries composed of the more common rainbow, brown and brook trout, but is best known for lake trout (*Salvelinus namaycush*) and kokanee (*Oncorhyncus nerka*). The lake trout is an excellent trophy quality fish that live full time within the lake. Kokanee move out of the lake into the tributaries, specifically Bucks Creek, in the fall to spawn, providing numerous visitor days by the viewing public. Other tributaries (Haskins, Mill Creek, Whitehorse Creek), support very modest year round trout fisheries. Lower Bucks Lake also provides a trout fishery.

Kokanee begin to move out of Bucks Lake into Bucks Creek about the second week in October and occupy the creek until the first or second week in December. Based on surveys conducted in 2010, by about October 28, it appears as if the kokanee have moved as far up as they are going to spawn, which is about one mile upstream in Bucks Creek above Bucks Lake. Bucks Creek also provides spawning habitat for brown trout and brook trout from Bucks Lake, appearing to spawn a little later than the kokanee and moving further up Bucks Creek than the kokanee. Spawning brook trout were found about 1.25 miles up Bucks Creek November 10; brook trout were also in Whitehorse Creek (south of Bucks Lake road at Whitehorse Campground) November 15.

**Environmental Consequences**

**Summary of Effects Determinations**

The “Bucks Lake Hazardous Fuels Project: Biological Assessment / Biological Evaluation for Aquatic and Terrestrial Wildlife Species” (USDA 2011) provides a discussion of the direct, indirect, and cumulative effects for all sensitive animal species analyzed for the Bucks Project. The BA/BE is located in the Bucks Project record and incorporated by reference. The BA/BE concluded that the Bucks Project would not affect the following species: Valley elderberry longhorn beetle, California red-legged frog, Hardhead minnow, Foothill yellow-legged frog, northern leopard frog, pond turtle, greater sandhill crane, Swainson’s hawk, Townsend’s big eared bat, and Western red bat.

Based on the direct, indirect, and cumulative effects discussed in the BA/BE, it was concluded that the Bucks Project would affect individuals but would likely not result in a trend toward federal listing or loss of viability for the following species: mountain yellow-legged frog, willow flycatcher, great gray owl, California spotted owl, northern goshawk, bald eagle, California wolverine, Sierra Nevada red fox, American marten, Pacific fisher, and pallid bat.

The NEPA (*National Environmental Policy Act*) process requires agencies to identify “the environmental issues deserving study and de-emphasizing insignificant issues, narrowing the scope of the environmental analysis” 40 CFR 15001.1(d). Due to the high visibility of old-forest species in California, and the potential impacts of fuels treatment, group selection, and area
thinning on forested habitat, the effects on bald eagle, California spotted owl, northern goshawk, American marten, and Pacific fisher are emphasized in this environmental analysis. The mountain yellow-legged frog is also emphasized in this EA due to the proposed DFPZ and area thinning within RHCAs.

**Terrestrial Wildlife Species**

**All Action Alternatives (A, C, and D)**

DFPZ and area thinning treatments applied to CWHR size-density class 4M and 4D stands, which provide important foraging, nesting, and denning habitat to old-forest species (California spotted owl, northern goshawk, Pacific fisher, and American marten), would result in little to no change to CWHR size class or canopy closure (CC). Alternative C would have the least effects, as no commercial sawlogs (conifers >10 inch DBH) are proposed for removal, with all tree removal confined to understory conifers ≤ 10” DBH. Thus no 4M or 4D would be reduced to 4P or below under alternative C. With Alternatives A and D, proposed mechanical thinning and follow-up treatments would result in some 4M and 4D stands being reduced to an unsuitable state (4P or below) due to thinning some stands to below 40 percent canopy cover. Alternative D, with implementation of DFPZ and group selection prescriptions, would have the largest adverse effects on habitat suitability but would still maintain 100 percent of existing 4M acres and 84 percent of existing 4D acres in a suitable state following treatment. Alternative A would reduce 43 acres to an unsuitable condition (43 acres to 4P) and alternative D would reduce 59 acres to an unsuitable condition (39 acres to 4P, 20 acres to GS).

No treatments are proposed within CWHR 5D stands. Approximately 86 acres of CWHR size density class 5M is proposed for treatment under each action alternative. These stands, with their larger tree components and higher canopy closure, provide important nesting habitat for spotted owls and goshawks and denning habitat for mesocarnivores. Under Alternatives A and D, 86 acres of 5M will be treated. All treated acres will retain 5M classification. Unique prescriptions associated with each alternative more fully refine the effects of treatments to 5M structural elements. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning up to 10” DBH and maintaining CWHR size and density classes throughout treatment units.

Group selection treatments are proposed under alternative D and are not proposed in other action alternatives. All of the group selection treatments proposed under alternative D would be located outside of CWHR 5M and 5D stands. Group selection treatments applied to CWHR size-density class 4M and 4D stands (approximately 20 acres total) would eliminate important foraging, nesting, and denning habitat to old-forest species. Group selection treatments would include a total of approximately 34 acres (10 acres 4D, 10 acres 4M, 1 acre 4P, 13 acres 3D, and 1 acre 3M). These 20 acres would be reduced to an early seral state (CWHR 1) after group selection treatment.
Table 45. Approximate change in CWHR size density classes 4M, 4D, 5M, 5D habitat types in the wildlife analysis area (based on 12,310 terrestrial National Forest System acres).

<table>
<thead>
<tr>
<th>CWHR Size and Density Class</th>
<th>No Action Alternative (Existing Acres)</th>
<th>Alternative A Post-Project</th>
<th>Alternative C Post-Project</th>
<th>Alternative D Post-Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>4M</td>
<td>3,772</td>
<td>3,792</td>
<td>3,772</td>
<td>3,781</td>
</tr>
<tr>
<td>% remaining</td>
<td>101%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>4D</td>
<td>415</td>
<td>352</td>
<td>415</td>
<td>347</td>
</tr>
<tr>
<td>% remaining</td>
<td>85%</td>
<td>100%</td>
<td>84%</td>
<td></td>
</tr>
<tr>
<td>5M</td>
<td>2,424</td>
<td>2,424</td>
<td>2,424</td>
<td>2,424</td>
</tr>
<tr>
<td>% remaining</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>5D/6</td>
<td>370</td>
<td>370</td>
<td>370</td>
<td>370</td>
</tr>
<tr>
<td>% remaining</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Total Change</td>
<td>6,981</td>
<td>6,938</td>
<td>6,981</td>
<td>6,922</td>
</tr>
<tr>
<td>% remaining</td>
<td>99%</td>
<td>100%</td>
<td>99%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 45 shows the cumulative changes in CWHR size density classes 4M, 4D, 5M, 5D, and 6 that would occur from implementing the DFPZs, area thinning, and group selections proposed in the action alternatives.

The 2 miles of new temporary non-system roads proposed to be constructed for the Bucks Project would be decommissioned upon project completion, so there will be no change in equivalent roaded acres. Thus, no long-term increases in human activities are expected as a result of the action alternatives.

All action alternatives would contribute to reducing the risk of high intensity wildfire, potentially protecting suitable habitat for old-forest species including spotted owls, goshawks, and mesocarnivores. The action alternatives would reduce hazardous fuel loads while protecting large structural components contributing to habitat suitability, thereby lowering the risk of habitat loss or degradation due to wildfire.

Alternatives A and C would treat more DFPZ acres than Alternative D (Alternative A: 1,511 acres, Alternative C: 1,475 acres, and Alternative D: 1,010 acres, as shown in Table 46, below). Therefore, Alternatives A and C would provide the greatest reduction in the risk of high intensity wildfire.

Under alternatives A and D, Borax (Sporax or similar product) would be applied to all cut stumps greater than 14 inches in diameter in fuel treatment areas and greater than 3 inches in diameter in campground areas to minimize the susceptibility to Heterobasidion root disease. In the most recent risk assessment for Borax (SERA 2006), Boron, the agent of toxicological concern in Borax, was further evaluated. The focus of the evaluation was wildlife’s direct consumption from the stump and ingestion of contaminated water. The assessment concluded that the use of Borax on stumps does not present a significant risk to wildlife species under most
conditions of normal use, even under the highest application rates. No adverse effects to terrestrial wildlife species are anticipated due to the use of Borax.

Table 46.  Comparison of effects on wildlife habitat for each alternative

<table>
<thead>
<tr>
<th></th>
<th>Proposed (A) : acres</th>
<th>No Action (B) : acres</th>
<th>Non-commercial (C) : acres</th>
<th>Alternative D (D) : acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total treated acres</td>
<td>2,063</td>
<td>0</td>
<td>1,476</td>
<td>1,596</td>
</tr>
<tr>
<td>Suitable acres of old forest habitat (4M, 4D, 5M, 5D, 6) following treatment</td>
<td>6,938</td>
<td>6,981</td>
<td>6,981</td>
<td>6,922</td>
</tr>
<tr>
<td><strong>Negative effects on wildlife species</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change suitable habitat for old forest species (4M, 4D, 5M, 5D, 6) to unsuitable and reduce connectivity via DFPZ and GS (D only)</td>
<td>43 (2% of treated acres, 1% of existing acres)</td>
<td>0</td>
<td>0</td>
<td>59 (4% of treated acres, 1% of existing acres)</td>
</tr>
<tr>
<td>Removal of snags (potential habitat features) via Hazard Tree Removal</td>
<td>552</td>
<td>0</td>
<td>0</td>
<td>552</td>
</tr>
<tr>
<td><strong>Positive effects on wildlife species</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspen habitat enhancement</td>
<td>12</td>
<td>0</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Create early successional habitat via underburning and GS (D only)</td>
<td>623</td>
<td>0</td>
<td>704</td>
<td>290</td>
</tr>
<tr>
<td>Reduction of fire risk via DFPZ</td>
<td>1,511</td>
<td>0</td>
<td>1,475</td>
<td>1,010</td>
</tr>
</tbody>
</table>

**California Spotted Owl**

The only direct habitat impacts that would occur in PACs would be due to hazard tree removal, proposed in three PACs (PL015, PL028, PL113). Removal of hazard trees would not adversely affect the integrity of any spotted owl PAC. No other activities are proposed in PACs or SOHAs. Two associated HRCAs would also be directly affected by hazard tree removal (PL028, PL267), and one of these HRCAs (PL028) would also be directly affected by DFPZ and group selection treatments. The remaining 3 PACs and 5 HRCAs within the wildlife analysis area could be
indirectly affected by proposed actions but not directly affected by habitat change as a result of project implementation.

Road reconstruction would traverse 1.4 miles of one PAC (PL028) and 0.5 miles of one HRCA (PL028). This road reconstruction would be subject to a limited operating period to eliminate direct effects on breeding spotted owls.

One of the five HRCAs in the analysis area (PL028) would be affected by proposed treatments under the action alternatives. Under Alternative D, one HRCA (PL028) would see a reduction in suitable acres. The reduction in this HRCA would be approximately 1 percent and would be entirely due to group selection acreage. Thus, group selection under alternative D is estimated to reduce a small percentage of suitable habitat in one HRCA (PL028 – 6 acres of White Fir WFR4D). Under Alternatives A and C, all existing suitable habitat would be maintained as suitable within HRCAs. Two HRCAs will be subject to hazard tree removal, which would not adversely affect the integrity of any spotted owl HRCAs.

**Northern Goshawk**

Two of the four goshawk PACs in the analysis area would be subject to hazard tree removal. Removal of hazard trees would not adversely affect the integrity of any goshawk PAC.

Proposed road reconstruction would traverse 1.1 miles of one goshawk PAC (Haskins North). This road reconstruction would be subject to a limited operating period to eliminate direct effects on breeding goshawks.

Fuel treatments proposed under alternatives A and D would enter two goshawk PACs and would maintain suitable habitat. No group selections are proposed in any goshawk PACs in the wildlife analysis area.

**Mesocarnivores (American marten and Pacific Fisher)**

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area.

Alternatives A and D, due to the heavier DFPZ treatments and group selections proposed would reduce some mesocarnivore suitable denning and foraging habitat to an unsuitable state (CWHR 4P or MCP). Reductions in denning habitat would occur under alternatives A and D as a result of thinning treatments opening up the canopy closure. Denning habitat treated under alternatives A and D would be reduced by 7.4 percent and 8.0 percent respectively. Suitable foraging habitat treated under alternatives A and D would result in a decrease of less than 1 percent. Alternative C would not reduce suitable denning habitat. Non-commercial treatments proposed under Alternatives A, C, and D would also remove components important to mesocarnivores for movement and foraging (snags, vertical and horizontal layering, down woody debris, etc.). The 2 miles of new temporary non-system roads proposed to be constructed for the Bucks Project would be decommissioned upon project completion, so there will be no change to the total equivalent roaded acres.

**Alternative B (No Action)**
Alternative B would pose no risk and uncertainty associated with the proposed actions, but it would maintain a risk of potential habitat loss from wildfire, while the action alternatives would reduce this risk.

**Aquatic Wildlife Species**

**All Action Alternatives (A, C, and D)**

Approximately 395-402 acres of Riparian Habitat Conservation Areas (RHCAs) would be entered for treatment under each action alternative. All alternatives would apply specific RHCA prescriptions that would maintain suitable habitat values for aquatic species while creating riparian conditions that would be less susceptible to high-severity fire. This reduction of long-term threat of stand-replacing fire as a result of treatments would offset any short-term minor effects.

The Bucks Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, no subwatersheds would be at or exceed the threshold of concern (TOC). Thus, suitable water quality, in-stream habitat and riparian conditions for aquatic species in both riverine and lacustrine aquatic systems would not be susceptible to adverse cumulative effects as a result of fuel reduction activities implemented under the Bucks Project.

No aquatic habitat would be directly impacted by any project activities except for instream bank stabilization: bank stabilization is proposed on 1,000 feet of Bucks Creek and 500 feet of Pat Maloy Ravine. Log and boulder vanes would be installed to stabilize the banks of Pat Maloy Ravine. Native riparian vegetation would be planted by hand at all proposed stream restoration sites to improve riparian habitat, stabilize stream banks, and increase channel shade. No fuels reduction or vegetation changes are expected along the Bucks Lake shoreline.

No change in riparian vegetation is expected from fuel reduction through thinning planned with any action. With incorporation of design standards within all RHCA’s, including implementation of the S&G’s and BMP’s, sedimentation into the stream channels should be minimal to non-existent. No live vegetation currently providing shade would be removed by the action alternatives, thus no immediate change in water surface shade is expected. Large woody recruitment would remain within RHCAs along all perennial creeks. Streams within the project area or the analysis area are not expected to change flow due to the implementation of the action alternatives. Changes in stream flow are not expected to increase with removal of trees proposed for fuel reduction through thinning. For example all perennial streams are expected to remain perennial, all intermittent streams are expected to remain intermittent and the same for ephemeral streams. Given implementation of erosion control features in activity areas, and observations of stream buffer effectiveness, impacts to water quality from activity disturbed ground are not expected to be a significant factor in the event of precipitation that induces overland flow in the watersheds. The slight amounts of sediment generated from activity areas during a high runoff event over the landscape would not be measurable or detectable at the analysis watershed scale.
and would not affect identified downstream beneficial uses, including habitat occupied by fish, including both lake and spawning habitat found in lake tributaries. Quality spawning habitat in Bucks Creek would continue to be provided for kokanee and trout, and this creek would benefit from surrounding upland fuel reduction that would reduce future fire severity within the watershed.

Under alternatives A and D, Borax (Sporax or similar product) would be applied to all cut stumps greater than 14 inches in diameter in fuel treatment areas and greater than 3 inches in diameter in campground areas to minimize the susceptibility to Heterobasidion root disease. In the most recent risk assessment for Borax (SERA 2006), Boron, the agent of toxicological concern in Borax, was further evaluated. The focus of the evaluation was wildlife’s direct consumption from the stump and ingestion of contaminated water. The assessment concluded that the use of Borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates. No adverse effects to aquatic wildlife species are anticipated due to the use of Borax.

*Mountain Yellow-legged Frog.* Potential direct effects are expected to be negligible to MYLFs due to the likelihood, based on survey results, that populations are not present in treatment areas. Suitable MYLF riparian habitat could be affected under all alternatives but, based on RHCA prescriptions and design criteria (including equipment exclusion zones), implementation of Best Management Practices, and implementation of soil and water mitigation standards (RMOs), adverse effects would be minimal. Existing suitable habitat for MYLF would benefit from reduction of fuels under all action alternatives, reducing the risk of fire severity within the watershed.

*Alternative B (No Action)*

Alternative B would pose no risk and uncertainty associated with the proposed actions, but it would maintain a risk of potential habitat loss or habitat degradation, from wildfire. There would be no direct effects on aquatic wildlife species because no activities would occur to create disturbance or result in any impacts on the existing habitat conditions.

*Environmental Consequences: USDA Forest Service R5 Sensitive Species*

**Bald Eagle**

**All Action Alternatives (A, C, and D)**

**Direct Effects**

There would be no direct effect to the existing bald eagle territory, including the foraging areas around Bucks Lake, with any action alternative. This is because there are no treatments within the terrestrial territory; minor hand thinning and some hazard tree removal is proposed adjacent to roads and facilities. Hazard trees, or large snags important for perching and fishing along the
majority of the Bucks Lake shoreline, will not be impacted. No road construction, prescribed burning, or handpiling would occur within the territory.

Area thinning prescriptions are designed to accelerate stand growth and provide for future CWHR size class 4 and 5 trees. Area thinning prescriptions are also designed to encourage long-term regeneration of large pines by maintaining the largest and most fire-resilient dominant and codominant trees. The resulting stand condition of such thinning within the Bucks Project would be an uneven-age forest structure composed of true fir, Jeffrey and sugar pine greater than 30 inches DBH with total canopy cover of 30-50 percent. Protection and enhancement of large tree habitat by thinning smaller conifers would improve the growth of the residual trees, while surface and ladder fuel reduction would protect the larger tree component for future nest trees. Therefore, the area thinning treatments, including both mechanical and hand thinning, implemented under the action alternatives would be deemed a beneficial effect, resulting in potentially suitable nesting habitat for bald eagles in the future.

**Indirect Effects**
Changes in the fishery production are not expected in Bucks Lake as a result of implementing proposed thinning treatments and hazard removal in the Bucks Project area. Implementing Best Management Practices and meeting all Riparian Management Objectives (the RMO analysis is located in the Hydrology and Soils report) would ensure that there would be no indirect effects on the fishery or fishery habitat.

**Cumulative Effects**
It is not anticipated that the Bucks Project would result in any additional cumulative effects in the Bucks Lake area that could adversely impact bald eagle or bald eagle habitat. The existing nest territory is located in the Bucks Wilderness so there is no threat from any private land activities within the territory.

Recreational activities in the wildlife analysis area contribute to cumulative effects on bald eagles in terms of increased levels of human disturbance and noise that can result in displacement of bald eagles from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as snowmobiling, hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering). Urbanization of the private land at Bucks Lake is expected to continue and make encroachments into available conifer and conifer edge habitat. At this writing, the existing recreational use at Bucks Lake seems compatible with bald eagle management and has not resulted in any loss of productivity since the Forest Service has been monitoring the nest site.

All action alternatives would contribute to reducing the risk of high intensity wildfire, potentially protecting suitable habitat for bald eagles. The action alternatives would reduce
hazardous fuel loads while protecting large structural components contributing to habitat suitability, thereby lowering the risk of habitat loss or degradation due to wildfire.

**Determination**

The Forest Service has determined that the action alternatives of the Bucks Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

**Alternative B (No Action)**

**Direct Effects**

There would be no direct effects on the bald eagle or existing bald eagle habitat. No activities would occur that would cause disturbance to nesting, wintering, or migrating birds.

**Indirect Effects**

The recreational affects are the same as described above under the action alternatives for cumulative effects. The indirect effects of no action would include the potential for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more severe burn. Increased rates of spread and fire severity would result in potential loss of bald eagle nesting habitat and other important habitat attributes such as large trees and snags.

**Cumulative Effects**

No acres of suitable habitat would be treated and would not reduce the average suitability of any habitat types within the analysis area for bald eagles.

The no-action alternative for the Bucks Project would not provide for the long-term protection of bald eagle habitat from potential stand replacing fire. There would be no actions designed to reduce the risk of high-intensity wildfire. There would be no thinning to enhance the growth of dominant and co-dominant trees that may provide future habitat availability. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA FEIS 2001) which could lead to lower bald eagle abundance in the wildlife analysis area compared to existing conditions.

**Determination**

The Forest Service has determined that the no action alternative of the Bucks Project will not affect the bald eagle.
California Spotted Owl

All Action Alternatives (A, C, and D)

Direct Effects
The analysis of direct effects on California spotted owl (CSO) is focused on Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs) existing within the wildlife analysis area and created as a result of surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs and HRCAs are discussed in the “Indirect Effects” section below. Direct effects on spotted owls are not anticipated within any of the PACs in the Buck’s Project Area. Of the six PACs within the analysis area, three would be entered for hazard tree removal and three would not be entered under any alternative. Direct effects on spotted owl habitat are expected to be minimal for all action alternatives, as described below.

Three PACs (PL015, PL028, and PL113) would be subject to hazard tree removal with Alternative A and D. Hazard tree removal would be subject to a Limited Operating Period (March 1 to August 15), to minimize disturbance to nesting owls during the breeding season. Removal of hazard trees (both live and dead) during the non-nesting season would not adversely affect owl behavior. Removal of hazard trees would not affect the integrity of any spotted owl PAC. No other actions proposed under any alternative would occur within spotted owl PACs.

One of the five HRCAs in the analysis area (PL028) would be affected by proposed treatments under the action alternatives. Under Alternative D, one HRCA (PL028) would see a reduction in suitable acres. The reduction in this HRCA would be approximately 1 percent and would be entirely due to group selection acreage. Thus, group selection under alternative D is estimated to reduce a small percentage of suitable habitat in one HRCA (PL028 – 6 acres of White Fir WFR4D).

If spotted owls are detected during future surveys or project-related activities, PACs and Home Range Core Areas (HRCAs) would be delineated, and all treatments would be modified to comply with the standards and guidelines in the HFQLG Act final EIS and Record of Decision (USDA 1999a, b) and the SNFPA 2004 ROD (USDA 2004b).

Limited Operating Periods (LOPs) would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections. Where nest sites are unknown, LOPs will be applied to Spotted owl PACs. An LOP would also be applied to haul routes within 0.25 mile of spotted owl PACs. LOPs are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location and are not expected to substantially affect habitat use or reproductive capacity of this species.

No new road construction would occur in spotted owl PACs, SOHAs, or RHCAs. Road reconstruction would traverse 1.4 miles of one PAC (PL028) and 0.5 miles of one HRCA.
(PL028). This road reconstruction would be subject to a limited operating period to eliminate direct effects on breeding spotted owls.

Proposed treatment activities could occur as early as Fall 2012 and may continue five years beyond the initiation of implementation. There is the potential that spotted owls could establish new, undocumented territories (activity centers) during project implementation and would not be protected by existing PACs. If spotted owl activity centers are determined during future surveys or project-related activities, PACs would be delineated, and all treatments would be modified to comply with the standards and guidelines in the HFQLG Act final EIS and Record of Decision (USDA 1999a, b) and the SNFPA 2004 ROD (USDA 2004b). The decision to conduct additional protocol surveys within the project area will be made by the District Ranger in consultation with the wildlife biologist based on project implementation timelines.

**Indirect Effects**

Based on the vegetation map and CWHR model, about 2,794 acres of National Forest System lands in the wildlife analysis area may be considered suitable spotted owl nesting habitat (CWHR size/density classes 5M, 5D, and 6), and about 4,187 of National Forest System acres may be considered suitable foraging habitat (CWHR size classes 4M and 4D). The total acres of suitable owl habitat in the wildlife analysis area that would remain after implementation of each action alternative are presented in Table 9 above. The post-project CWHR changes summarized in Table 9 are based on the silviculture prescription assigned to each CWHR type within treatment units (see chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable spotted owl foraging habitat (CWHR size classes 4M and 4D) as a result of implementing project activities would occur under Alternatives A and D. Approximately 693 acres of 4M and 4D habitat is proposed for treatment under Alternative A (281 acres includes overstory treatment and the remaining 412 acres would not affect the forest canopy) and approximately 509 acres of 4M and 4D habitat is proposed for treatment under Alternative D (289 acres includes overstory treatment and the remaining 220 acres would not affect the forest canopy). Prescriptions that would result in 4M and 4D stands being reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units in Alternatives A and D and all group selection (GS) units in Alternative D. Alternative A would reduce 44 acres of 4M/4D stands to a 4P state (35 acres from 4D, 9 acres from 4M). Alternative D would reduce 40 4M/4D acres to a 4P state (31 acres from 4D, 9 acres from 4M). Group selection treatments under alternative D would reduce an additional 20 acres of 4M and 4D stands to a SMC 1 or WFR 1 condition (approximately 10 acres from 4D and 10 acres from 4M). Alternative D, with DFPZ and group selection units, would have the greatest affect on suitable owl habitat. No stands treated under alternative C would be reduced to an unsuitable state.

The amount of 4D stands reduced to a 4M condition (i.e. canopy closure after treatment would be 40-60 percent) under each alternative would be as follows — Alternative A-28 acres,
Alternative D-27 acres. Although canopy cover down to 40 percent is considered suitable for foraging (USDI 2005), it appears to be marginally so based on owl occurrence and productivity threshold at around 50 percent canopy cover (Verner et al. 1992). Under all alternatives, the majority of DFPZ and area thinning treatments applied to CWHR 4M and 4D stands would result in no change to CWHR size class or canopy closure class. Of the approximate 693 acres of 4M and 4D habitat proposed for treatment, 94 percent and 100 percent under alternatives A and C, respectively, would continue to provide suitable foraging conditions for the spotted owl. No group selection would occur under Alternative A and C and treatments such as light thinning, mastication, hand-thinning, underburning would maintain these stands in a suitable CWHR state. Alternative D, which would implement group selections, would maintain 449 acres (88 percent) of treated 4M and 4D acres in a suitable state.

Based on recent habitat assessments of 103 CSO territorial sites across the Plumas Lassen study area (Keane 2010) the habitat value to nesting/roosting spotted owls of size class 4 stands with a moderate canopy cover increases significantly when larger tree (LT) components (i.e., contribution of >24 inch trees to the total tree crown cover) were recorded. Based on stand exam data collected and modeled for the Bucks Project, this large tree component exists in most of the post-project 4D and 4M stands (i.e. large tree attributes recorded in all but three units, and more than 10 large trees recorded in approximately 50 percent of the stands). These areas, based on recent research findings (ibid), would likely provide not just foraging conditions for the spotted owl but also suitable conditions for roosting and possibly for nesting.

Suitable nesting habitat (CWHR 5M and 5D) proposed for treatment under all alternatives is expected to remain suitable for spotted owls (i.e., no change or reduced to 5M). Approximately 87 acres of 5M is proposed for treatment under each action alternative. No mechanical thinning is proposed in 5D habitat under any of the action alternatives. Alternative D would result in the heaviest treatments, with up to 30” DBH trees removed while maintaining a 30-40 percent canopy closure in some stands and 40-50 percent canopy closure in other stands. Prescriptions under alternative A would adhere to an upper diameter limit of 30” DBH trees and would maintain 40-50 percent or 50-60 percent canopy closure in most stands. Under Alternative A, six units would be reduced to a 30-40 percent canopy closure. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12” DBH and maintaining existing canopy closure in all 5M and 5D stands.

All group selection treatments proposed under Alternative D would be located outside of CWHR 5M and 5D stands. Alternative D would treat, using GS, approximately 34 total acres (12 acres PPN3M, 10 acres WFR4D, 4 acres WFR4M, 6 acres SMC4M and approximately 1 acre each of WFR3M, WFR3D, and SMC4P). All acreage treated with GS would be reduced to a SMC 1 or WFR 1 condition, which is considered unsuitable for spotted owl nesting or foraging.

Group selection treatments, as proposed under alternative D, would create early seral stages and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The
treatment would not result in areas that prevent access to adjoining suitable habitat. The small size of the groups (0.5 acre to 2 acres) would not preclude owls from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in group selection units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is anticipated that the majority of snags would be felled, and very few snags would be left in the 34 acres of group selection under alternative D.

Improving forest health is one of the objectives of the Bucks Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal in mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that owls seek to control exposure and changes in ambient temperature for roosting. Biomass removal can degrade or remove hiding cover in the lower and mid canopy often used by young of the year owlets. On average, the following percentage of stand biomass would be retained in mechanical thin units:

under alternatives A, C, and D, 23 to 76 percent in CWHR size class 4 and 8 to 83 percent in CWHR size class 5.

Irwin and Rock (Irwin and Rock 2004) found that the probability of stand use by spotted owl increased strongly as basal area rose from 80 to 320 square feet per acre (optimum range is between 160 and 320 square feet per acre) and was positively influenced by the number of trees per acre that were greater than 26 inches DBH. With implementation of mechanical thinning under alternative A the residual basal area in CWHR size class 4 would average 181 to 268 square feet per acre and 193 to 322 in CWHR size class 5. Under alternative C mechanical thin units in CWHR size class 4 would average 225 to 348 square feet per acre and CWHR size class 5 stands would average 234 to 414 square feet per acre. Under alternative D mechanical thin units in CWHR size class 4 would average 179 to 262 square feet per acre and CWHR size class 5 stands would average 187 to 304 square feet per acre.

One of the 5 HRCAs in the analysis area (PL028) would be affected by proposed treatments under all alternatives (Table 10). Alternative D would decrease existing suitable acres in one HRCAs as a result of implementation of group selection (GS) treatments. DFPZ treatments proposed in alternatives A and D would not reduce existing suitable acres in HRCAs. Estimated HRCA group selections would occur in 4D or 3D stands. HRCA acres treated under alternative C would retain sufficient size trees and canopy closure to result in no change to existing CWHR size and density classes. No group selection would occur under alternatives A and C.
Several studies provide insight into spatial availability of habitat for California spotted owls (Hunter et al. 1995, Bingham and Noon 1997, Meyer et al. 1998, Franklin et al. 2000, Blakesley 2003, Zabel et al. 2003). Blakesley (Blakesley 2003, Blakesley et al. 2005) states that occupancy, apparent survival, and nesting success all increased with increasing amounts of old-forest characteristics, and reproductive output decreased with increasing amount of nonhabitat within a 500 acre area surrounding nest sites. Blakesley’s data indicates that 71 percent suitable habitat within this nest area should be a minimum management target (Blakesley 2005, Blakesley et al 2005). These data suggest that effects outside of the PAC (on another 200 acres) may influence a site’s “quality” for spotted owls. Based on these studies, it could be assumed that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area.

Using GIS, a 500-acre nest core area for each spotted owl activity center was created. Existing suitable habitat was examined in each circle, with respect to all proposed Bucks Project treatments. Of the six 500-acre nest cores within the analysis area, five have acreage that will be treated under each alternative. Table 11 (column 2) summarizes the existing conditions within these five nest cores. Most of these 500-acre nest cores included private land, which was assumed to be unsuitable habitat, regardless of current classification. None of these nest cores currently meet the desired management target of 71 percent habitat stated by Blakesley (2003 and 2005) and summarized above. However, the treatments proposed will not reduce suitability in most of these nest core areas. In one nest core area, PL028, some acres of 4D will be reduced to a 4M condition (22 acres in Alternative A, 21 acres in Alternative D). In Alternative C, the 92 acres in this nest core would be proposed for handthin, pile, and burn treatment, which will not reduce suitability in these acres. As Table 11 shows, the remaining four nest cores will not be affected by actions proposed in Alternatives A, C, and D.

Table 11 summarizes the treatments and corresponding effects to suitable CWHR 4M, 4D, 5M, and 5D within the six 500-acre CSO nest cores within the analysis area, one of which would...
be affected by treatments. Total proposed acres of treatment within each nest core is as follows: PL015 — 93 acres remove hazard trees, PL143 — 7 acres remove hazard trees, PL113 — 26 acres remove hazard trees, PL373 — 0 treatment acres, PL305 — 0 treatment acres, and PL028 -- 47 acres of suitable habitat treated. Under Alternative A, based on planned DFPZ treatments in 4D that would be mechanically thinned to 40-50 percent canopy closure, 22 acres within PL028 nest core would be reduced post-project to 4M. Under Alternative D, based on similar proposed DFPZ fuel treatments, 21 acres of 4D will be reduced to 4M. Also, under Alternative D, the PL028 nest core includes portions of two mechanical thinning units where four group selections (GS) totaling 6.1 acres are proposed. The percent reduction of suitable acres for the 500 acre nest cores is as follows: PL028 – 3 percent in Alternative D only, due to group selection.

Table 48. Summary of existing condition of 500-acre nest cores affected by proposed DFPZ and area thinning treatments and project’s effects to suitable CWHR.

<table>
<thead>
<tr>
<th>PAC</th>
<th>Existing suitable nest core acres</th>
<th>Effects to CWHR size/density</th>
<th>Treated acres</th>
<th>Proposed treatment prescription*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing suitable nest core acres</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL015</td>
<td>289 (58%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL028</td>
<td>175 (35%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL113</td>
<td>208 (42%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL143</td>
<td>171 (34%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL305</td>
<td>240 (48%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL373</td>
<td>278 (56%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DFPZ, area thinning, and group selection treatments under all alternatives would not reduce CWHR 5M and 5D within the nest cores to an unsuitable state. The CWHR size class 5 in nest cores that would be treated is 35 acres in PL015 and 3 acres in PL028. These acres would remain suitable post-treatment for all action alternatives. Under all action alternatives, these acres are
proposed for mechanical biomass removal of trees less than 10" DBH, resulting in no change to CWHR.

By quantifying the habitat changes within the home range as a result of project actions, a risk assessment based on habitat needs as outlined by Verner et al. (1992) and Blakesley (2003) among others, can be completed. This method or derivatives of this method have been used for over a decade to predict potential effects and the subsequent risk of implementing vegetation management projects. While there is a large amount of data on habitat suitability with regard to spotted owls, there have been no comprehensive studies on the impacts of vegetation management activities on reproductive success, impacts to prey, and long-term viability at the landscape level within a managed landscape. Specifically, although a risk assessment can be made when projects reduce habitat within a territory below a given threshold, no data exists that permit a reasoned prediction of impacts that vegetation management activities may have when the amount of suitable habitat remains above a given threshold.

The size of the home range selected for this analysis is reflective of breeding home range sizes elsewhere in the Sierra bioregion for mixed conifer forests. While a specific home range size is not discussed per se within the 2004 Record of Decision on the SNFPA Final Supplemental EIS, the Record of Decision does reference an analysis-size circle of 1.5 miles in diameter around the activity center, which equates to approximately 4,500 acres. Home range sizes for the California spotted owl are reported to vary between 3,000 acres (Call et al. 1992, Verner et al. 1992) for breeding pairs to as much as 12,500 acres (Verner et al. 1992) for non-breeding pairs on the east slopes of the Cascade Range. This analysis uses findings from Verner et. al. (1992) and SNFPA guidelines (USDA 2004b) in delineating spotted owl home ranges as a circle of approximately 4,500 acres (1.5 mile radius) surrounding the territorial site.

Table 12 shows the amount of suitable habitat and effects of treatment in each territorial home range potentially affected by the Bucks Project. Six 1.5 mile radius home ranges would have acres treated under this project. Note that several of these home ranges overlap with one another. The percent of overlap is reflected in Table 12. Following implementation of the Bucks Project, all six 4,500-acre home ranges would retain above 30 percent suitable habitat, which is the minimum threshold recommended by Bart (1995). DFPZ treatments under alternative A and DFPZ and group selection treatments under alternative D would change a maximum of 1 percent of suitable acres in these home ranges to an unsuitable state. Overall, the remaining suitable spotted owl habitat home range percentage for these six territories would be reduced by 0-1 percent over pre-project levels. The vegetation map used for this analysis indicates that five out of six home ranges include a significant amount of private forested land, which may provide additional suitable acres (the total FS acres and the total private acres within the 4500 acre home range are shown in Table 12). Our impact analysis is based solely on NF system acres. The average percent reduction in suitable habitat for all 4500-acre home ranges is between 0 and 1 percent for Alternatives A and D. Treatments under Alternative C would not reduce any home range acres to unsuitable.
Table 49. Summary of existing conditions and treatment effects (including group selection treatments in Alternative D) on 4500 acre California spotted owl home ranges in the wildlife analysis area

<table>
<thead>
<tr>
<th>PAC</th>
<th>Existing suitable Forest System acres / % of 4500</th>
<th>Total Forest System Acres / (Private acres)</th>
<th>% overlap with other Home Ranges</th>
<th>CWHR 4M/4D acres reduced to unsuitable</th>
<th>CWHR density class D reduced to class M (acres)</th>
<th>% suitable post project (% acres reduced from existing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL015</td>
<td>2190 (49%)</td>
<td>4000 (1000)</td>
<td>25%</td>
<td>1 0 1</td>
<td>28 0 27</td>
<td>49% (0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44% (1%)</td>
</tr>
<tr>
<td>PL028</td>
<td>2034 (45%)</td>
<td>3504 (996)</td>
<td>70%</td>
<td>40 0 51</td>
<td></td>
<td>34% (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34% (1%)</td>
</tr>
<tr>
<td>PL113</td>
<td>1591 (35%)</td>
<td>3846 (654)</td>
<td>50%</td>
<td>43 0 52</td>
<td></td>
<td>37% (0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>37% (0%)</td>
</tr>
<tr>
<td>PL143</td>
<td>1643 (37%)</td>
<td>3485 (1015)</td>
<td>25%</td>
<td>0 0 0</td>
<td></td>
<td>56% (1%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>56% (1%)</td>
</tr>
<tr>
<td>PL305</td>
<td>2552 (57%)</td>
<td>4433 (67)</td>
<td>70%</td>
<td>42 0 48</td>
<td></td>
<td>61% (0%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>61% (0%)</td>
</tr>
<tr>
<td>PL373</td>
<td>2727 (61%)</td>
<td>4187 (313)</td>
<td>25%</td>
<td>1 0 1</td>
<td></td>
<td>61% (0%)</td>
</tr>
</tbody>
</table>

**Cumulative Effects Common to Old-forest Species, including the California Spotted Owl.**

The analysis of cumulative effects of the proposed project evaluates its anticipated impact on Threatened, Endangered, and Sensitive species and Management Indicator Species (MIS) and compares those effects to the existing condition (the existing condition reflected by changes that have occurred in the past) within the 15,914 acre wildlife analysis area. Past actions in the area include timber harvest, wildfires, recreation use, wildlife habitat improvement, grazing, and mining. Past timber harvesting on National Forest and private land, together with wildfires, have created a mix of vegetation types and age classes across the wildlife analysis area that has shaped the distribution of old-forest and early seral wildlife species, as reflected by the existing vegetative condition.

The past management history of the Bucks Project area has strongly influenced stand structure, species composition, fuels, and potential fire behavior at both stand and landscape levels. Fire exclusion and extensive drought-related mortality has created relatively homogeneous areas typified by mid-seral even-aged trees existing at high densities. High-density stands are more susceptible to density-dependent mortality driven by drought and insect and disease infestations. Despite many past salvage treatments to remove drought-related mortality, especially along the eastern edge of the analysis area, much of this material has fallen over in the last two decades and become dead and down fuel with high fuel loadings. The high densities of small trees and high fuel loads contribute to continued accumulation of surface, ladder, and canopy fuels, and this accumulation increases the potential for stand-replacing high-severity fire events.
All action alternatives would contribute to reducing the risk of high intensity wildfire, potentially protecting suitable habitat for old-forest species. The action alternatives would reduce hazardous fuel loads while protecting large structural components contributing to habitat suitability, thereby lowering the risk of habitat loss or degradation due to wildfire.

Alternatives A and C would treat more DFPZ acres than Alternative D (Alternative A: 1,511 acres, Alternative C: 1,475 acres, and Alternative D: 1,010 acres). Therefore, Alternatives A and C would provide the greatest reduction in the risk of high intensity wildfire.

The majority of the timber harvest activity on public lands within the wildlife analysis area has occurred on the eastern edge of the analysis area, specifically east of the Big Creek road. Much of this area has experienced sanitation/salvage harvest. Most recently the Guard Timber Sale implemented DFPZ’s, area thinning, and group selection harvest. Approximately 13 group selections totaling 20 acres created by the Guard Timber sale are present within the analysis area, but none are within or adjacent to proposed treatment units for the Bucks Project. Site preparation for planting, pre-commercial thinning, and underburning were also part of the timber harvest activities. These past actions resulted in reduced canopies and simplified overstory and understory structure within treated stands, which could have increased overall habitat diversity at the landscape level at the time of implementation. In summary, the timber/fuels/vegetation projects in the wildlife analysis area focused on even-aged (clearcut, overstory removal) forestry in the 1970s and 1980s, then switched to sanitation and singletree selection, and then to commercial thinning and fuels reduction in the 1990s and 2000’s. This change in focus, brought on by changes in management guidelines (USDA 1988, 1993a, 2001b, 2004b) has created habitat conditions that support the wildlife habitat currently present in the wildlife analysis area.

Private land logging activities in the wildlife analysis area that have occurred have been more recent (since 2005). Pacific Gas & Electric Company has implemented logging actions that have thinned from above, creating approximately 230 acres of CWHR SMC/WFR 4P. Thus, actions on private lands have provided for a more open canopy forest with very little understory vegetation.

Four fires have been recorded within the wildlife analysis area in the past 100 years totaling 3,391 acres. Two of the fires burned in 1926 (3,179 acres) and two burned in 1999 (212 acres). These wildland fires burned at high intensity and created small to large monotypic openings of early seral brush habitat within the forest that contribute to both small and large scale fragmentation of continuous forest cover. Specifically, in the Bucks Summit burn area, which burned in 1926, the majority of the fire area that was not planted to pine is still supporting dense montane chaparral that is slowly being invaded by shade tolerant fir species. Brushfields within and between the plantations support very decadent, impenetrable brush. Large brushfields created by wildfire are used extensively by early seral and mid-seral wildlife species but not used by species requiring old forest and continuous forest conifer cover.

The Personal Use Firewood Program on the Plumas National Forest is an ongoing program that has been in existence for years and will continue. This program allows the public to purchase a woodcutting permit and remove fuel and firewood from National Forest System lands. A 9-year
average (2001–2009) for the Mt. Hough Ranger District indicates that 2,525 permits were issued annually, resulting in the average annual sale of 5,049 cords of wood on the district. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. Portions of the Bucks Project area are open for woodcutting. The Bucks Lake wilderness and a defined perimeter around Bucks Lake and Lower Bucks Lake are closed to woodcutting. Thus, areas of snag and log recruitment would continue in closed areas, while snags and logs would continue to be removed in open areas, resulting in the cumulative loss of these habitat components across the landscape, negatively affecting those species dependent on such structures. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss in the analysis area; snag and log removal is most common along or within a short distance from open roads. Hazard tree removal proposed in the Bucks Project would contribute to a reduction in snag availability along roads within the analysis area.

Urbanization of private land is ongoing within the analysis area, with rural cabin/home sites being developed slowly over time. On National Forest land, recreation residences along the western side of Bucks Lake and within Haskins Valley has created an urban wildland habitat interspersion that probably allows for some continued wildlife use, but probably only during certain portions of the year when the majority of residences are unoccupied. In these situations, wildlife diversity increases while species density decreases.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering. Other forms of recreation may also cause disturbance to wildlife species, although it is expected that the majority of these uses would be associated with Bucks Lake; camping, boating, fishing, and general day use activities. Recreation use of the area with the corresponding effects of recreational disturbance on wildlife and wildlife habitat are considered minor.

The 6.8 miles of new temporary non-system roads proposed to be constructed for the Bucks Project would be decommissioned upon project completion. Thus, no long-term increases in human activities are expected as a result of the action alternatives.

Present and ongoing projects occurring in the boundary of the Bucks Project wildlife analysis area include the Basin Group Selection Project and the On-Top Timber Sale. The Grizzly and Ararat Timber sales were planned under the Basin EIS and are currently under contract. Portions of the groups have been cut. There are 16 group selections totaling approximately 26 acres from the Ararat Timber sale within the wildlife analysis area. The Grizzly groups are outside of the wildlife analysis area.
Within the Bucks Analysis Area, approximately 46 acres of group selections are present (26 acres from the Ararat Timber Sale and 20 acres from the Guard Timber sale). Approximately 25 acres of SMC1 and 21 acres of WFR1 have been created by these activities, previously reducing the amount of 4M/4D by 37 acres and reducing the amount of 5M by 2 acres. These changes in acres are accounted for in Table 3 of the Bucks Project BA/BE as existing conditions.

The only future foreseeable project that would potentially affect habitat in the wildlife analysis area is the On-Top HFQLG Project. One treatment unit of the On-Top project is within the Bucks Analysis area. This proposed treatment unit consists of 18 acres of CWHR4P that will have 3.5 acres of groups and 14.5 acres of mastication within the matrix between the groups. Thus this project would not add cumulatively to any reduction in late seral forest habitat within the Bucks analysis area.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in northern spotted owls, through both hybridization as well as replacing the spotted owl in some areas. It is thought that this range expansion and subsequent northern spotted owl displacement can be a result of forest fragmentation and the barred owl’s ability to adapt better to a mosaic of habitats. It is suspected that barred owl expansion into the range of the California spotted owl is occurring due to these same reasons.

Barred owls have expanded their range in California as far south as Sequoia National Park, and in recent years the known range of barred owls has expanded 200 miles southward in the Sierras(USDI 2006). The U.S. Fish and Wildlife Service has concluded that barred owls constitute a threat to site occupancy, reproduction, and survival of the California spotted owl, but that there is currently not enough information to conclude that hybridization with barred owls poses a threat (ibid.).

According to the most recent annual report of the Plumas-Lassen Administrative Study (Keane 2010) based on historical and current occurrence records, there have been a minimum total of 53 individual barred owl records across the Sierra Nevada. This includes a minimum total of 19 records in the PLS study area, a portion of which is located in the Bucks wildlife analysis area. The pattern of records suggest that barred owls have been increasing in the northern Sierra Nevada between 1989-2009 and are now present in low, stable numbers in the PLS study area. No barred owl detections have occurred within the wildlife analysis area.

**Determination.**

The Forest Service has determined that the action alternatives of the Bucks Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.
Alternative B (No Action)

Direct Effects
There would be no direct effects on the spotted owl or existing spotted owl habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects
This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such as weather and fire. The increase in conifer mortality could indirectly benefit the owls, as the increased decadence would have a positive effect on prey base numbers and overall habitat values.

Cumulative Effects
The no-action alternative for the Bucks Project may not provide for the long-term protection of spotted owl habitat from potential stand replacing fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total acres burned by high-intensity wildfire are anticipated to increase from current levels under this alternative (based on analysis conducted in the SNFPA final EIS 2001) which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities and urbanization in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.
Determination
The Forest Service has determined that the no action alternative of the Bucks Project would not affect individual California spotted owls or California spotted owl habitat.

Northern Goshawk

All Action Alternatives (A, C, and D)

Direct Effects
The analysis of direct effects on northern goshawk is focused on known PACs up to and including the 2011 surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the “Indirect Effects” section below.

Under all action alternatives, goshawk PACs would be entered for hazard tree removal (57 acres). Currently, there are 4 goshawk PACs (929 acres) in the Wildlife Analysis Area. One goshawk PAC overlaps with spotted owl PAC habitat (goshawk nesting habitat requirements are similar to California spotted owl nesting and foraging requirements [(USDA 1999a), page 3-106]).

Within two goshawk PACs, the only treatments would be hazard tree removal. Hazard tree removal would be subject to a Limited Operating Period (February 15 to September 15), to minimize disturbance to nesting goshawks during the breeding season. Removal of hazard trees (both live and dead) during the non-nesting season would not adversely affect goshawk behavior or alter the integrity of any goshawk PAC.

Within two goshawk PACs, DFPZ treatments are proposed under alternatives A and D. These DFPZ treatments would occur in 10 acres of 4M habitat in the Buck’s Summit PAC and in 16 acres of 5M habitat in the Haskins South PAC. Following treatment, canopy cover would be retained above 40 percent and suitable habitat conditions for goshawks would be maintained. Under alternative C, all suitable goshawk habitat would be retained, as no treatments would affect canopy cover or CWHR size class conditions.

Under alternatives A and C, in the Buck’s Summit PAC, an additional 20 acres of 4M and 4D will be entered for understory treatment to reduce surface fuels. Proposed treatments include grapple pile and burn (14 acres of 4M) and hand pile and burn (6 acres of 4D). These proposed treatments would not affect habitat suitability for goshawks. Under alternative D, these understory treatments would not be included.

Limited Operating Periods (LOPs) would be implemented which would not allow treatment activities and use of haul roads within 0.25 mile of goshawk PACs and active nest sites from February 15 to September 15. Goshawk PACs will be used as a surrogate for nest sites for this LOP until surveys are conducted to determine whether nest sites are active. If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, PACs would be delineated and applicable resource protection measures (such as LOPs)
would be applied. The LOPs are expected to eliminate effects from increased human activity and vehicle and equipment noise.

No new road construction would occur in northern goshawk PACs. There would be 1.1 miles of road reconstruction traversing one goshawk PAC (Haskins North). This road reconstruction would be subject to a LOP to eliminate direct effects on goshawks.

The proposed treatments could occur as early as the fall of 2012, and potentially continue an additional 5 years. There is the potential that goshawks could establish new territories (activity centers) during project implementation that would not be protected as PACs. The decision to conduct additional protocol surveys within the project area will be made by the District Ranger in consultation with the wildlife biologist based on project implementation timelines. If goshawk nests are detected during future surveys or project-related activities, PACs would be delineated, and all treatments would be modified to comply with the standards and guidelines in the HFQLG Act final EIS and Record of Decision (USDA 1999a, b) and the SNFPA 2004 ROD (USDA 2004b).

**Indirect Effects**

Based on the vegetation map and CWHR model, about 6,942 acres of National Forest System lands in the wildlife analysis area provide high nesting capability for the northern goshawk (CWHR size/density classes 4M,4D,5M,5D), and an additional 39 National Forest System acres provide moderate nesting capability (Red fir 4M,4D), as shown above in Table 4. The total acres of suitable goshawk habitat in the wildlife analysis area that would remain after implementation of each action alternative is basically the same as presented in Table 9 above, with the exception that this table includes an additional 39 acres of red fir 4M and 4D, which is considered moderately suitable goshawk habitat. The post-project CWHR changes summarized in Table 9 are based on the silvicultural prescriptions assigned to each CWHR stand within treatment units (see chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable goshawk nesting habitat (CWHR size classes 4M and 4D) as a result of implementing project activities would occur under Alternatives A and D. Approximately 693 acres of 4M and 4D habitat is proposed for treatment under Alternative A (281 acres includes overstory treatment and the remaining 412 acres would not affect the forest canopy) and approximately 509 acres of 4M and 4D habitat is proposed for treatment under Alternative D (289 acres includes overstory treatment and the remaining 220 acres would not affect the forest canopy). Prescriptions that would result in 4M and 4D stands being reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units in Alternatives A and D and all group selection (GS) units in Alternative D. Alternative A would reduce 44 acres of 4M/4D stands to a 4P state (35 acres from 4D, 9 acres from 4M). Alternative D would reduce 40 4M/4D acres to a 4P state (31 acres from 4D, 9 acres from 4M). Group selection treatments under alternative D would reduce an additional 20 acres of 4M and 4D stands to a SMC 1 or WFR 1 condition (approximately 10
acres from 4D and 10 acres from 4M). Alternative D, with DFPZ and group selection units, would have the greatest affect on suitable goshawk habitat. No stands treated under alternative C would be reduced to an unsuitable state.

Improving forest health is one of the objectives of the Bucks Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal within mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that goshawks seek to control exposure and changes in ambient temperature for roosting. On average, the following percentage of stand biomass would be retained in mechanical thin units: under alternatives A, C, and D, 23 to 76 percent in CWHR size class 4 and 8 to 83 percent in CWHR size class 5.

Group selection treatments, as proposed under alternative D, would create early seral stage gaps within forested stands and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The treatment would not result in areas that prevent access to adjoining suitable habitat. The small size of the groups (0.5 acre to 2 acres) would not preclude goshawks from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in group selection units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is likely that the majority of snags would be felled, and very few snags would be left in the 34 acres of group selection under alternative D.

The 6.8 miles of new temporary non-system roads proposed to be constructed for the Bucks Project would be decommissioned upon project completion. Thus, no long-term increases in human activities are expected as a result of the action alternatives. No new roads would be constructed in goshawk PACs.

It is an unknown as to how some of the important prey species (small mammals, birds) preferred by goshawks would respond to opening up forested stands with fuel treatments and group selection units. Based on CWHR modeling, it is known that several bird species respond favorably to either opening up forested stands and/or openings, while some do not (USDA 1999a, Appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. The response of prey species, including small mammals and passerine bird use of group openings, is one of the main objectives of the HFQLG post-implementation monitoring that has been ongoing by the Pacific Southwest Research Station through the Plumas-Lassen Administrative Study.
Cumulative Effects
Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the means by which land managers control them, have contributed and may continue to contribute to loss of habitat for this species.

Refer to the cumulative effects discussion above for the California spotted owl. The cumulative effects discussion focuses on past, present, and future actions as they relate to impacts on suitable owl habitat, more specifically CWHR size/density classes 4M, 4D, 5M, and 5D. These same CWHR types are considered to provide suitable goshawk nesting habitat. It is not anticipated that the cumulative habitat reduction would result in loss of occupancy and productivity of known goshawk PACs. This is based on the location of project activities in relation to known PACs, minimal habitat alteration in PACs, distribution of known PACs, and virtually 100 percent retention of available suitable nesting habitat distributed across the wildlife analysis area following project implementation.

All action alternatives would contribute to reducing the risk of high intensity wildfire, potentially protecting suitable habitat for goshawks. The action alternatives would reduce hazardous fuel loads while protecting large structural components contributing to habitat suitability, thereby lowering the risk of habitat loss or degradation due to wildfire.

Determination
The Forest Service has determined that the action alternatives of the Bucks Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Alternative B (No Action)

Direct Effects
There would be no direct effects on the northern goshawk or existing goshawk habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects
The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn which may result in higher severity effects to forested habitats. Increased rates of spread would result in potential loss of suitable goshawk nesting habitat and other important habitat attributes such as large trees and snags and down woody material.
**Cumulative Effects**

There would be no additional cumulative effects created by project actions. Cumulative effects from private land use including urban development and site conversion from forest to housing would continue to pose risks to goshawk habitat through direct removal of vegetation important for prey species as well as disturbance to birds during the nesting season. These risks to habitat and birds are not increased or decreased with the no action alternative.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering. Urbanization of the private land in Bucks Lake is expected to continue and make encroachments into available conifer and conifer edge habitat.

The no-action alternative for the Bucks Project would not provide for the long-term protection of northern goshawk habitat from potential stand replacing fire. There would be no actions designed to reduce the risk of high-intensity wildfire. There would be no thinning to enhance the growth of dominant and co-dominant trees that may provide future habitat availability. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA FEIS 2001) which could lead to lower goshawk abundance in the wildlife analysis area compared to existing conditions.

**Determination**

The Forest Service has determined that the no action alternative of the Bucks Project would not affect northern goshawks or northern goshawk habitat.

**Mesocarnivores**

**All Action Alternatives (A, C, and D)**

**Direct Effects**

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area. The indirect effects section below discusses potential effects to existing suitable mesocarnivore habitat as a result of implementing Bucks Project activities.

**Indirect Effects**

Refer to the indirect effects discussion for the spotted owl for changes to suitable mesocarnivore habitat (CWHR size-density classes 4M, 4D, 5M, and 5D) as a result of implementing fuel
treatments, group selection harvests, and area thinning under each action alternative. The number of denning and foraging habitat acres that could be reduced by each alternative is discussed below.

Table 13 summarizes the project effects to denning and foraging habitat for the fisher. As Table 13 shows, alternatives A and D, due to the DFPZ treatments and group selections proposed, would reduce some acres to an unsuitable state (CWRH 4P, SMC 1, or WFR 1). Alternative D would treat 20 acres of suitable habitat with group selections (10 acres in 4D denning habitat and 10 acres in 4M foraging habitat). These 20 acres of suitable habitat would be reduced to unsuitable (SMC 1 or WFR 1) for fishers for denning or foraging under alternative D. Alternative C would maintain existing suitable denning and foraging habitat acres. Acres of 4D/5D reduced to 4M/5M under all action alternatives would be considered suitable foraging habitat for the fisher. Understory treatments proposed to reduce ground fuels in all action alternatives (grapple pile, hand thin, and pile burning) would remove structural components important to foraging and movement for fisher (snags, vertical and horizontal layering, down woody debris, etc.).

Table 50. Bucks Project effects to fisher denning and foraging habitat.

<table>
<thead>
<tr>
<th></th>
<th>Denning Habitat acres (CWRH 4D/5D)</th>
<th>Foraging Habitat acres (CWRH 4M/5M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt A</td>
<td>28→4M 28 4D→4P 35 no GS</td>
<td>63 9 no GS</td>
</tr>
<tr>
<td>Alt C</td>
<td>0→4P 0 0 no GS</td>
<td>0 0 no GS</td>
</tr>
<tr>
<td>Alt D</td>
<td>27→4M 27 31 10 (4D only-10)</td>
<td>68 9 (4M-10, 5M-0) 19</td>
</tr>
</tbody>
</table>

*approximation of GS acres only - exact location and acreage yet to be determined.

In summary, existing fisher denning habitat treated under alternatives A and D would be reduced by 8 percent and 9 percent respectively. After factoring in the CWRH density class D stands converted to density class M as a result of treatments, alternatives A and D would result in an increase of suitable foraging habitat by 3 percent and 1 percent respectively. Alternatives A and D would see an increase of approximately 19 and 18 foraging acres, respectively, from existing conditions as a result of thinning treatments within 4D stands. No treatments are proposed in 5D stands. Alternative D would treat 20 acres of suitable habitat with group selection (10 acres in 4D denning habitat and 10 acres in 4M foraging habitat). These 20 acres of suitable habitat would be reduced to unsuitable (SMC 1 or WFR 1) for fisher for denning or foraging under alternative D. Alternative C would not affect CWRH size and density classes and would not affect suitable habitat for fisher.

Foraging habitat for American marten (4M, 5M) proposed for treatment in Alternative A is 838 acres (304 acres include overstory treatment and 534 acres of understory only treatment). Denning habitat (4D, 5D) proposed for treatment in alternative A is 128 acres (63 acres include overstory treatment and 65 acres of understory only treatment). For alternative D, there is 709 acres of foraging habitat (4M, 5M) proposed for treatment (317 acres include overstory treatment...
and 392 acres of understory only treatment) and 66 acres of denning habitat (4D, 5D) proposed for treatment (58 acres include overstory treatment and 8 acres of understory only treatment). Alternative C would include understory treatments and would not affect suitable denning or foraging habitat for the American marten. Table 14 summarizes the project effects to suitable marten habitat. Under alternatives A and C, no group selection would occur within suitable marten denning habitat in the wildlife analysis area. Alternative D would treat 20 acres of suitable habitat with group selections (10 acres in 4D denning habitat and 5 acres in 4M foraging habitat). These 20 acres of suitable habitat would be reduced to unsuitable (SMC 1 or WFR 1) for American marten for denning or foraging under alternative D. Understory treatments proposed to reduce ground fuels in all action alternatives (grapple pile, hand thin, and pile burning) would remove structural components important to foraging and movement for marten (snags, vertical and horizontal layering, down woody debris, etc.).

Table 51. Bucks Project effects to marten denning and foraging habitat.

<table>
<thead>
<tr>
<th></th>
<th>Denning Habitat acres (CWHR 4D/5D)</th>
<th>Foraging Habitat acres (CWHR 4M/5M)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4D→4M</td>
<td>4D→4P</td>
</tr>
<tr>
<td>Alt A</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>Alt C</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Alt D</td>
<td>27</td>
<td>31</td>
</tr>
</tbody>
</table>

*approximation of GS acres only - exact location and acreage yet to be determined.

In summary, existing marten denning habitat (4D/5D) treated under alternative A would be reduced by 3.3 percent and would be reduced by 4.3 percent under alternative D. Existing marten foraging habitat treated under alternatives A and D would see a reduction of less than 1 percent. Alternatives A and D would see an increase of approximately 19 and 18 foraging acres, respectively, from existing conditions as a result of thinning treatments within 4D stands. No treatments are proposed within 5D stands. Alternative C would not affect CWHR size and density classes and would not affect suitable habitat for American marten.

Approximately 11,241 acres (4.1 percent) of the forest carnivore network are within the wildlife analysis area. The Bucks Project proposes to treat 1713 acres of this network under alternative A. Hand thin/pile/and burn, mastication, or prescribed fire treatments would fall within 967 network acres, resulting in little to no change to existing suitable carnivore habitat. Approximately 746 to 748 acres of the carnivore network would be mechanically thinned under alternatives A and D, respectively. Alternative A would reduce 35 acres 4M habitat to a 4P state. Alternative D would reduce 31 acres of 4M to a 4P state and would reduce 10 acres of 4D to SMC1, through group selection. No action alternatives will alter 5M or 5D habitat.

Under alternative D, 17 group selection units totaling 29 acres are proposed in the carnivore network. Of the proposed GS acres, none are proposed in 5D or 5M, 10 are in 4D and 5 are in
4M. A total of 15 acres of 4D/4M habitat within the carnivore network would be reduced to SMC1 or WFR 1 by group selection under alternative D.

In summary, the Bucks Project’s effects on the forest carnivore network would be minor, due to the small amount of acreage proposed for treatment and less than 1 percent change to overall existing suitable habitat post project.

All new roads that would be constructed in support of the Bucks Project would be closed and rehabilitated upon project completion, thus no long-term increases in human activities are expected. The open road density in the Bucks Project area would remain the same under all action alternatives (approximately 2.8 miles per square mile in the terrestrial habitat of the wildlife analysis area), which would continue to provide very low habitat capability for forest mesocarnivores (Freel 1991). With implementation of the proposed strategic system of DFPZs, the Bucks Project would help reduce understory fuel buildup and may reduce the potential for high-severity wildfires, which have a great potential to degrade vast tracts of habitat for the marten and fisher.

Proposed treatment activities could occur as early as Fall 2012 and may continue five years beyond the initiation of implementation. There is the potential that fisher or marten could establish new territories during project implementation. If fisher or marten are detected during future surveys or project-related activities, all treatments would be modified to comply with the standards and guidelines in the SNFPA 2004 ROD (USDA 2004b). The decision to conduct additional protocol surveys within the project area will be made by the District Ranger in consultation with the wildlife biologist based on project implementation timelines.
Figure 17. Mesocarnivore suitable habitat (CWHR size-density classes 4M, 4D, 5M, 5D, 6), Plumas NF carnivore connectivity network, and maximum area reduced to unsuitable after implementation of the Bucks Project (group selections shown are proposed under Alternative D)

Figure 2 shows the existing suitable habitat for mesocarnivores in the wildlife analysis area as well as the extent of the carnivore connectivity network. The locations of the group selection units proposed under Alternative D are displayed. Through group selection, a total of 20 acres of suitable habitat will be reduced to unsuitable. In addition, approximately 35 acres of 4D and 9 acres of 4M would be reduced to 4P under Alternative A, while 31 acres of 4D and 9 acres of 4M would be reduced to 4P under Alternative D. Of all action alternatives, alternative D would have the largest effect on suitable carnivore habitat. Implementation of any of the action alternatives would result in little change to available contiguous suitable habitat.

Cumulative Effects
Refer to the cumulative effects discussion above for the California spotted owl, as well as the general cumulative effects discussion, also above. The cumulative effects on forest mesocarnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for
this species. High severity stand-replacing fires, and the means by which land managers control them, have contributed, and may continue to contribute to loss of habitat for these species.

The action alternatives would not increase any large-scale, high-contrast fragmentation above existing levels. The cumulative effect of logging on private lands, older National Forest System land plantations, and the large brushfields created by past wildfires, together with implementation of DFPZs (alternatives A and D) and group selection (alternative D) under the Bucks Project would result in increased “patchwork” of open habitat and young age class vegetation between mature forested stands within the analysis area. This would increase edge effects and possibly increase potential risks to forest interior species movement and use in the wildlife analysis area. Thus the Bucks Project would act cumulatively with past actions to slightly reduce the connectivity of habitat within the wildlife analysis area, although connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high severity fire. The action alternatives would reduce the long-term threat of stand-replacing fires, which would offset their short-term, minor effects (USDA 2003). Connectivity of dense forest habitat (moderate and dense stands in size classes 4 and 5) is shown in Figure 2, map of the Plumas National forest carnivore network.

Based on the direct and indirect effects, implementation of all action alternatives would contribute to cumulative effects on mesocarnivores and mesocarnivore habitat. Post-treatment amounts of suitable mesocarnivore habitat would provide similar numbers and size blocks of contiguous habitat as the existing condition. The reduction of 8-9 percent of suitable denning habitat and the reduction of less than 1 percent (alternatives A and D) of suitable foraging habitat for the fisher would not cause any significant large-scale fragmentation of suitable habitat. Implementation of alternative D would result in the highest risk of all alternatives to mesocarnivore habitat in the short term and would result in modest uncertainty about future mesocarnivore activity. Implementation of alternative C would not result in any change to suitable habitat. Based on known detections of marten on the Plumas National Forest, no changes in marten occupancy or populations on the Forest would occur.

**Determination**
The Forest Service has determined that, for all action alternatives, the Bucks Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the American marten or Pacific fisher.

**Alternative B (No Action)**

**Direct Effects**
There would be no direct effects on mesocarnivores or existing mesocarnivore habitat. No activities would occur that would cause disturbance to denning or foraging carnivores.
**Indirect Effects**
The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn. Increased rates of spread would result in potential loss of carnivore denning and foraging habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable carnivore habitat as a result of fire could become patchy or unevenly distributed, resulting in less desirable conditions for martens and fishers to become re-established in the wildlife analysis area.

**Cumulative Effects**
Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. Such displacement is usually temporary and seasonal. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

The no-action alternative for the Bucks Project would not provide for the long-term protection of carnivore habitat from potential stand replacing fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA final EIS 2001), which could lead to lower mesocarnivore abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and co-dominant trees that may provide future habitat availability.

**Determination**
The Forest Service has determined that the no action alternative of the Bucks Project will not affect individual American martens or Pacific fishers or habitat for American marten and Pacific fisher.

**Mountain Yellow-legged Frog**

**All Action Alternatives (A, C, and D)**
Approximately six to nine acres of the 402 acres classified as CWHR MRI within Riparian Habitat Conservation Areas (RHCAs) could be potentially entered for treatment under each action alternative. All alternatives would apply specific RHCA prescriptions that would maintain suitable habitat values for aquatic species and meet riparian management objectives (RMO’s) while creating riparian conditions that would be less susceptible to high-severity fire. This
reduction of long-term threat of stand-replacing fire as a result of treatments would offset any short-term minor effects.

The Bucks Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, none of the four subwatersheds would be at or exceed the threshold of concern (TOC). Thus, water quality, in-stream habitat and suitable riparian conditions for aquatic species would not be susceptible to significant adverse cumulative effects as a result of fuel reduction activities implemented under the Bucks Project.

Suitable MYLF riparian habitat would be affected under all alternatives, but, based on RHCA prescriptions and design criteria (including equipment exclusion zones), implementation of Best Management Practices, and implementation of soil and water standards (RMOs), adverse effects would be minimal.

**Direct Effects**

No MYLF have been detected within the Bucks Project analysis area so risks to the species are low. Nevertheless, potential direct effects from the Bucks Project could include impacts to individual MYLFs during activities. Possible direct effects from the proposed actions on Forest Service R5 aquatic sensitive species include crushing of individuals if they are present during project activities. The use of a fellerbuncher within RHCA's has the potential of directly injuring or killing frogs. Although skyline logging is considered to have minimal ground disturbing effects, falling of trees can result in crushing, injuring, or killing of animals that occur where trees fall. The potential for direct impacts to individuals is greatest during wet periods and in early fall, when frogs are most likely to disperse from aquatic habitats.

**Indirect Effects**

Riparian Habitat Conservation Areas (RHCA’s) would be entered during DFPZ and area thinning treatments for the purpose of restoring, maintaining, or improving riparian habitat conditions. Treatments would include the removal of encroaching conifer vegetation (up to 20” in diameter) through mechanical means, hand thinning, mastication, and underburning. It is projected that six to nine acres of montane riparian could be directly treated with underburning. Group selection would avoid RHCA’s. Approximately 395 - 402 acres of RHCA’s would be entered for treatment under the action alternatives.

“Equivalent Roaded Acres” (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one “Equivalent Roaded Acre” or ERA. The proposed fuel treatment and area thinning activities would increase ERA values in the subwatersheds where treatments would occur. Increases in ERA may lead to detrimental effects to MYLF stream habitat, including erosion from treated hillsides and increased delivery of sedimentation into streams. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover.
Disturbances are often added together to determine a cumulative ERA for individual watersheds. This is discussed in the following cumulative effects section.

Equipment exclusion zones in RHCAs, based on existing RHCA buffer widths and slope class would lessen the extent of skid trail creation within RHCAs. Areas in which mechanical harvest activities would be allowed within RHCAs have the potential to increase the extent of disturbed, displaced, or compacted soils. Such soil conditions would have a potential adverse effect on watershed conditions by increasing sedimentation delivery into streams. Indirect effects due to skidding would likely not occur or would be minimal. Implementation of design criteria specific to skid trails in RHCAs, Standard Management Practices (SMPs), and Best Management Practices (BMPs) would help mitigate and prevent increased compaction, erosion and sedimentation.

Prescribed fires would not affect canopy cover in RHCAs, but they could remove some ground cover. The implementation of standard protection measures (design criteria, SMPs, BMPs) would help minimize indirect effects on amphibians and reptile species. Burns occurring before the first soaking rains of the fall are least likely to directly affect amphibians because the frogs would be in the RHCAs at that time. Burns occurring during the spring would be more likely to cause direct effects on amphibians and reptiles, as individuals would be more likely to be moving outside the RHCAs at that time.

Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. In-channel large woody debris (LWD)(trees greater than 12" diameter) would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers and snag retention standards.

Chapter 2 of the EA, displays the design criteria for RHCA treatments under all action alternatives. These design criteria, including the retention of 50 percent or greater canopy cover, all hardwood and riparian species, and sufficient amounts of residual surface fuels (including large woody debris) within RHCAs would indirectly benefit MYLFs by maintaining suitable habitat values while creating riparian conditions that would be less susceptible to high-severity, stand-replacing fire. Large fires have the potential to create large-scale, high-contrast fragmentation across the landscape, which could remove suitable MYLF habitat, isolate habitat patches, and create large openings that may prevent species occupancy, emigration, and immigration. The action alternatives would reduce the long-term threat of stand-replacing fires, which would offset their short-term minor effects (USDA 2003).

Under alternatives A and D, Borax (Sporax or similar product) would be applied to all cut stumps greater than 14 inches in diameter in fuel treatment areas and greater than 3 inches in diameter in campground areas to minimize the susceptibility to Heterobasidion root disease. In the most recent risk assessment for Borax (SERA 2006), Boron, the agent of toxicological
concern in Borax, was further evaluated. The focus of the evaluation was wildlife’s direct consumption from the stump and ingestion of contaminated water. The assessment concluded that the use of Borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates.

**Cumulative Effects**
The following discussion on watershed conditions within the analysis area is drawn from the cumulative watershed assessment under the Hydrology section found in this EA chapter, which is hereby incorporated by reference.

The Threshold of Concern (TOC) is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects is high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the TOC is 12 percent of the watershed area, 100 percent of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface. For this project, the TOC is conservatively estimated to be 14 percent of the watershed area, beyond which an adverse effect might be expected. The TOC is generally expressed as a percentage of watershed area in a roadded condition or equivalent roadded acres (ERA).

Equivalent Roaded Acre (ERA) existing condition values for all four subwatersheds are currently under threshold; Bucks Creek 6.79 percent ERA, Haskins Creek 2.56 percent ERA, Lakeshore 8.47 percent ERA, and Pat Maloy 9.87 percent ERA. After implementation of the proposed action, ERA values are as follows; Bucks Creek 9.9 percent, Haskins Creek 3.56 percent, Lakeshore 9.97 percent, and Pat Maloy 10.45 percent. Projected increases in ERA values under the Non Commercial alternative and alternative D are very similar (+/- 1 percent ERA) to the proposed action figures reported above.

The HFQLG Act Record of Decision, and its associated Scientific Analysis Team guidelines for DFPZ construction, and the SNFPA Record of Decision’s aquatic strategy for DFPZ maintenance, would not only prevent or strictly control any additional impacts on frog habitat, but would result in actual habitat restoration and enhancement for some streams. It is unlikely that the proposed activities would be a significant addition to cumulative effects on the frog species, and habitat characteristics would not change to a degree that these effects would limit populations; therefore, there would be very few cumulative effects.

**Determination**
The Forest Service has determined that the action alternatives of the Bucks Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog. This determination is based on project design features and mitigations that would lessen and minimize impacts to the MYLF and suitable habitat which
include; 1) Incorporation of RHCA equipment restriction zones, 2) Implementation of Best Management Practices, and 3) Implementation of soil and water mitigation standards (RMOs).

**Alternative B (No Action)**

**Direct Effects**
There would be no direct effects on MYLF habitat because no activities would occur to cause disturbance to individual frogs or to impact existing habitat conditions.

**Indirect Effects**
The DFPZ, group selection, and area thinning treatments would not occur under the no-action alternative, so there would be no expected effects on the channel network. The fuel loads left by alternative B could make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to a potential loss of RHCAs. There would be the potential for RHCAs with high fuel loads to act like chimneys and carry fire up and down the watershed. Typically, burn severity and the effects of wildfire disturbance are often limited in near-stream areas compared to upland areas. The effects of fire adjacent to channels can be devastating to the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation and the resulting effects on stream and riparian habitats and water quality would likely increase following a stand-replacing fire. Roads in the Bucks Project area would not be improved for drainage and aquatic species habitat connectivity. Sedimentation from road runoff into the drainages and fragmentation of aquatic habitats would continue.

**Cumulative Effects**
Cumulative effects from private land use (timber extraction, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting. There would be no change in the ERA above existing conditions.

**Determination**
The Forest Service has determined that the no action alternative of the Bucks Project will not affect individuals for the mountain yellow-legged frog.

*Environmental Consequences: USDA Forest Service R5 Management Indicator Species*
As stated earlier in the affected environment section, the direct, indirect, and cumulative effect of the Bucks Project, and the relationship of project-level habitat impacts to bioregional-scale trends, it was concluded that for all Category 3 MIS and associated habitats considered in the Bucks analysis, that the habitats would either not change from the existing condition, or would change so minimally with implementation of action alternatives, that habitat in the Bucks Project analysis area would not alter the existing trend in the habitat, nor would it lead to a change in the
distribution of any Category 3 MIS across the Sierra Nevada bioregion (USDA 2011b). The Bucks Project does not propose to treat existing snags in burned forest, the habitat component represented by black-backed woodpeckers. The proposed treatment areas are part of a larger landscape pattern of fuel reduction treatments designed to slow the spread of a wildfire, thereby providing useful options for fire suppression tactics and reducing the severity of fire effects, particularly within the proposed 2,063 acres of treated areas. Untreated areas with high fuel loading within the Bucks project area would likely produce areas of high tree mortality in the event of a wildfire. While fuels reduction treatments moderate fire behavior, they do not inherently stop wildfires and areas surrounding fuels treatments typically experience high vegetation burn severity effects. Therefore, if implemented, the action alternatives are designed to locally reduce, but would not eliminate, the potential for future wildfires to create patches of high quality black-backed woodpecker habitat. Furthermore, acres of high severity wildfires have increased in California during the past decade, thereby increasing the acreage of suitable habitat for black-backed woodpeckers (Miller et al 2008). The no action alternative would not alter the existing high risk of wildfire within the Bucks Project area.

Environmental Consequences: Migratory Landbirds

Actions that open up forest stands thru thinning, such as with the proposed DFPZ - thinning prescriptions, would result in projected increases in habitat trends for several species (warbling vireo, chipping sparrow, lazuli bunting, white-crowned sparrow, western bluebird, common nighthawk and common poorwill). These species respond favorably to opening up the forested canopy, allowing for increased understory plant diversity. Swainson’s thrush appears to be adversely affected by thinning that converts closed forested stands to open forested stand. Olive-sided flycatcher and evening grosbeak also appear to have projected decrease in habitat suitability. The majority of the landbirds considered in the Bucks Project Neotropical Migratory Bird Report (USDA 2011c) have changes in habitat suitability that are relatively neutral. Alternative C would create less open stands across the analysis area and subsequently maintains more habitat for Swainson’s thrush, olive-sided flycatcher and evening grosbeak.

The cumulative effect of area thinning, group selection, hazard tree removal and DFPZ construction on forested conditions supporting neotropical birds considered in the Bucks Landbird Report (USDA 2011c) would be that habitat capability would overall be improved for birds that prefer shrubs, and open canopied habitat across the landscape. Based on the CWHHR model Swainson’s thrush, evening grosbeak and red crossbill would have decreased habitat suitability. The remainder of the listed birds are relatively unaffected by the proposed action. If DFPZ treatments remove shrubs and are managed to minimize shrub regeneration through maintenance activities, it would be expected that the benefits of creating an open forest with a shrub understory component would be minimized and that there would be a decline in shrub nesting species (USDA, PSW, 2006). Burnett et al. 2011, states that the results of the Plumas-Lassen Administrative Study (PLAS) green forest study “suggests the use of prescribed fire has
far more positive effects on the avian community compared to the use of mechanical mastication in shrub habitats”.

Allowing group selection treatments (created with Alternative D) to naturally regenerate would ensure that shrub habitat would remain on the landscape longer than with intensive regeneration efforts. Actions that result in regeneration of existing shrublands (prescribed fire, mastication) as well as improve vigor of aspen components, would improve long-term habitat availability for early seral and riparian species.

In addition to habitat modification and its affect on migratory birds, direct effects on nesting birds can occur as a result of tree removal, mastication, and prescribed burning, killing young birds in the nest that cannot fly. It is recognized that the proposed project, when implemented during the breeding season (June-September) could directly impact nesting birds. This would affect individual birds. Conservation measures for landbirds, such as snag/down woody retention, use of LOP’s for sensitive species, avoidance of riparian vegetation, retention of trees greater than 30 inches, which are incorporated into project design, as well as large tracts of forested land between proposed treatment units, would alleviate the overall effect on migratory bird populations within the analysis area.

**Social and Economic Environment**

**Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction**

**Regulatory Environment**

**Forest Plan**

The guidance for economic and social environment is provided in the 1988 Plumas National Forest Land and Resource Management Plan, as amended by the 1999 Record of Decision on the final environmental impact statement for the Herger-Feinstein Quincy Library Group Forest Recovery Act, the 2004 Record of Decision on the final environmental impact statement EIS for the Sierra Nevada Forest Plan Amendment.

**Effects Analysis Methodology**

**Specific Assumptions**

This economic analysis focuses on those revenues and treatment costs associated with implementing fuel reduction treatments and forest health activities, in the Bucks Lake Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality, or fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used.
Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Bucks Lake Project area would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, and fuel suppliers. Induced effects are driven by wages, and are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs and monetary outputs. It was assumed for this analysis that 10 to 15 jobs are created per million board feet of timber harvested. This number includes direct, indirect and induced jobs. It was assumed for this analysis that most products from the Bucks Lake Project area would be processed locally due to high hauling costs of products. Likewise, it is also assumed that most employment would largely be derived from Plumas County for the timber harvesting activities.

**Specific Methodology**

Timber harvest values used in this economic analysis were based on the pond values (delivered log prices) of local mills from the State Board of Equalization. Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Reforestation treatments are based on the latest service contract prices and Knutson-Vandenberg sale area improvement plans. The “IMPLAN” software program was utilized in the input/output analysis for monetary outputs to the local economy.

**Data Sources**

The social and economic figures were obtained from State and Federal maintained databases. The most current reports were run as well as several years earlier in order to correlate with current year’s information. Statistics were obtained from the U.S. Census Bureau, America Community Survey, Censtats, Business and Industry, Bureau of Labor Statistics, Bureau of Economics, and California Department of Finance.

**Affected Environment**

The Plumas National Forest contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Plumas National Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. Table 52 shows the percentage of Plumas National Forest land in local counties. The National Forest System lands account for approximately 72 percent of Plumas County. Consequently, management of National Forest System lands has a notable effect on the regional economy of Plumas County.
Table 52. Percentage of National Forest System Lands by County (Based on GIS Data)

<table>
<thead>
<tr>
<th>County</th>
<th>County Acres</th>
<th>Beckwourth Ranger District (acres)</th>
<th>Feather River Ranger District (acres)</th>
<th>Mount Hough Ranger District (acres)</th>
<th>Total National Forest System Lands in Each County (acres)</th>
<th>National Forest System Lands within Each County (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butte</td>
<td>1,072,708</td>
<td>0</td>
<td>143,517</td>
<td>0</td>
<td>143,517</td>
<td>13.4</td>
</tr>
<tr>
<td>Lassen</td>
<td>3,022,136</td>
<td>39,686</td>
<td>0</td>
<td>1,635</td>
<td>41,320</td>
<td>1.4</td>
</tr>
<tr>
<td>Plumas</td>
<td>1,672,778</td>
<td>448,365</td>
<td>183,210</td>
<td>579,196</td>
<td>1,210,771</td>
<td>72.4</td>
</tr>
<tr>
<td>Sierra</td>
<td>615,514</td>
<td>14,794</td>
<td>33,522</td>
<td>0</td>
<td>48,316</td>
<td>7.8</td>
</tr>
<tr>
<td>Yuba</td>
<td>411,695</td>
<td>0</td>
<td>33,734</td>
<td>0</td>
<td>33,734</td>
<td>8.2</td>
</tr>
<tr>
<td>Totals</td>
<td>6,794,830</td>
<td>502,844</td>
<td>393,984</td>
<td>580,831</td>
<td>1,477,659</td>
<td>21.7</td>
</tr>
</tbody>
</table>

**Industry/Employment**

The two employment sectors most related to forest planning processes are the timber industry and tourism. Forest planning processes can positively affect the farm industry (logging operations), manufacturing (mills), transportation (trucks and railroad) and utilities (biomass power plants). They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal statistical gathering agencies generally do not break down employment data specific to logging and lumber; rather it is lumped under farm manufacturing and transportation industries.

The timber industry resides within two industries, (1) Farm and (2) Manufacturing. According to the Bureau of Economic, Farm and Manufacturing earnings in Plumas County represent 11.73 percent of the major industries in Plumas County. Earnings in these two industries have decreased and are experiencing negative growth. Employment in farm and manufacturing represents 7.87 percent of the jobs in Plumas County. The per capita personal income in 2008 was $38,525. The total personal income for Plumas County was $784 million. Output for all industries in Plumas County is $1.1 billion. There are six employers in logging operations, and seven employers related to forestry services totaling 104 jobs. There are two large mills in the local area within distance of the project area combined employment is under 500 employees. The value of the mills total production is at $91 million. Total employee compensation is $16 million.

Plumas County labor statistics reflect a seasonal labor force with employment up during the warmer months. In the winter unemployment rises as the timber harvesting season stops, thus contributing to the unemployment rate as reflected in Table 53 and Table 54. The housing downturn has had an impact on the unemployment rates in Plumas County; nearly doubling the unemployment rate during the months when normal employment rates go up. In 2009 between May and September the unemployment rates nearly doubled as reflected in the information obtained from the Bureau of Labor Statistics. This project can have a significant effect on the numerous industries’ employment in the local labor force and transient labor force.
Table 53. Bureau of Labor Statistics, Plumas County Unemployment Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<tbody>
<tr>
<td>2007</td>
<td>12.3</td>
<td>12.6</td>
<td>12.2</td>
<td>9.8</td>
<td>7.4</td>
<td>6.3</td>
<td>6.7</td>
<td>6.1</td>
<td>5.8</td>
<td>6.4</td>
<td>8.2</td>
<td>10.3</td>
</tr>
<tr>
<td>2008</td>
<td>14.2</td>
<td>14.2</td>
<td>14.0</td>
<td>11.6</td>
<td>8.3</td>
<td>7.9</td>
<td>7.8</td>
<td>7.7</td>
<td>7.3</td>
<td>9.1</td>
<td>12.0</td>
<td>14.0</td>
</tr>
<tr>
<td>2009</td>
<td>18.9</td>
<td>19.5</td>
<td>20.8</td>
<td>17.8</td>
<td>16.2</td>
<td>15.3</td>
<td>14</td>
<td>13.9</td>
<td>13.6</td>
<td>14.6</td>
<td>16.7</td>
<td>18.9</td>
</tr>
<tr>
<td>2010</td>
<td>22.3</td>
<td>22.8</td>
<td>22.9</td>
<td>20.1</td>
<td>17.5</td>
<td>16</td>
<td>16.1p</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(p) preliminary

Table 54. Bureau of Labor Statistics, Plumas County Labor Force

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>9363</td>
<td>9268</td>
<td>9220</td>
<td>9799</td>
<td>10188</td>
<td>10740</td>
<td>11023</td>
<td>11007</td>
<td>10475</td>
<td>10178</td>
<td>9763</td>
<td>9583</td>
</tr>
<tr>
<td>2008</td>
<td>9400</td>
<td>9375</td>
<td>9356</td>
<td>9705</td>
<td>10090</td>
<td>10447</td>
<td>10703</td>
<td>10559</td>
<td>10260</td>
<td>10232</td>
<td>9983</td>
<td>9843</td>
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<tr>
<td>2009</td>
<td>10033</td>
<td>10209</td>
<td>10125</td>
<td>10152</td>
<td>10180</td>
<td>10416</td>
<td>10561</td>
<td>10141</td>
<td>10033</td>
<td>9788</td>
<td>9549</td>
<td>9442</td>
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<td>2010</td>
<td>9456</td>
<td>9579</td>
<td>9608</td>
<td>9468</td>
<td>9363</td>
<td>9473</td>
<td>9380p</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

(p) preliminary

Energy

Plumas County has two co-generation plants and two biomass power plants operating within a reasonable haul distance. The Wendell facility is a 35 megawatt plant and when operating at full capacity uses 550 bone dry tons/day or 37 truck loads. The Wendell facility sells to PG&E approximately 30 megawatts a day when they can produce at full capacity. Presently they cannot produce full capacity due to the lack of biomass material. The Westwood facility is a 10 megawatt plant that employs 10 to 19 people. The Westwood facility when operating at full capacity uses 200 bone dry tons/day.

County, State and Federal Taxes

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, a standard rate, (2) Receipt Act payments or payments from the Secure Rural Schools and Community Self-Determination Act of 2008, a fixed rate, (3) timber yield taxes that fluctuate based on timber sold.

Payments in Lieu of Taxes

The Bureau of Land Management administers the Payments in Lieu of Taxes, which apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county.

Secure Rural Schools and Community Self-Determination Act

The Secure Rural Schools and Community Self-Determination Act 2008, offers counties an alternative to the Receipt Act. A county may choose to continue to receive payments under the Receipt Act or to receive its share of the state’s full payment amount under the Secure Rural Schools and Community Self-Determination Act. Table 55 reflects Plumas County’s payments of $7,000,000 for the past several years.
The Secure Rural Schools and Community Self-Determination Act payments have expired in September 2011. There is legislation proposed which may extend the Act. This Act provides payments to counties regardless of the amount of timber harvested. The payment is based on a complicated formula which factors acres of National Forest System lands, population, and per capita income. If this Act terminates then counties will continue to receive payments under the Receipt Act at 25 percent of the timber cut value from the National Forest System lands contained within the county. If Plumas County reverts back to the Receipt Act collections then each project and the timber harvested become significantly important to Plumas County and its residence, as education and road safety will be impacted with each commercial project the Plumas National Forest implements.

<table>
<thead>
<tr>
<th>Year</th>
<th>Butte</th>
<th>Lassen</th>
<th>Plumas</th>
<th>Sierra</th>
<th>Yuba</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>$866,419</td>
<td>$3,751,241</td>
<td>$7,024,648</td>
<td>$1,788,350</td>
<td>$231,268,</td>
</tr>
<tr>
<td>2002</td>
<td>$873,350</td>
<td>$3,781,250</td>
<td>$7,080,847</td>
<td>$1,802,657</td>
<td>$233,118</td>
</tr>
<tr>
<td>2003</td>
<td>$883,830</td>
<td>$3,826,626</td>
<td>$7,165,816</td>
<td>$1,824,289</td>
<td>$235,915</td>
</tr>
<tr>
<td>2004</td>
<td>$895,320</td>
<td>$3,876,372</td>
<td>$7,258,972</td>
<td>$1,848,005</td>
<td>$238,982</td>
</tr>
<tr>
<td>2005</td>
<td>$915,912</td>
<td>$3,965,528</td>
<td>$7,425,928</td>
<td>$1,890,509</td>
<td>$244,479</td>
</tr>
<tr>
<td>2006</td>
<td>$925,071</td>
<td>$4,005,183</td>
<td>$7,500,187</td>
<td>$1,909,414</td>
<td>$246,924</td>
</tr>
<tr>
<td>2007</td>
<td>$923,173</td>
<td>$3,996,963</td>
<td>$7,484,795</td>
<td>$1,905,495</td>
<td>$246,417</td>
</tr>
<tr>
<td>2008</td>
<td>$832,565</td>
<td>$3,604,665</td>
<td>$6,750,168</td>
<td>$1,718,472</td>
<td>$222,231</td>
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<tr>
<td>2009</td>
<td>$749,308</td>
<td>$3,244,198</td>
<td>$6,075,151</td>
<td>$1,546,625</td>
<td>$200,008</td>
</tr>
<tr>
<td>2010</td>
<td>$675,302</td>
<td>$2,923,783</td>
<td>$5,475,136</td>
<td>$1,393,872</td>
<td>$180,254</td>
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<td>2011</td>
<td>$536,006</td>
<td>$594,100</td>
<td>$986,093</td>
<td>$1,106,534</td>
<td>$143,073</td>
</tr>
</tbody>
</table>

**Timber Yield Taxes**

The third source of revenues to local government is the timber yield tax, which is administered by the State Board of Equalization. The Forest does not pay this tax; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and NFS lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state, and approximately 80 percent is returned to the counties from which the timber was harvested. The amount of revenues disbursed to the counties can be affected by decisions about the amount of timber to be offered for sale each year on the Forest. The volumes harvested from Plumas County indicate a downward trend with a notable positive shift of volume harvested from NFS lands in 2009, due to the salvage of timber from numerous fires. In Table 56 a downward trend of volume harvested on NFS lands has occurred since 1994 as reported by the Board of Equalizations tax records.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>37%</td>
</tr>
</tbody>
</table>
Plumas County in 2005 produced 107,817 mmbf of timber which is 6 percent of the volume produced in the State of California as documented in the California Department of Finance. According to the California Board of Equalization 15 percent of the volume from Plumas County came from NFS lands including the Forest Service; a total of 16 mmbf.

**Timber Harvest Trends**

The harvest of trees provides commercial and noncommercial wood products, such as sawlogs and biomass, to the local economy. Local sawmills that rely, at least in part, on logs from National Forest System lands include Sierra Pacific Industries in Quincy and Collins Pine Company in Chester. **Figure 1** displays the volume of timber harvested on the PNF since 1978. There was no green timber harvest in 2008. In 2008 salvage timber was only harvested on the PNF. In 2009 green timber harvested from PNF was 4.5 mmbf. In 2010 green timber harvested from PNF was 23 mmbf. Local sawmills have processed most of this volume although mills as far away as Weaverville and Roseburg have bid or purchased timber from the Forest.

**Figure 1.** Annual Amount of Wood Products Sold on the Plumas National Forest from 1978 to 2007
Recreation Industries

This project will promote forest resiliency for the recreation area and potentially protect the business investment in the Bucks Lake Recreation Area. The Bucks Lake Project is on the southern edge of the Bucks Lake Recreation Area. An area highly visited by residents and non-residents for numerous types of recreational activities. Plumas County Recreation industry’s output in 2007 was $10.4 million and its commodity demand was $3.4 million. Total employment compensation is $4.7 million. Plumas County collected with the 9 percent tax from the Transient Occupancy Tax (TOT) from the Meadow Valley area in 2009 a total of $27,850 which represents an industry output of $309,444. In 2010 the TOT collected from the Bucks Lake Recreation area was $26,439 which represents an industry output of $293,766. Bucks Lake Recreation area is within the Meadow Valley area as reported by the Plumas County Visitor Bureau.

Environmental Consequences

Action Alternatives A, C, D

Direct and Indirect Effects of DFPZ and WUI Fuels Reduction Treatments

Economic effects are determined by the value of products and services for each alternative (which includes the no action alternative) considered in this analysis. The level and mix of goods and services available to the public varies by alternative. The effects discussed in this section include estimated government expenditures for cost of services and revenues from the value of timber and biomass.

Direct monetary effects are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments; and direct, indirect, and induced job opportunities. In general, the monetary value of each alternative depends on the amount and method of timber harvest, type of treatment and the acreage planned for treatments.

The anticipated timber volume, value, costs, service treatment costs, and jobs, are displayed for all alternatives in Table 57. The revenue generated would also depend on the availability of logging equipment, haul distances to available mills, and fuel prices. This analysis assumes equipment cost and not full ownership of equipment, and hauling to the closest mill. However, haul to other mills is feasible as evidenced by past and current timber sales.

Alternative A reduces fuels across the landscape. The value of the DFPZ has not been quantified as a monetary value with reducing suppression cost or protection of timber. However we do know the DFPZ is effective tool for fire suppression and has the potential of saving millions of dollars in fire suppression cost, value of timber and protection of private property. If you had a 2000 acre fire the value of the timber could represent as much as a $7,000,000 loss of value of timber.

Table 57. Comparison of Economic Effects by Action Alternative

<table>
<thead>
<tr>
<th>Revenue/Cost Employment</th>
<th>Alternatives</th>
</tr>
</thead>
</table>
Table 58. Comparison of Economic Effects for Forest Health Improvements by Action Alternative

<table>
<thead>
<tr>
<th></th>
<th>Alternative A</th>
<th>Alternative C</th>
<th>Alternative D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawlog Volume</td>
<td>6,130 mbf</td>
<td>0mbf</td>
<td>7,762 mbf</td>
</tr>
<tr>
<td>Sawlog Value (typical logging/hauling cost)</td>
<td>$1,264,000</td>
<td>$0</td>
<td>$1,630,000</td>
</tr>
<tr>
<td>Sawlog Additional Operation Cost</td>
<td>$474,000</td>
<td>$0</td>
<td>$514,000</td>
</tr>
<tr>
<td>Sawlog Net Value</td>
<td>$791,000</td>
<td>$0</td>
<td>$1,116,000</td>
</tr>
<tr>
<td>Biomass Volume</td>
<td>7,000 tons</td>
<td>7,000 tons</td>
<td>6,000 tons</td>
</tr>
<tr>
<td>Biomass Value</td>
<td>$146,000</td>
<td>$146,000</td>
<td>$121,000</td>
</tr>
<tr>
<td>Biomass Additional Operation Cost</td>
<td>$431,000</td>
<td>$775,000</td>
<td>$399,000</td>
</tr>
<tr>
<td>Biomass Net Cost</td>
<td>$286,000</td>
<td>$824,000</td>
<td>$375,000</td>
</tr>
<tr>
<td>Mastication ($500/ac)</td>
<td>$8,500</td>
<td>$8,500</td>
<td>$0</td>
</tr>
<tr>
<td>Removal ($500/ac)</td>
<td>$0</td>
<td>$0</td>
<td>$17,000</td>
</tr>
<tr>
<td>Sawlog and Biomass Value (typical logging/hauling cost included)</td>
<td>$1,410,000</td>
<td>$1,170,000</td>
<td>$1,806,000</td>
</tr>
<tr>
<td>Sawlog and Biomass Additional Operation Cost</td>
<td>$905,000</td>
<td>$140,000</td>
<td>$1,751,000</td>
</tr>
<tr>
<td>Value Combined Sawlog Biomass Project</td>
<td>$505,000</td>
<td>$120,000</td>
<td>$281,000</td>
</tr>
<tr>
<td>Percent above Value</td>
<td>36%</td>
<td>10%</td>
<td>46%</td>
</tr>
<tr>
<td>Potential Advertised Value to the Government</td>
<td>$82,600</td>
<td>$1,097,000</td>
<td>$1,131,000</td>
</tr>
<tr>
<td>Forest Health Improvement Project Costs</td>
<td>$1,081,000</td>
<td>$1,081,000</td>
<td>$591,000</td>
</tr>
<tr>
<td>Value After Forest Health Improvements Project Costs</td>
<td>$376,000</td>
<td>$1,628,000</td>
<td>$246,000</td>
</tr>
<tr>
<td>Potential Direct and Indirect Jobs (Full Time Equivalent)</td>
<td>87</td>
<td>6</td>
<td>107</td>
</tr>
<tr>
<td>Potential Employee Income</td>
<td>$3,364,000</td>
<td>$472,000</td>
<td>$3,916,000</td>
</tr>
<tr>
<td>DFPZ Acres Protecting Bucks Lake Economy (Recreation Industry section of this EA)</td>
<td>1,511 acres</td>
<td>1,477 acres</td>
<td>1,010 acres</td>
</tr>
</tbody>
</table>

Positive net value when the saw timber and biomass projects are combined. Alternative C has a higher cost to treat the biomass because fixed costs are not spread out over a larger amount of product. Forest health improvement contracts are estimated to cost $1,081,000 for Alternative A, cost $1,000,000 for Alternative C while Alternative D is estimated to cost $591,000. Some of these projects could be combined with the timber sale or stewardship contract if the saw timber and biomass project was projected to have sufficient value at the time of sale to cover the forest health improvement costs.

All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) that serve the timber industry. The local economy, driven by wages would improve stability for the small communities throughout the county. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. Harvesting and forest health improvement treatments would generate 96 direct and indirect jobs with alternative A. Some of the other industries to benefit from activities associated with alternative A and D are retail, newspaper, data processing, banks, real estate, waste management, college, doctors, hospitals, child care services, lodging, electric power, and gas distribution.

Alternative A and D would have a positive effect on the overall economic activity in Plumas County. This project would help provide stability and revenue to the manufacturing industry, farming industry (logging operators), transportation (haul trucks and equipment), and indirect industries (housing, food, education, etc.).
for families and generate harvest revenues for local businesses and provide the state and county timber yield taxes. The collection of taxes would help the county provide services such as road maintenance and education. The saw-timber provided by the action alternatives contributes to the stability of local economy by providing a supply of wood products to local industries dependent on forest management activities. Refer to Appendix D of this EA for the complete economic analysis by alternative.

**Alternative B – No Action**

Under alternative B, no treatments would be implemented. There would be no implementation costs. Under the no action alternative, no funds would be generated for the U.S. Treasury or returned to local counties through the receipt tax. No additional employment opportunities or wages paid to primary and service industry employees would circulate through the local economy.

The no action alternative would result in a negative effect on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. Local industries would have notably reduced opportunities related to forest management activities such as timber harvesting and forest health projects. Additionally, the local economy would not receive benefits from associated employment, such as in food, lodging, and transportation businesses. The unemployment rate could potentially stay constant throughout the year, at double the national unemployment rate. The income loss for families would trickle throughout the local economy affecting many of the local industries in a negative way.

The economic resiliency of Plumas County is low. The major industries manufacturing lumber, the logging operators, transportation, the Forest Service and the county are all interconnected and represent nearly 40 percent of employment. If manufacturing of lumber is diminished or stopped, then all of these industries would be affected by the lack of production by the mill. There is not another industry which can carry the community through economic lows.

Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures and corresponding loss of logging companies could significantly reduce or eliminate future economic and environmental opportunities from National Forest System lands. The Plumas National Forest is unique in that the infrastructure is still in place; however these industries in the county are experiencing numerous years of negative growth and are faced with lay-offs, mill closures, and operators liquidating equipment. The loss of this industry will have a negative effect on managing NFS lands in a cost effective manner. The continuation of current conditions under alternative B would preclude and/or notably limit opportunities for long-term employment and rural community stability.
Botanical Resources

Introduction
The purpose of this section is to present a summary of the effects of the proposed project on botanically sensitive resources within the Botany analysis area. Throughout this section, the term “rare species” is used to refer to federally Endangered, Threatened, and Candidate plant species and Forest Service Region 5 Sensitive species. A complete discussion of effects to these species, as well as to Plumas National Forest special interest species, is provided in the “Bucks Lake Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species” (USDA 2011a), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Endangered Species Act (16 USC 1531 et seq.): Under this act, federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to (a) jeopardize the continued existence of any listed species or (b) result in the destruction or adverse modification of a listed species’ designated critical habitat. Section 7 of the act requires federal agencies to consult the U.S. Fish and Wildlife Service concerning listed (i.e. threatened or endangered) plant species that fall under their jurisdiction.

FSM Section 2670 (USDA 2005): provides policy for the protection of sensitive species and calls for the development and implementation of management practices to ensure that species do not become threatened or endangered because of Forest Service actions. It requires a review of all activities or programs that are planned, funded, executed, or permitted for possible effects on federally listed or U.S. Forest Service sensitive species (FSM 2672.4, USDA 2005).

Forest Plan

The Plumas NF Land Management Plan (USDA 1988, 1999b, 2004b) provides management direction for all Plumas NF Sensitive plants; that direction is to “maintain viable populations of sensitive plant species” (USDA 1988). The 1988 Forest Plan also provides forest-wide standards and guidelines to:

- protect Sensitive and Special Interest plant species as needed to maintain viability;
- inventory and monitor Sensitive plant populations on an individual project basis; and
- develop species management guidelines to identify population goals and compatible management activities / prescriptions that will maintain viability.
Management direction for sensitive plant species on the Plumas NF is also provided in the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (USDA 1999a) and the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (USDA 2004a). The standards and guidelines provided in the SNFPA include conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adhering to the Regional Native Plant Policy (USDA 2004a).

**Interim Management Prescriptions**

Individual species conservation strategies, or species management guidelines, for the Plumas NF have not been completed for most of the Forest’s Sensitive species. Until these conservation strategies have been completed, the Plumas NF has developed Interim Management Prescriptions (USDA 2007) that will be followed to ensure compliance with the Plumas LRMP.

**Effects Analysis Methodology**

**Geographic Area Evaluated**

The area analyzed in this document is referred to as the “Botany analysis area”; it encompasses approximately 19,570 acres and consists of all proposed treatment units, access roads to the treatment units, and the area within one mile of treatment unit boundaries (Figure 19). This area was chosen to capture all rare plants that occur (a) within the proposed treatment units or (b) have suitable habitat within the Bucks Project area as well as a source population (i.e. potential for seed dispersal) located within close proximity to the proposed activities.
Figure 19. Geographic area used for analysis of effects to botanical resources within the Bucks Project.

**Species Analyzed**

Those species present within the Botany analysis area were considered to have the highest potential to be impacted by the proposed project activities. Conversely, species outside of the analysis area were not considered to have a high likelihood of being impacted by the proposed project either directly, indirectly, or cumulatively. Table 59 lists all of the rare species that have been documented within the Botany analysis area. A detailed analysis of effects to these species is provided in the Biological Evaluation (USDA 2011a), which is included in the Bucks Project record. This portion of the Environmental Analysis summarizes effects for only those rare species that occur within the proposed treatment units.

**Table 59.** Threatened, Endangered, Candidate and Sensitive species known within proposed treatment units or the Bucks Botany analysis area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Listing Status</th>
<th>Within Analysis Area</th>
<th>Within Treatment Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clarkia mildrediae ssp. mildrediae</em></td>
<td>Mildred’s clarkia</td>
<td>Sensitive</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td><em>Cypripedium fasciculatum</em></td>
<td>clustered lady’s-slipper</td>
<td>Sensitive</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Lupinus dalesiae</em></td>
<td>Quincy lupine</td>
<td>Sensitive</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td><em>Meesia triqueta</em></td>
<td>three-ranked hump-moss</td>
<td>Sensitive</td>
<td>x</td>
<td>x¹</td>
</tr>
<tr>
<td><em>Penstemon personatus</em></td>
<td>closed-throated beardtongue</td>
<td>Sensitive</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

¹One occurrence is considered within a proposed treatment unit because of its close proximity (within 10 feet)
Analysis Methodology
The analysis of effects on rare plant species was a three-step process (FSM 2672.43; USDA 2005). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas NF (U.S. Fish and Wildlife Service 2011), USDA Forest Service Region 5 Sensitive Species list (USDA 2006), Plumas NF rare plant records and vegetation maps, and California Natural Diversity Database records (CNDDB 2011).

The second step was field reconnaissance surveys. To date, field surveys have been conducted on approximately 3,355 acres within the Botany analysis area; this includes all of the proposed treatment units (Dittes and Guardino 2000, USDA 2011b). For those areas outside of the surveyed areas, but within the Botany analysis area, species occurrence information was compiled using Plumas NF rare plant records and the California Natural Diversity Database (2011).

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence and habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—effects analysis. Data were imported into a Global Information System (GIS) and used to analyze proximity to the proposed treatments, identify direct and indirect effects, and develop mitigation measures.

Data Sources
Basic information describing the life history, ecology, pollination biology, and specific habitat requirements is lacking for most of the Sensitive species that occur within the Botany analysis area. The scientific literature and internal government documents were utilized for the analysis whenever available; however more frequently the analysis of effects was based on observations by qualified individuals, field experience, unpublished monitoring results, and studies of comparable species.

Types and Duration of Impacts

Direct Effects
Direct effects occur when plants are physically impacted. Examples of proposed treatment activities that have the potential to directly affect rare plants include timber falling; crushing by vehicles or equipment; application of borax; temporary road and landing construction; and prescribed fire treatments. These actions can result in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, or uprooting plants.

Indirect Effects
Indirect effects are separated from an action in either time or space. These effects, which can be beneficial or detrimental to rare species, may include changes in vegetation composition,
successional patterns, fire regimes, or the distribution and abundance of noxious weeds. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance and tend to occupy interior forest habitats with high canopy cover. In contrast, for those species that tolerate or are dependent upon some level of disturbance and inhabit gaps and forest openings, treatments may have beneficial indirect effects.

**Cumulative Effects**

A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 section 15.1).

One crucial step in assessing cumulative impacts on a particular resource is to compare the current condition of the resource (i.e. rare plants) and the projected changes as a result of management activities (i.e. timber harvest) to the natural variability in the resources and processes of concern (MacDonald 2000). This assessment is particularly difficult for rare plant species because long-term data are often lacking. In addition, the habitats in which many rare plant species are presently found have a long history of disturbance, making an undisturbed reference difficult to find. For some rare plants, particularly those that do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site change is an effective way of reducing the potential for larger-scale cumulative impact (MacDonald 2000). If the greatest impact on a rare species is both local and immediate, then this is the scale at which the effect is easiest to detect (MacDonald 2000).

Undeniably, past, present, and future activities have and will continue to alter rare plant populations and their habitats to various degrees; however, the approach taken in this analysis is that, if direct and indirect adverse effects on rare plant species in the Bucks project are minimal or would not occur, then they would not contribute substantially to cumulative effects on the species. In addition, the effects of future projects would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys and protection of known rare species locations) remain in place.

**Duration of Effects**

It is difficult to state with certainty when the effects of the proposed treatments would no longer be altering the life history dynamics (i.e. germination, seed production, etc.) of the rare species considered in this analysis. One method to estimate duration of effects is to assume that the effects of the action alternatives last as long as they are, singly or in combination with other anticipated effects, distinguishable from the effects of the no-action alternative. Using this as an
assumption, the duration used to estimate effects in this analysis, is the recovery time of the vegetation to near baseline (current) conditions, which is approximately 100 years for group selection treatments and 50 years for fuel treatments.

The additive effects of past actions (such as wildfires, wildfire suppression, timber harvest, recreation, and ranching) have shaped the present landscape and corresponding populations of rare plants; however, data describing the past distribution and abundance of rare plant species is extremely limited, making it impossible to quantify the effects of historic activities on the resources and conditions that are present today. Undoubtedly, some plant species have always been rare due to particular ecological requirements or geographic isolation. It is also likely that past actions have caused some species to become rarer and encouraged others to become more common. Within the Botany analysis area, documentation of rare plant surveys began in the early 1980s; therefore, the baseline used for the effects analysis of past activities is 30 years.

Affected Environment
The following section provides a summary of the biology, ecology, and project-level distribution of the two rare plant species that occur within the proposed treatment units.

**Clarkia mildrediae ssp. mildrediae (Mildred’s clarkia)**

Mildred’s clarkia is an annual species that is geographically limited to eastern Butte County and western Plumas County. There are approximately 33 occurrences of Mildred’s clarkia on the Plumas NF (Table 60), most of which are found on sandy, granitic soils in cismontane woodland and lower montane coniferous forest. Wildfire suppression has likely restricted the amount of suitable habitat for this species. As a result, most of the Plumas NF occurrences are found on road cut banks or previously disturbed sites, where there is minimal plant competition and open light conditions. The current trend for this species is unknown; however most occurrences appear to be stable.

A portion (roughly 59 acres) of one large Mildred’s clarkia occurrence overlaps with the Botany analysis area and approximately four acres fall within Treatment Unit 5. This large occurrence (CLMIM_001) extends beyond the Botany analysis area boundary; it covers a total area of over 200 acres and extends for roughly 6.5 miles along NFS Road 24N24. Within this occurrence, patches of Mildred’s clarkia have been found on the road berms and cut-banks, in pull-outs, and on the slopes above and below the road.

<table>
<thead>
<tr>
<th>Species</th>
<th>Global Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Occurrences</td>
</tr>
<tr>
<td></td>
<td>California</td>
</tr>
<tr>
<td>Clarkia mildrediae ssp. mildrediae</td>
<td>G3</td>
</tr>
</tbody>
</table>

1 G3 = Vulnerable: moderate risk of extinction due to restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
**Meesia triquetra (three-ranked hump-moss)**

Although three-ranked hump-moss is well distributed in the northern hemisphere, it is geographically limited in California where the majority of occurrences are found in the Sierra Nevada Mountains (Dillingham 2005). Ten occurrences of three-ranked hump-moss have been documented on the Plumas NF (Table 61).

Three-ranked hump-moss is most commonly associated with montane fen habitats (groundwater-fed wetland ecosystems). These habitats are considered significant resources due to their unique hydrologic characteristics (USDA 2004a); ability to support high levels of biodiversity, including rare species such as three-ranked hump-moss (USDA 2004a); relative rarity across the Sierra Nevada (Bartolome et al. 1990); and ability to remain relatively stable for long periods of time, storing plant and climatic data over millennia (Chimner et al. 2002).

The abundance and distribution of three-ranked hump-moss is strongly tied to hydrological processes within fens. It has been demonstrated that small-scale disturbances caused by management actions, such as timber harvest and road construction, can have substantial negative impacts on rare fen species and their habitat (Cooper et al. 1998, Weixelman and Cooper 2009).

Three occurrences of three-ranked hump-moss, occupying less than 100 square feet, fall within the Botany analysis area. No occurrences are within any of the proposed treatment units; however one occurrence (METR_009) is within 10 feet of Treatment Unit 87.

**Table 61.** Three-ranked hump-moss abundance at the global, state, forest, and project scale.

<table>
<thead>
<tr>
<th>Species</th>
<th>Global Ranking</th>
<th>Number of Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meesia triquetra</td>
<td>G51</td>
<td>California</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

1\(^1\) G5 = **Demonstrably Secure**: Common; widespread and abundant

**Environmental Consequences**

The following section provides a discussion of the direct, indirect, and cumulative effects specific to the two Sensitive plant species that are within the proposed treatment units. The effects of the treatments on rare species were similar across all action alternatives; therefore, this discussion is organized to highlight differences between the no-action and the three action alternatives.

**Clarkia mildrediae ssp. mildrediae (Mildred’s clarkia)**

**Alternative B – No Action Alternative**

**Direct Effects**

No direct effects are anticipated because no project-related activities would occur.

**Indirect Effects**
The indirect effects of not implementing the proposed project would be negligible. The suppression of wildfire over the past century has likely reduced the amount of suitable habitat for this species across the landscape. Consequently, most occurrences are restricted to road cut banks or areas of past disturbance, such as clearcuts or wildfires, where there is minimal plant competition and open light conditions (L. Janeway, personal communication, 2011). Although Mildred’s clarkia has been found in undisturbed sites, less than one percent has been documented in dense forested stands with canopy closure greater than 60 percent.

Under the no-action alternative, the number of trees within stands would continue to increase, resulting in areas with greater canopy closure, reduced light to the understory, and increased duff and litter deposition. Within the proposed treatment units, there are almost 300 acres that are currently classified as being at or above 60 percent canopy closure (see Table 62). In the absence of treatments, this could result in a loss of suitable habitat for Mildred’s clarkia across the landscape over time.

Table 62. Estimated number of acres that will change from greater than 60 percent canopy closure to less than 60 percent following treatment.

<table>
<thead>
<tr>
<th>Target Canopy Cover (after treatment)</th>
<th>Acres that Change from &gt; 60% Canopy Closure to &lt; 60%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative A</td>
</tr>
<tr>
<td>30 to 40%</td>
<td>129.4</td>
</tr>
<tr>
<td>40 to 50%</td>
<td>60.0</td>
</tr>
<tr>
<td>50 to 60%</td>
<td>109.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>298.9</td>
</tr>
</tbody>
</table>

The effects of wildfire on Mildred’s clarkia are not well understood; however observations suggest that even high intensity wildfires do not appear to negatively impact the following year’s population numbers and may even enhance habitat by decreasing shrub and canopy cover (L. Janeway, personal communication, 2011).

Cumulative Effects

The effect of past projects on Mildred’s clarkia is largely unknown. This species was added to the Plumas NF Sensitive species list in 2006; prior to that it had been identified as a Special Interest, or watch list species, since 1996. Because of its relatively recent listing, projects implemented more than 18 years ago may not have avoided or mitigated effects to known occurrences.

The one documented Mildred’s clarkia occurrence within the Botany analysis area has likely been impacted by both past management activities and natural disturbance processes. Within the past 18 years, at least one large wildfire (Bucks Fire 1999), one roadside hazard tree project, and one road improvement project have occurred within the known occurrence. In addition, individual plants are situated directly adjacent to NFS Road 24N24, which is regularly maintained and frequently used by forest visitors for recreation.

The amount of suitable, but unoccupied habitat, within the analysis area has not been quantified; however the ability of Mildred’s clarkia to colonize previously disturbed sites
suggests that this species has and will continue to benefit from management activities that create open conditions and increase light reception to the understory. Under the no-action alternative, treatments would not be implemented and additional areas of potential habitat would not be created. Overall, there would be negligible cumulative effects to Mildred’s clarkia from the no-action alternative due to the lack of direct effects and minor indirect effects to this species’ potential habitat.

**Alternatives A, C, and D – Action Alternatives**

**Direct Effects**

Some individuals of Mildred’s clarkia may be directly impacted by the hazard tree and watershed improvement treatments proposed under Alternatives A and D; however the percentage of individuals with the potential to be affected is very low (estimated at less than 2 percent) compared to the population as a whole.

Direct effects from hazard tree treatments are more likely to occur under Alternative A, which proposes hazard tree removal, rather than dropping the trees and leaving them in place (which is proposed under Alternative D). Because hazard trees by definition are those that are likely to fall within one year, dropping and leaving them in place can be considered an acceleration of a natural ecological process; therefore the direct effects to individuals under Alternative D would be similar to those that could occur under the no-action alternative.

The road treatments proposed under Alternatives A and D could directly impact individuals of Mildred’s clarkia. Within the documented occurrence, plants have been observed in close proximity to the road, which greatly increases the potential for direct impacts from road treatments and maintenance activities. Implementation of a limited operating period (i.e. after seed set) or designation of control areas will greatly reduce the potential for direct impacts to individuals.

**Indirect Effects**

The indirect effect of implementing the action alternatives would be minor to negligible and may be beneficial.

Mildred’s clarkia is an annual species; it germinates, flowers, and dies in a single year or season. As a result, the long-term persistence of the population is highly dependent upon the ability of the plants to set seed. Treatments that occur after seed set (i.e. after mid to late August) will have a much smaller effect on the following year’s population than those that are implemented prior to seed set. Even in the absence of the proposed standard management requirements (described in Appendix G), the indirect effects to Mildred’s clarkia are considered minor due to the low intensity of the proposed treatments within the known occurrence, the patchy distribution of plants, and the species’ positive response to past management activities.

At the landscape scale, the proposed treatments could have a minor beneficial indirect effect to Mildred’s clarkia. Observations have demonstrated that this species tolerates and even thrives in
areas of past disturbance. Mildred’s clarkia has been found along road cut-banks, forest edges, in past clearcuts, and within the boundary of high intensity wildfires, where there is minimal plant competition and open light conditions (L. Janeway, personal communication, 2011). Although Mildred’s clarkia has been found in undisturbed sites, less than one percent has been documented in dense forested stands with canopy closure greater than 60 percent.

Taking these factors into consideration, it is expected that the proposed thinning and prescribed fire treatments, would result in the creation of additional areas of suitable habitat for Mildred’s clarkia. In general, Alternatives A and D will create a larger area of potential suitable habitat for Mildred’s clarkia than Alternative C; this is primarily due to the number of acres within proposed treatment units that are expected to decrease from an existing canopy closure of greater than 60 percent (i.e. a dense forest canopy) to less than 60 percent (i.e. a more open forest canopy) (Table 62).

Cumulative Effects

The single occurrence of Mildred’s clarkia within the Botany analysis area represents a small fraction (two percent) of all known occurrences in California. In addition, the portion (four acres) of Mildred’s clarkia that overlaps with Treatment Unit 5 is less than two percent of the total area occupied by the occurrence. Therefore, there is low potential for the proposed treatments to have substantial negative impacts to the species as a whole, and even more specifically to the occurrence within the analysis area.

The effect of past projects on Mildred’s clarkia is largely unknown. This species was added to the Plumas NF Sensitive species list in 2006; prior to that it had been identified as a Special Interest, or watch list species, since 1996. Because of its relatively recent listing, projects implemented more than 18 years ago may not have avoided or mitigated effects to known occurrences.

The one documented Mildred’s clarkia occurrence within the Botany analysis area has likely been impacted by both past management activities and natural disturbance processes. Within the past 18 years, at least one large wildfire (Bucks Fire 1999), one roadside hazard tree project, and one road improvement project have occurred within the known occurrence. In addition, individual plants are situated directly adjacent to NFS Road 24N24, which is regularly maintained and frequently used by forest visitors for recreation.

The amount of suitable, but unoccupied habitat, within the analysis area has not been quantified; however the ability of Mildred’s clarkia to colonize previously disturbed sites suggests that this species has and will continue to benefit from management activities that create open conditions and increase light reception to the understory. Alternatives A, C, and D propose treatments that could create additional areas of suitable habitat for this species. Although implementation of these action alternatives may have some minor direct and indirect impacts on individuals, cumulatively, these effects will not lead to a trend toward listing for Mildred’s clarkia. This is based on the small percentage of individuals with potential to be directly
impacted, the species’ high tolerance to disturbance, and the creation of additional areas of suitable habitat through implementation of the proposed treatments.

**Determinations for Mildred’s clarkia**

**No-action Alternative (B):** It is my determination that the no-action alternative will not affect *Clarkia mildrediae ssp. mildrediae* (Mildred’s clarkia). This determination is based on the negligible direct, indirect, and cumulative effects to individuals and areas of suitable habitat.

**Action Alternatives (A, C, and D):** It is my determination that the Bucks Project action alternatives (A, C, and D) may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Clarkia mildrediae ssp. mildrediae* (Mildred’s clarkia). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

**Meesia triquetra (three-ranked hump-moss)**

**Alternative B – No Action Alternative**

**Direct Effects**

No direct effects are anticipated because no project-related activities would occur.

**Indirect Effects**

The no-action alternative is expected to have a negligible effect on three-ranked hump-moss. This species grows in fens where high soil moisture levels during the fire season and the dominance of fine fuels (i.e. sedges and rushes) greatly reduce the likelihood of high-severity fire (Dwire and Kauffman 2003). Based on this, the lack of treatments in adjacent stands is not expected to significantly alter the future wildfire risk or intensity within three-ranked hump-moss occurrences or areas of unoccupied suitable habitat.

**Cumulative Effects**

Three-ranked hump-moss has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species list relatively recently in 1998; therefore it is unknown whether projects implemented more than 14 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years (USDA 1988). Based on this, it is likely that the three three-ranked hump-moss occurrences have received little impact from management activities in the past few decades.
There would be no cumulative effects from the no-action alternative because the direct and indirect effects are expected to be negligible. The effects of future projects on three-ranked hump-moss would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys and protection of known rare species locations) remain in place.

**Alternatives A, C, and D – Action Alternatives**

**Direct Effects**

No direct effects will occur because the three-ranked hump-moss occurrences will be avoided during project implementation. The occurrence that is within 10 feet of Treatment Unit 87 will be flagged for avoidance; the remaining two occurrences are greater than 0.25 mile from the treatments and will not be directly affected by project activities.

**Indirect Effects**

The indirect effects from the action alternatives are anticipated to be negligible. Three-ranked hump-moss is found in wet meadows and fens. These types of habitats differ from their surrounding uplands in moisture regime, microclimate, and vegetative composition (Pettit and Naiman 2007). In general, high soil moisture levels and the dominance of grass-like species (i.e. fine fuels) greatly reduce the risk of high-severity wildfire within these habitats. Based on this, the thinning and underburning treatments in adjacent stands are not expected to significantly alter the future wildfire risk or intensity within three-ranked hump-moss occurrences or unoccupied suitable habitat.

Positive effects of the proposed thinning treatments may include increased water percolation and groundwater, which could slightly increase the water availability within adjacent meadow and fen habitats where three-ranked hump-moss is found. Occurrences and suitable habitat for three-ranked hump-moss will be avoided during project implementation; therefore the proposed activities are not expected to negatively affect the timing or hydrologic regime within areas of suitable habitat.

**Cumulative Effects**

Three-ranked hump-moss has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species list relatively recently in 1998; therefore it is unknown whether projects implemented more than 14 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years (USDA 1988). Based on this, it is
likely that the three three-ranked hump-moss occurrences have received little impact from management activities in the past few decades.

The three occurrences in the Botany analysis area represent four percent of the three-ranked hump-moss occurrences in California. All of these occurrences will be avoided during implementation of the action alternatives. In addition, areas of suitable habitat will be protected through implementation of Best Management Practices (BMPs). The effects of future projects on three-ranked hump-moss would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys and protection of known rare species locations) remain in place.

Based on these protection measures, as well as the negligible direct and indirect effects to three-ranked hump-moss no adverse cumulative effects are anticipated from implementation of the action alternatives.

**Determinations for three-ranked hump-moss**

**No-action Alternative (B):** It is my determination that No-action alternative (B) will not affect *Meesia triquetra* (three-ranked hump-moss). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

**Action Alternatives (A, C, and D):** It is my determination that the Bucks Project action alternatives (A, C, and D) will not affect *Meesia triquetra* (three-ranked hump-moss). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

**Comparison of Alternatives**

The no-action alternative will not affect any Threatened, Endangered, Candidate, or Region 5 Sensitive plant species. This determination is based on the negligible direct, indirect, and cumulative effects to individuals and areas of unoccupied suitable habitat.

Some individuals of *Clarkia mildrediae ssp. mildrediae* (Mildred’s clarkia) may be directly impacted by the hazard tree and watershed improvement treatments proposed under Alternatives A and D; however, this species’ ability to tolerate and even thrive in disturbed areas, suggests that these two alternatives could also have a beneficial indirect effect by creating additional areas of suitable habitat for Mildred’s clarkia. Alternative C would have no direct effects and negligible indirect effects on this species. None of the three action alternatives would result in a trend toward Federal listing or loss of viability for Mildred’s clarkia.

Alternatives A, C, and D would not affect *Meesia triquetra* (three-ranked hump-moss) or any other Threatened, Endangered, Candidate, or Region 5 Sensitive species. This determination is based on the negligible direct and indirect effects to individuals or areas of suitable habitat; lack of individuals known or expected to occur within the project area; or absence of suitable habitat within the project area for these species.
Compliance with the Forest Plan and Other Direction
All of the alternatives are consistent with the Forest Plan and other direction. Under these alternatives, sensitive plant species are protected as needed to maintain viability.

Noxious Weeds

Introduction
In 2003, the United States Forest Service identified invasive species as one of four critical threats to the nation’s ecosystems (Bosworth 2003). Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed species have the potential to affect native plant species through direct competition for nutrients, light, and water (Bossard et al. 2000). Noxious weed infestations can also reduce the recreational or aesthetic value of native habitats.

Forest management activities, such as those associated with timber harvest, can contribute to the introduction and spread of noxious weed species by creating suitable environmental conditions for establishment and by acting as vectors for spread. A complete assessment of noxious weed risk is appended to the Bucks Lake Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (USDA 2011), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Executive Order 13112 (1999) - directs federal agencies to prevent the introduction of invasive species; detect and respond rapidly to control such species; and to minimize the economic, ecological, and human health impacts from invasive species on public lands.

Forest Service Manual (FSM) Section 2081.03 - directs the U.S. Forest Service to prevent the introduction and establishment of noxious weeds; contain and suppress existing weed infestations; and to educate and cooperate with agencies, land owners, land managers, and members of the public to control weeds. It also requires a weed risk assessment for any proposed ground disturbing activities and calls for the incorporation of noxious weed control measures into any project that has a moderate to high risk of introducing or spreading noxious weeds.

Forest Plan Direction

final supplemental EIS (USDA 2004a) amended the management direction in the Forest Plan to address management of noxious weeds and invasive exotic (nonnative) species.

The HFQLG EIS provides direction for noxious weed and invasive exotic weed management; this direction is to “manage National Forest System lands so that management activities do not introduce or spread noxious or invasive exotic weeds.” The HFQLG EIS also provides guidelines to follow during project planning and implementation. These guidelines are included as standard management requirements in Appendix G of this document.

The Record of Decision (ROD) for the 2004 SNFPA established goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 2081.2. The three priorities include:

- Prevent the introduction of new invaders.
- Conduct early treatment of new infestations.
- Contain and control established infestations.

**Effects Analysis Methodology**

**Geographic and Temporal Bounds**

The area analyzed in this document is referred to as the “Botany analysis area”; it encompasses approximately 19,570 acres and consists of all proposed treatment units, access roads to the treatment units, and the area within one mile of treatment unit boundaries (figure provided in Botanical Resources section). This area was selected to focus the analysis on weed species and infestations with the highest potential for impacts within the project area. In general, weed infestations located in close proximity to proposed treatment units and access routes increase the probability of spread into treated areas as well as other parts of the Forest.

**Analysis Methodology**

The analysis of effects for noxious weeds followed a process similar to that described under the Botanical Resources section of this document. Field surveys were conducted within all of the proposed units and data were collected that described the spatial extent and density of infestations, as well as their potential for spread.

The risk of noxious weed spread or introduction was evaluated for each alternative taking into consideration the amount of soil disturbance associated with the proposed project activities; species invasiveness and proximity to the proposed units; and mitigation and treatment measures. The indicator measure used to compare the effects across the alternatives was the overall risk of noxious weed introduction and spread.
Affected Environment

**Known Noxious Weeds**

Two invasive species of high management concern, *Linaria dalmatica* spp. *dalmatica* (Dalmatian toadflax) and *Centaurea solstitialis* (yellow starthistle), have been documented within the Botany analysis area. Both occur along frequently used paved roads. These small infestations have been actively treated (i.e. hand pulled) by Forest Service personnel for over eight years (Figure 20) and are considered to be successfully contained at this time.

![Figure 20. The effects of manual treatments on the two noxious weed infestations within the Botany analysis area.](image)

Table 63 lists the two noxious weed species known to occur within the Botany analysis area. Also included in the table are the ratings from the California Department of Food and Agriculture’s noxious weed list (CDFA 2009b) and the California Invasive Plant Council’s invasive plant inventory (Cal-IPC 2006).

**Table 63. Noxious weed infestations within the Botany analysis area and proposed treatment units.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>CDFA</th>
<th>Cal-IPC</th>
<th>Analysis Area</th>
<th>Treatment Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Centaurea solstitialis</em></td>
<td>yellow starthistle</td>
<td>C</td>
<td>High</td>
<td>1 site</td>
<td>0</td>
</tr>
<tr>
<td><em>Linaria dalmatica</em></td>
<td>Dalmatian toadflax</td>
<td>A</td>
<td>Moderate</td>
<td>1 site</td>
<td>1 site</td>
</tr>
</tbody>
</table>

1 CDFA ratings in table: A: eradication or containment required at state or county level; C: eradication or containment required only when found in nursery or at the discretion of the County Agricultural Commissioner.

2 Cal-IPC ratings - High: moderate to high rates of dispersal and establishment; widely distributed among and within ecosystems. Moderate: impacts substantial and apparent, but not severe; moderate to high dispersal rates; distribution limited to widespread.
Centaurea solstitialis (yellow starthistle)
This highly invasive, deep-rooted winter annual is considered a high priority for control and eradication in Plumas County as well as on the Plumas NF. Dense infestations of yellow starthistle have been shown to reduce the diversity and abundance of native plant species; decrease the value of wildlife habitat and forage; alter fuel characteristics and fire behavior; and deplete soil moisture reserves (DiTomaso 2005).

Yellow starthistle reproduces exclusively from seed, with most long-distance dispersal (greater than 16 feet) attributed to wildlife or human-related factors (Roche 1992). The control or eradication of this species requires elimination of seed production as well as depletion of the soil seedbank (seeds residing in the soil that have not germinated). The size of the seedbank is dependent upon the age of the infestation; experimental results suggest that seeds remain viable in the soil for three to ten years (DiTomaso et al. 2006).

The Botany analysis area contains one small infestation of yellow starthistle (CESO3_0100). This site is directly adjacent to Bucks Lake road, is less than 300 feet northwest of the Bucks Summit parking lot, and is more than 0.2 miles from the boundary of Treatment Unit 83. At the time of its discovery in 2003, this small infestation supported 60 individuals; however manual treatments have resulted in successful containment and annual monitoring has not detected any individuals at this site since 2005 (see Figure 20). This site is considered a high priority for ongoing treatment and monitoring under the Mt Hough noxious weed program.

Linaria dalmatica ssp. dalmatica (Dalmatian toadflax)
This short-lived, herbaceous perennial was originally introduced to North America in the late 1600s as an ornamental plant (CDFA 2009a). It has since widely escaped cultivation and is currently classified as a noxious weed in 22 states in the U.S. Dalmatian toadflax typically occupies disturbed, dry sites with coarse, well-drained soils (CDFA 2009a).

Dalmatian toadflax reproduces by seed and vegetatively from lateral roots and root fragments. This species has an extensive root system; vertical roots can reach depths of four to ten feet, while lateral roots can extend over twelve feet from the parent plant (USDA 2006b). Most seeds fall close to the parent plant. Longer distance dispersal occurs via wind, water, soil movement, and animals (CDFA 2009a). Seed can remain viable for up to 10 years (CDFA 2009a). Once established, this aggressive weed is capable of forming large, dense monocultures that out-compete native vegetation and reduce species diversity (USDA 2006b).

Dalmatian toadflax is known from only one infestation in the Botany analysis area (see Table 63). This site is situated directly adjacent to NFS Road 23N56 (Big Creek Road) and occurs within the boundary of Treatment Unit 112, which is proposed for hand thinning, piling, and burning or chipping under all action alternatives. At the time of its discovery in 2004, this small infestation supported eight individuals. Four years of manual treatments have resulted in successful containment and annual monitoring has not detected any individuals at this site since
2008 (see Figure 20). This site is considered a high priority for ongoing treatment and monitoring under the Mt Hough noxious weed program.

**Habitat Vulnerability**

The landscape within the Botany analysis area has been heavily influenced over the past 100 years by management activities that include livestock grazing, private land management activities, fire exclusion, timber harvest, and wildfires. The Bucks Lake area is also a popular destination for forest visitors and contains numerous campgrounds, trails, day use facilities, and Forest Service recreation residences. Despite these past and present activities, which have increased the vulnerability of the landscape to noxious weed invasion and spread, the Bucks project area is currently considered relatively free of noxious weeds. The limited number of infestations is most likely due to the distance between the project area and weed infestations that can act as potential seed sources.

Habitats within the Botany analysis area vary from areas of dense overstory canopy to areas with open overstory canopy and sparse ground cover (e.g. in campgrounds, old burns, and along roadsides). Habitats with more open cover are more likely to be invaded by noxious weeds; however disturbance within any habitat type will increase the potential for noxious weed invasion. Even in the absence of the proposed treatments, the high amount of visitor use, the number of past and present land management activities, the close proximity to private land and recreation residences, and the presence of open, disturbed habitats (e.g. campgrounds, trails, roads, etc.) increase the vulnerability of the landscape to noxious weed invasion.

**Non-project Dependent Vectors**

Noxious weed introduction occurs when plant propagules are moved from one infestation (the “seed source”) to a new and often unininvaded habitat. In general, any activity that moves soil or plant parts from one location to another has the potential to facilitate weed introduction and invasion. Within the analysis area, non-project dependent vectors may include (but are not limited to): recreational activities such as camping, hiking, boating, biking, and horseback riding; road construction, maintenance, and use; timber management activities; wildfire suppression; and livestock grazing.

The Botany analysis area encompasses over 70 miles of roads; of these, at least 20 miles are frequently utilized by forest visitors and homeowners to access recreational facilities. Roads, whether they are major highways or general forest roads are often the primary conduit for weed introduction and establishment. Roads contribute to dispersal of noxious weed species because they (1) create suitable habitat by altering environmental conditions, (2) make invasion more likely by stressing or removing native species, and (3) allow for easier movement by wild or human vectors (Trombulak and Frissell 2000).

Bucks Lake is a major recreation destination on the Plumas NF. Within the Botany analysis area, National Forest System lands alone contain five developed campgrounds, numerous trails, three day use facilities, two organizational camps, one lodge, and two large Forest Service
recreation residence tracts with a total of 122 homes under special use permit. The utilization of these facilities by forest visitors and homeowners can aide in the dispersal and spread of noxious weed species within the Botany analysis area.

**Environmental Consequences**

**Alternative B – No Action Alternative**

*Direct Effects and Indirect Effects*

Noxious weed species are oftentimes classified as pioneer species or invaders. Disturbance, whether it is natural (i.e. lightning-caused fire) or associated with management activities, often creates ideal conditions for noxious weed introduction and establishment. Under this alternative, direct effects would be avoided, soil disturbance would be minimized, and the existing cover of native plant species maintained. These factors reduce the potential for introduction and noxious weed invasion within the Botany analysis area.

While the no-action alternative may decrease the short-term risk of noxious weed invasion by minimizing the amount of disturbance, it will not reduce the long-term risk of disturbance from high-severity wildfire. High-severity wildfires aid in the establishment and spread of noxious weeds by increasing the availability of resources, such as light and nitrogen, and decreasing competition from native plant species.

Even in the absence of proposed treatments, habitats that are in close proximity to roads, trails, or private land will remain vulnerable to noxious weed invasion and spread. At present, both of the noxious weed sites in the Botany analysis area occur in close proximity to frequently utilized roads. Roads, whether they are major highways or general forest roads are often the primary conduit for weed introduction and establishment.

*Cumulative Effects*

The effect of specific past management actions on noxious weed species is largely unknown. Targeted noxious weed surveys at the project-level began relatively recently on the forest. Both of the noxious weed sites within the Botany analysis area have been, and will continue to be, manually treated as part of the Mt Hough noxious weed treatment program. Both have also been successfully contained by manual treatments over the past eight to nine years.

The lack of ground disturbing activities under the no-action alternative would reduce the amount of suitable weed habitat in the short term; however the large number of past activities, the close proximity to private land, and the high amount of visitor use in the area all increase the vulnerability of the landscape to noxious weed invasion, even in the absence of project activities. Vectors for noxious weed spread that are unrelated to the proposed project, such as recreational activities and ongoing forest management (e.g. road maintenance), could continue to aide in the dispersal and spread of noxious weed species in the Botany analysis area.
Alternatives A, C, and D – Action Alternatives

Direct and Indirect Effects

No direct effects to noxious weed species are anticipated from the proposed vegetation and fuels treatments because infestations will be avoided during project implementation. The proposed vegetation, fuels, and road treatments would result in areas with reduced native plant cover and increased soil disturbance; these conditions favor noxious weed establishment and spread. During implementation, project equipment and vehicles could facilitate the spread of noxious weeds by transporting seed and propagative plant parts into uninvaded portions of the project area. In one National Park in Australia, weed seed was found to be most often transported into and around the park by vehicles that had been driven off-road (Lonsdale and Lane 1994).

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each treatment unit. For example, group selection units (i.e., those with relatively high amounts of soil disturbance and vegetation removal) may be at higher risk of invasion than hand thinning units. The amount of soil disturbance associated with the proposed project activities is considered higher for Alternatives A and D than for Alternative C.

The two weed species that currently exist within the Botany analysis area can rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present; however both of these sites have been, and will continue to be, manually treated as part of the Mt Hough noxious weed treatment program. These sites have not supported plants for at least four years.

The elevated risk of noxious weed introduction and spread under the action alternatives would be greatly reduced through implementation of the standard management requirements (refer to Appendix G) and the ongoing noxious weed treatments and monitoring. Although these control measures would not remove the risk of noxious weed invasion and spread entirely, they would greatly reduce the potential for noxious weed introduction. Post-implementation monitoring of past projects with similar vegetation and fuels treatments has shown that aggressive treatment of noxious weeds prior to and through project implementation and incorporation of the standard management requirements have been successful in eradicating small populations of noxious weeds as well as preventing new occurrences (USDA 2006a).

Cumulative Effects

The effect of specific past management actions on noxious weed species is largely unknown. Targeted noxious weed surveys at the project-level began relatively recently on the forest. Both of the noxious weed sites within the Botany analysis area have been, and will continue to be, manually treated as part of the Mt Hough noxious weed treatment program. Both have been successfully contained by manual treatments over the past eight to nine years.

As discussed above, the proposed vegetation, fuels, and road treatment activities would increase the risk of noxious weed introduction into the Botany analysis area by increasing the
amount of suitable habitat for weeds. In addition, the close proximity to private land, and the high amount of visitor use in the area all increase the vulnerability of the landscape to noxious weed invasion, even in the absence of project activities. Vectors for noxious weed spread that are unrelated to the proposed project, such as recreational activities and ongoing forest management (e.g. road maintenance), could continue to aide in the dispersal and spread of noxious weed species in the Botany analysis area.

Implementation of the proposed noxious weed treatment measures and standard management requirements, as well as post-project monitoring, would greatly reduce this risk.

Comparison of Alternatives
Even in the absence of the proposed project activities, existing conditions increase the risk of noxious weed introduction and invasion into the Bucks Project area. These conditions include: high amounts of visitor use; past and present land management activities; close proximity to private lands and recreation residences; and the presence of open, disturbed habitats such as campgrounds, trails, and roadsides. The two infestations within the Botany analysis area present a low risk of spread. This is primarily due to the manual control and monitoring efforts that have occurred over the past eight to nine years, which are believed to have successfully contained these infestations.

The proposed vegetation, fuels, and road treatment activities (Alternatives A, C, and D) would slightly increase the existing risk of noxious weed introduction by creating disturbed conditions that favor noxious weed establishment and spread and providing additional vectors for new weed introductions; however implementation of standard management practices, control areas, and ongoing noxious weed treatments and monitoring, would result in a low overall risk of noxious weed introduction and spread.

Compliance with the Forest Plan and Other Direction
The action alternatives are consistent with the Forest Plan and other direction. A noxious weed risk assessment has been completed for each alternative (FSM 2081.03 and USDA 2004b); the public has been informed of the risk and effects from the proposed project (USDA 2004b); and noxious weed control measures have been proposed.

Heritage Resources

Introduction
In accordance with the National Historic Preservation Act of 1966 (specifically Section 106), as amended, and First Amended Regional Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region, California State Historic Preservation Officer, And Advisory Council On Historic Preservation, Regarding The Process For Compliance With Section 106 Of The National Historic Preservation Act For Undertakings On The National Forests Of The Pacific
Southwest Region (March, 2001), a literature review, files search, and heritage resource inventory were conducted for the Bucks Lake Hazardous Fuels Reduction Project. Heritage resource inventory of 1,337.1 acres was conducted by Doug Baughman, Miguel Jeffrey, Courtney Jackson, Cari Burns, Tanner Whetstone, Grayson Harris, Steven Windward, and Cristina Weinberg between May, 2009 and October, 2011.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

The Bucks Lake Hazardous Fuels Reduction Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental environmental impact statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, b; USDA 2003a, b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, b). Heritage resource management activities are designed to comply with the standards and guidelines as described in the First Amended Regional Programmatic Agreement Among the USDA Forest Service, Pacific Southwest Region, California State Historic Preservation Officer, And Advisory Council On Historic Preservation, Regarding The Process For Compliance With Section 106 Of The National Historic Preservation Act For Undertakings On The National Forests Of The Pacific Southwest Region (March, 2001).

All heritage resource inventory was accomplished following the direction of the National Historic Preservation Act of 1966 (specifically Section 106), the 2001 California SHPO/USDA Forest Service Region 5 Programmatic Agreement, and the Forest Service Manual chapter 2360 – Heritage Program Management.

Effects Analysis Methodology

Heritage resource survey was conducted based on ground conditions within each specific unit. The three types of survey used were: Complete (12-20 meter transect spacing), General (20-40 meter transect spacing), and Cursory (40-70 meter transect spacing). The two factors that most limited the heritage resource survey were dense ground cover and steep terrain. All three transect types are acceptable methods according to the applicable rules and regulations listed above.

Geographic and Temporal Bounds

The geographic boundaries surveyed for this project included the area within each unit boundary, defined as the Area of Potential Effect (APE). Some areas were previously surveyed for other projects while other areas were newly surveyed for this project. As per direction in the fore-mentioned rules and regulations artifacts and features 50 years old or older were GPSed, photographed, mapped, and recorded.
**Analysis Methodology**

Prior to field survey the Plumas National Forest Heritage Resources GIS database, Heritage Resource hard-copy atlases, GLO notes and maps, and past Archaeological Reconnaissance reports were examined to determine locations of previously recorded heritage resources within the project area and areas of sensitivity for historic properties. Following this literature review a field survey was conducted by the Plumas National Forest, Mt. Hough Ranger District Heritage Resources crew to identify previously unrecorded heritage sites and relocate - monitor recorded sites.

**Affected Environment**

There are 39 heritage resource sites within the proposed project area. These sites have all been flagged for avoidance. All sites are unevaluated for the NRHP and are considered potentially eligible for listing.

**Environmental Consequences**

By adhering to the flag & avoid policy there will be no direct, indirect, or cumulative effects to any heritage resources in this project area under any of the alternatives of this project.

**Compliance with the Forest Plan and Other Direction**

All heritage resource inventory was accomplished following the direction of the National Historic Preservation Act of 1966 (specifically Section 106), the 2001 California SHPO/USDA Forest Service Region 5 Programmatic Agreement, and the Forest Service Manual chapter 2360 – Heritage Program Management.

**Range**

**Introduction**

The range resource encompasses permitted livestock that are authorized to graze within an allotment boundary through a ten year Term Grazing Permit issued by the Forest Service. Included in the range resource are:

- permitted livestock;
- range improvements needed to manage the allotment including fences, gates, exclosures, cattle guards and water developments;
- the permittee, that is, the rancher who owns and manages the cattle;
- creeks and springs from which livestock drink;
- and forage (grass, forbs, and shrubs) eaten by permitted livestock.
Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction
The guidance for range management is provided in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b).

Effects Analysis Methodology
In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

Geographic and Temporal Bounds
Analysis Methodology
Analysis is based on Plumas National Forest GIS data and current allotment information.
Affected Environment

The Plumas National Forest is divided into 67 allotments. An allotment is an area of land that has been designated for the permittee to graze their livestock. The area of land contains both primary and secondary range. Primary range is land that is less than 30 percent slope and produces more than 200 pounds of forage per acre per year. Secondary range is the timbered areas within an allotment that is less than 30 percent slope and produces less than 200 pounds of forage per year. There are about 23 acres of primary range within the analysis area. Areas with greater than 60 percent canopy cover or with slopes greater than 30 percent are considered not available to cattle grazing because of steep slopes or lack of forage. The remainder of the analysis area is secondary range.

There are three range improvements in the Bucks Project area: a cattle guard in NFS road 24N33, a fence about 425 feet long tied into the cattle guard, and about a two acre exclosure to protect a fen near the cattle guard. There are no key areas within the Bucks Project area.

The Bucks Creek Allotment is about 41,110 acres. The overlap with the Bucks Project is about 1,325 acres (Figure 21) which is less than 3.2 percent of the allotment area. The allotment is active and under the current term permit, the permittee is authorized 353 cow/calf pairs for the grazing period June 1 to September 30 (1,441 animal unit months). The use by these livestock is approximately 77 percent (273 pair “on”) on Forest Service administered land and 23 percent (80 pair “off”) on private land. This area of Plumas County is designated open range so cattle freely roam between National Forest System lands and private lands.

There is a proposal to reduce the “on” pair to 242 while extending the season to October 15 (1,438 animal unit months). This action is unrelated to the Bucks Project. Under this proposal the number of animal unit months would remain unchanged. The modification for this proposal has not been signed by the permittee.
Environmental Consequences

Alternatives A, C and D – Direct and Indirect Effects
The Bucks Creek Allotment would continue to be managed at current levels. Cattle displacement from the noise and activity would require coordination between the Forest Service range specialist and the range permittee to ensure that livestock are kept away from active operations. Coordination would also be required during times cattle are driven from pasture to pasture approximately mid-August and late September to prevent potential conflict between project operations and permitted cattle.

There could be an increased risk of vehicle collisions with livestock on haul routes and access roads to the treatment areas. Vehicle collisions could be avoided by ensuring that contracts contain safety specifications for traffic and by alerting contractors where and when cattle may be present.

The effects of hand thinning, piling, and burning or chipping; grapple piling and burning; mechanical biomass removal; masticating; mechanical and radial thinning; group selection harvest; and prescribed underburning treatments to permitted cattle may positively affect both short-term and long-term conditions by reducing conifer density and reducing the amount of down woody material that impedes livestock movement. Furthermore, transitory range would likely increase especially in units that currently have greater than 60 percent canopy cover and would have less than 60 percent canopy cover after treatment (Table 64).
Table 64. Treatment units in the Bucks Creek allotment that are predicted to go from greater than 60 percent canopy cover to less than 60 percent canopy cover.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Unit Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>75, 87, 88, 94, 95, 96, 98</td>
</tr>
<tr>
<td>B</td>
<td>none</td>
</tr>
<tr>
<td>C</td>
<td>75, 87, 88, 94, 95, 96, 98</td>
</tr>
<tr>
<td>D</td>
<td>98</td>
</tr>
</tbody>
</table>

During implementation of project activities and the recovery period, grazing management practices would be implemented to achieve desired distribution and levels of use. Practices may include deferment of grazing, adjustment of pasture management, placement of salt blocks, or other actions that would promote use by livestock away from treatment areas. Grazing management adjustments would be developed in coordination with the permittee.

**Alternative A, C, and D – Cumulative Effects**

Alternatives A, C, and D would not contribute to adverse cumulative effects on range resources. Past, present and future vegetation management activities (listed in Appendix F) have and would continue to help maintain or improve transitory range. Future DFPZ maintenance would continue to allow short-term opportunities for openings and transitory rangelands. Livestock distribution could change because of the reduction of both tree density and downed woody material.

**Alternative B No Action**

**Alternative B – Direct and Indirect Effects**

There would be no adverse effects on range resources under the no action alternative. The Bucks Creek Allotment in the Bucks Project area would continue to be managed under current direction and guidelines in the Forest Plan. The permittee or their livestock would not be affected by project activities. There would be no risk of damaging range fences or cattle guard. Existing improvements would require normal maintenance. There is no risk of the permittee taking a deferment due to logging activities. There would be no improvement in forage availability or cattle distribution.

**Alternative B – Cumulative Effects**

Alternative B could increase the potential short-term cumulative effects on range resources. The risk of future fires causing damage to soil and water resources and a short-term reduction in forage would increase. Cows may need to be temporarily removed for one to three years until new vegetation and soils are better stabilized.

**References**


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Environmental Assessment  Bucks Lake Hazardous Fuels Reduction Project


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USDA. 2004b. Sierra Nevada Forest Plan Amendment Record of Decision. USDA Forest Service, Pacific Southwest Region, Vallejo, CA.


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

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Department of Water Resources
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Plumas County Environmental Health Department
Plumas County Fire Safe Council
Plumas County Horseman’s Association
Plumas County Museum
Plumas County Road Department
Plumas-Sierra Counties Department of Agriculture

TRIBES:
Greenville Rancheria
Susanville Indian Rancheria
Estom Yumeka Tribe of Enterprise Rancheria
Time Maidu Tribe of Berry Creek Rancheria
Concow Maidu Tribe of Mooretown Rancheria
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American Forest Resource Council
California Alternatives for Toxics
California Fisheries and Water Unlimited
California Forestry Association
California Native Plant Society
Central Valley Regional Water Quality Control Board
Chester/Lake Almanor Chamber of Commerce
Collins Pine Company
Columbia Helicopters
Copper Creek Kids Camp
Crescent Mills Fire Department
Coordinated Resource Management
Dawn Institute
Feather River Land Trust
Feather River Resource Conservation District
Greenville Rotary
High Mountain Riders
Indian Valley Chamber of Commerce
Indian Valley Community Services District
Indian Valley Fire and Rescue
Indian Valley Lumber Co
John Muir Project
Lassen County Fire Safe Council
Mt. Lassen Chapter, California Native Plant Society
Northern Sierra Air Quality Management District
Northwest Park Management
Pacific Crest Trail Association
Pacific Gas & Electric
Pew Logging
Plumas Corporation
Plumas Forest Project
Round Valley Lake Resort
Royal Elk Park Management
Rubicon Rentals
Sierra Forest Legacy Friends of the River
Sierra Institute for Community and Environment
Sierra Pacific Industries
Trout Unlimited
U.S. Department of Interior
United Prospectors Inc.
USDA Natural Resource Conservation Service
USDI Bureau of Indian Affairs