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Draft Environmental Impact Statement

Moonlight and Wheeler Fires Recovery and Restoration Project

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

Moonlight and Wheeler Fires Recovery and Restoration Project
Draft Environmental Impact Statement

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Abstract: The Moonlight and Wheeler Fires Recovery and Restoration Project (Moonlight and Wheeler Project) Environmental Impact Statement (EIS) documents the analysis of the no-action alternative and two action alternatives.

Alternative A (proposed action and preferred alternative) proposes to contribute to the short-term local economic benefit by creating jobs from the sale of fire-killed merchantable trees and promote long-term recovery by reestablishing forested conditions.

Alternative B (no action) represents current conditions and proposes no management actions.

Alternative C is similar to alternative A, but it reduces the number of acres where fire-killed merchantable trees would be removed.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: Mike Donald, Mt. Hough District Ranger, at 39696 Highway 70, Quincy, CA 95971 (telephone 530-283-7610). Comments may be (1) mailed; (2) hand delivered between the hours of 8:00 a.m. and 4:30 p.m. weekdays; (3) faxed to (530) 283-1821; or (4) electronically mailed to:

comments-pacificsouthwest-plumas-mthough@fs.fed.us. Please indicate the name "Moonlight and Wheeler Fires Recovery and Restoration Project" on the subject line of

your email. Comments submitted electronically must be in rich text format (.rtf), plain text format (.txt), or Word format (.doc).

Date Comments Must Be Received: The opportunity to Comment ends 45 days following publication of the notice of availability (NOA) in the Federal Register.

Summary

The Plumas National Forest (PNF) proposes to harvest fire-killed conifer trees on 15,568 acres using the following methods: ground based, skyline, and helicopter. Up to 33 miles of temporary roads would be constructed and decommissioned after use. About 14 helicopter landings (30 acres) would be constructed. About 17,474 acres would be reforested with conifer seedlings. The area affected by the proposal includes 16,739 acres that burned with moderately high and high vegetation burn severity that resulted in a deforested condition characterized by relatively large areas of standing fire-killed trees.

This action is needed, because wood quality, volume, and value deteriorate rapidly. The trees killed by the fire would have a short-term local economic benefit. The value of the trees would cover the cost of their removal and possibly other activities associated with the project. Without reforestation, shrub species would dominate the project area for decades and experience a delay in returning to a forested condition. The early establishment of conifers through reforestation would expedite forest regeneration.

In December 2007, the Mt. Hough Ranger District of the PNF began the process to determine the scope (the depth and breadth) of the environmental analysis. At that time, it was anticipated that the Moonlight Fire Recovery and Restoration Project analysis would be documented in an EIS and the Wheeler Fire Recovery and Restoration Project analysis would be documented in an Environmental Assessment.

An open house was held for interested parties on December 20, 2007, in Taylorsville, California. The news release concerning the meeting was distributed to 262 key Forest contacts and members of the media. An article informing the public of the meeting was also published in several local newspapers, including the *Feather River Bulletin*, the Newspaper of Record for this project. Eighteen members of the public attended the meeting and several submitted comments.

In late December 2007, individual letters for each project were mailed to Native American entities (including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations/non-profit groups), that are interested in projects that are located on this portion of the PNF.

In addition, individual letters for each project were mailed to 231 agencies, organizations, adjacent landowners, and individuals who expressed interest in projects of this type.

A Notice of Intent (NOI) for the Moonlight Fire Recovery and Restoration Project was published in the Federal Register on January 7, 2008. Sixteen comments on the proposed action were received.

Fourteen comments on the Wheeler Fire Recovery and Restoration Project proposed action were received.

A revised NOI for the Moonlight and Wheeler Project was published in the Federal Register on May 22, 2008. The two projects were merged because each had similar actions, the fire perimeters are adjacent to one another, and it was uncertain to what degree, if any, the proposed action may have a significant effect on the quality of the human environment.

On May 15, 2008, an scoping update letter regarding the combined project was mailed to Native American entities (including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations/non-profit groups), that are interested in projects that are located on this portion of the PNF.

In addition, the scoping update letter was mailed to 231 agencies, organizations, adjacent landowners, and individuals who expressed interest in projects of this type.

No major issues were identified for the project; however minor issues were identified. The interdisciplinary team considered the scoping comments received and the potential effects of the proposed action. They developed cause and effect relationship flow charts to identify potential issues. Some analyses were completed to determine the effects of the proposed action and none of the analyses showed more than minor effects to any resources.

The following alternative (alternative C), designed to meet project objectives using a different mix of log yarding systems, will be fully analyzed. It was developed from comments and preliminary analysis:

- Harvest fire-killed conifer trees utilizing ground-based equipment on about 7,639 acres, construction of about 27 miles of temporary roads, and reforestation on about 8,758 acres.

The following alternatives were developed and considered but are eliminated from detailed study:

- An alternative utilizing natural regeneration, wildland fire use, prescribed fire, and pile burning.
- An alternative that has an upper diameter limitation of 24 inches for conifer removal.
- An alternative that proposes harvest activities by California Wildlife Habitat Relationship (CWHR) density and size classes and excludes: ground-based logging and road construction and reconstruction from high vegetation burn severity areas, and harvesting from PACs and Home Range Core Areas (HRCAs).

Major conclusions include:

- Alternative A provides more jobs, employee related income, and sawlog and biomass volumes; however alternative A is marginal at about five percent below the net revenues.
- Alternative C provides less jobs, employee related income, and sawlog and biomass volume; however alternative C is about eight percent more in percent above net revenues.
- No change in CWHR forest types resulting from proposed salvage activities.
- Seven wildlife species with “May Affect Individuals” determinations: mountain yellow-legged frog, bald eagle, California spotted owl, Northern goshawk, American marten, pallid bat, and Western red bat.
- None of the proposed activities are other than minor (less than 2.3in ERA percentage of TOC) proportions of ERA percentage. Existing harvested land has actually a greater effect to runoff in most watersheds than the proposed action.

- Large woody debris guidelines would be met in areas proposed for treatment, including ground-based units and RHCAs.
- Noxious weeds have a high risk of being spread within treatment units, but a low risk of spread from one treatment unit to another.
- Reforestation efforts should hasten restoration of large tree forest conditions; CWHR 4M in 50 to 100 years.

Based upon the effects of the alternatives, the responsible official will decide to implement the project as proposed, implement the project based on an alternative, or not implement the project at this time.

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1 Purpose of and Need for Action

1.1 Document Structure

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

- **Chapter 1. Purpose of and Need for Action:** This chapter briefly describes the proposed action, the need for action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a detailed description of the Agency's proposed action, as well as alternative actions that were developed in response to comments raised by the public during scoping. The end of the chapter includes a summary table (Table 10) comparing the proposed action and alternatives with respect to their possible environmental impacts.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- **Index:** The index provides page numbers by document topic.

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, 39696 Highway 70, Quincy, CA 95971.

1.2 Background

The Antelope Complex fires began on July 5, 2007, burned approximately 23,000 acres, over 13,000 of which burned with high vegetation burn severity, and affected lands on both Mt. Hough and Beckwourth Ranger Districts. As a result of several lightning strikes, nine wildland fires began; the Wheeler fire became the largest fire within the Antelope Complex.

The Moonlight fire began on September 3, 2007, burned approximately 65,000 acres, and was contained on September 15, 2007. Based on the most recent fire severity assessment methods and severity maps (Safford et al. in press; Miller 2007; Miller and Fites 2006; Miller and Thode 1997), over 40,000 acres burned with high vegetation burn severity (killing 75 to 100 percent of the trees). This has resulted in a deforested condition characterized by relatively large areas of standing fire-killed trees.

1.3 Purpose and Need for Action

The Moonlight and Wheeler Project is proposed to respond to the goals and objectives of the PNF Land Resource and Management Plan (PNF LRMP)(1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (1999, 2003), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (2004). Comparison of the existing condition and the desired conditions for the PNF LRMP indicates a need to address undesirable resource conditions as a result of the Moonlight and Antelope Complex fires.

The SNFPA ROD (2004) identifies the need for incorporating ecosystem restoration following catastrophic events (II. Rationale for Decision, Old Forest Ecosystems and Associated Species, Restoration, page 6). This project specifically includes the recovery of economic value of fire-killed trees (within moderately high and high vegetation burn severity), and conifer seedling planting (restoration).

The action of recovering the economic value of fire-killed trees would contribute to the short-term stability and economic health of rural communities. The action of conifer seedling planting would contribute to ecosystem restoration, as well as long-term stability and economic health.

1.3.1 Purpose 1: Contribute to the Stability and Economic Health of Rural Communities

Objective: Provide for short-term local economic benefit by creating jobs from the harvesting of fire-killed merchantable trees, as well as contribute to local and regional areas with net revenues and receipts.

Harvesting fire-killed merchantable trees would generate income and employment opportunities in local and regional areas. **Measurement indicators**:

- Anticipated employee income
- Anticipated costs
- Net revenue
- Anticipated number of jobs
- Anticipated percent of receipts to local counties

1.3.2 Purpose 2: Re-establish Forested Conditions

Objective: Reforest harvested areas.

Reforestation would insure long-term forested conditions. **Measurement indicator:**

- Percent of Moonlight and Antelope Complex fires (NFS lands) reforested

Need for action: The National Forest Management Act (1976) requires areas that "have been cut-over or otherwise denuded or deforested" be reforested within five years.

As a result of the Moonlight and Antelope Complex fires, thousands of acres burned with high vegetation burn severity resulting in deforested conditions. As a result, shrub species would dominate these areas for decades and experience a delay in returning to a

forested condition. The early establishment of conifers through reforestation would expedite forest regeneration.

Roads and landings are absent in several areas of the project. Temporary road and landing construction is needed to permit the removal and utilization of material.

1.4 Proposed Action Summary

A brief description of the proposed action is provided in this section. The proposed action and other alternatives are described in detail in chapter 2.

The USDA Forest Service, PNF, Mt. Hough Ranger District proposes the Moonlight and Wheeler Project to harvest fire-killed merchantable trees (15,568 acres), including RHCAs, and plant native conifer tree seedlings (17,474 acres). The project would include 7,639 acres of ground-based, 2,649 acres of skyline, and 5,280 acres of helicopter logging systems. The project would start in the fall of 2008.

The proposed project is located in Plumas County, California, on the Mt. Hough Ranger District of the PNF. The project is located in all or portions of: sections 13, 23-27, 34-35, T28N, R10E; sections 13-14, 17-19, 23-24, 29-34, T28N, R11E; sections 19-20, 29-32, T28N, R12E; sections 1-2, 13-14, 23-25, T27N, R10E; sections 2-11, 13-15, 17, 19-22, 25, 35-36, T27N, R11E; sections 5, 8, 17-20, 29-32, T27N, R12E; sections 1-5, 9-12, 14–16, 21–23, and 26-27, T26N, R12E; sections 23 – 29 and 31 – 36, T27N, R12E; and sections 19, 20, and 30, T27N, R13E; Mount Diablo Meridian.

1.5 Decision Framework

The Responsible Official is the Forest Supervisor for the PNF. Given the purpose and need, the Responsible Official will review the no action and action alternatives and decide to implement the project as proposed, implement the project based on an alternative, or not implement the project at this time.

1.6 Public Involvement

An open house was held for interested parties on December 20, 2007, in Taylorsville, California. The news release concerning the meeting was distributed to 262 key Forest contacts and members of the media. An article informing the public of the meeting was also published in several local newspapers, including the *Feather River Bulletin*, the Newspaper of Record for this project. Eighteen members of the public attended the meeting and several submitted comments.

In late December 2007, individual letters for each project were mailed to Native American entities (including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations/non-profit groups), that are interested in projects that are located on this portion of the PNF.

In addition, individual letters for each project were mailed to 231 agencies, organizations, adjacent landowners, and individuals who expressed interest in projects of this type.

A Notice of Intent (NOI) for the Moonlight Fire Recovery and Restoration Project was published in the Federal Register on January 7, 2008.

About 21 comments on the proposed action were received.

A revised NOI for the Moonlight and Wheeler Project was published in the Federal Register on May 22, 2008. The two projects were merged because each had similar actions, the fire perimeters are adjacent to one another, and it was uncertain to what degree, if any, the proposed action may have a significant effect on the quality of the human environment.

On May 15, 2008, an scoping update letter regarding the combined project was mailed to Native American entities (including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations/non-profit groups), that are interested in projects that are located on this portion of the PNF.

In addition, the scoping update letter was mailed to 231 agencies, organizations, adjacent landowners, and individuals who expressed interest in projects of this type.

A complete record of public and internal scoping activities is in the project file at the Mt. Hough Ranger District, Quincy, CA.

The following individuals and groups provided comments during scoping:

- Keith and Wanda Crummer
- Monica Bond
- Joe Musser
- Chuck Will
- Leslie Mink
- Randy Pew, Pew Forest Products
- Jay C. Francis, Collins Pine
- Gale Dupree, Nevada Wildlife Federation
- Frank Stewart, Counties' QLG Forester
- Jonathan Rhodes, Planeto Azul Hydrology
- John Forno, Sierra Pacific Industries
- Darrel Cruz, Washoe Tribe of California and Nevada
- Sam Longmire, Northern Sierra Air Quality Management District
- Brian Wayland, Sierra Pacific Industries
- One joint letter signed by Craig Thomas for Sierra Forest Legacy; Pat Gallagher for Sierra Club; John Preschutti for Plumas Forest Project; and Chad Hanson for John Muir Project
- Shaun McCloud, Northern Sierra Air Quality Management District
- Bill Wickman, American Forest Resource Council
- Jennifer Johnson, Washoe Tribe of California and Nevada
- Rose Comstock, Plumas County Board of Supervisors
- Chad Hanson, John Muir Project

Using the comments from the public and other agencies, the interdisciplinary team (IDT) developed a list of minor issues to be addressed (section 1.7).

1.7 Scope of the Analysis

The need for the project led to the development of the project objectives (1.3). These objectives were used to develop the proposed action (alternative A), alternative C and the

alternatives eliminated from detailed study in chapter 2. Analysis of these objectives appears in chapter 3. The comparison of the alternatives relative to the objectives and the indicator measures appears in the comparison summary table (Table 10) at the end of chapter 2.

Public and agency scoping is the process used to identify major, minor, and non-issues and to determine the extent of environmental analysis necessary for an informed decision to be made concerning the proposed action.

The public and IDT identified potential issues and the Responsible Official approved those issues to be carried through the analysis as either minor issues.

1.7.1 Major Issues

This section identifies major issues (unresolved conflicts with the proposed action) and project objectives. The analysis of major issues and project objectives provide the basis for formulating alternatives and for making a decision on the project.

No major issues were identified for the project. The IDT considered the scoping comments received and the potential effects of the proposed action. They developed cause and effect relationship flow charts to identify potential issues. Some analyses were completed to determine the effects of the proposed action and none of the analyses showed more than minor effects to any resources. Due to restrictions on proposed project activities imposed by laws, PNF LRMP Standards, and overall design of the proposed action, the project was developed to have relatively low impacts to resources.

1.7.2 Minor Issues

Following the analysis of the proposed action, the IDT found that there were minor effects to some resources. The cause and effect relationships, with levels of effects too low to drive the development of additional alternatives or influence a decision, were determined to be minor issues. The effects related to these minor issues are described in chapter 3. These minor issues do not appear in the comparison summary table at the end of chapter 2. Some issue statements do not have quantitative indicator measures and the effects of the alternatives are discussed qualitatively within chapter 3.

1.7.2.1 Economics

1. Log hauling would increase congestion, noise levels, and decrease safety.

   Indicator:

   - Total number of trips of loaded and unloaded log trucks and chip vans

1.7.2.2 Forest Vegetation, Fire, Fuels, and Air Quality

2. Post-fire logging of fire-killed trees in high vegetation burn severity areas would reduce snags in both the short- and long-term.

   Indicator:

   - Number of snags/acre (greater than 15 inches dbh) retained across the Moonlight and Antelope Complex fire perimeters

3. Post-fire logging would change the diversity of fire effects (low, moderate, and high vegetation burn severity) across the landscape.

   Indicators:

   - Percent of Moonlight and Antelope Complex fire perimeters with low, moderate, and high vegetation burn severity
   - Percent of low vegetation burn severity salvaged
   - Percent of moderate vegetation burn severity salvaged
   - Percent of high vegetation burn severity salvaged

4. Yarding, road building, and landing construction would result in the removal of green trees.

   Indicator:

   - Estimated number of green trees incidentally felled and removed due to yarding, road building, and landing construction relative to total amount of trees harvested

5. Reduced recruitment of large woody debris would affect natural regeneration.

   Indicator:

   - Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

6. Soil disturbance from post-fire logging would damage, bury, and hinder natural regeneration.

   Indicator:

   - Not measured discussed qualitatively.

7. Lop and scatter would damage, bury, and hinder natural regeneration.

   Indicators:

   - Not measurable, discussed qualitatively.

8. Planting would accelerate the replacement of shrub habitat by forest habitat.

   Indicator:

   - Acres of reforestation compared to acres not reforested

9. Lop and scatter would cause a short-term increase in fuel loading and potential fire severity.

   Indicators:

   - Average tons/acre of surface fuels (1, 10, and 100 hour fuels)
   - Total flame length (feet) (90th percentile weather conditions)
   - Percent of basal area killed (90th percentile weather conditions)

10. Planting would increase future potential fire severity.

    Indicators:

    - Total flame length (feet) (90th percentile weather conditions)
    - Percent of basal area killed (90th percentile weather conditions)

11. Pile burning would cause a short-term production of smoke and reduced air quality.

    Indicator:

    - Total predicted PM_{10} (tons) and $PM_{2.5}$ emitted from project

12. Soil disturbance and compaction would result in a short-term production of dust.

    Indicator:

    - Not measured, discussed qualitatively.

1.7.2.3 Wildlife-Terrestrial and Aquatic

13. Reduction of snags would reduce habitat for snag-dependent wildlife species (particularly black backed woodpeckers).

    Indicator(s):

    - Percent of total suitable black-backed woodpecker habitat available before and after treatments within the Moonlight and Antelope Complex fire perimeters
    - Trends in habitat at the Bioregional scale

14. Reductions in snags would affect old forest species.

    Indicator:

    - Acres of pre-wildfire old forest habitat impacted by fire-killed tree removal

15. Post-fire logging activities would result in improved access while roads are open, which would increase disturbance to wildlife.

    Indicator:

    - Comparison of the amount of open road density pre and post project expressed as miles of open road/square mile.

16. Post-fire logging activities would cause a short-term displacement of wildlife.

    Indicator:

    - Not measured, discussed qualitatively.

17. Reduced recruitment of large woody debris would reduce terrestrial microhabitats.

    Indicator:

    - Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

18. Reduced terrestrial microhabitats would affect early seral wildlife species.

    Indicator:

    - Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

19. Reduce recruitment of large woody debris to streams would change stream channel morphology, reduce microhabitats for aquatic species, and reduce thermal cover for cold water fisheries.

Indicators:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term
- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

20. Increased sediment delivery would result in changes to stream channel morphology, water quality, and downstream fish habitat.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

1.7.2.4 Soil and Hydrology

21. Post-fire logging would reduce large woody debris in the long-term.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

22. Reduced large woody debris would reduce soil productivity.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

23. Post-fire logging would reduce recruitment of large woody debris to streams.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

24. Post-fire logging, landing construction, road building, fireline construction, and road maintenance would cause soil disturbance and compaction.

Indicator:

- Not measured, discussed qualitatively.

25. Soil disturbance and compaction would increase erosion and subsequent delivery to streams.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

26. Increased erosion would result in reduced long-term soil productivity.

Indicator:

- Not measured, discussed qualitatively.

27. Soil disturbance and compaction would result in a reduction in soil productivity.

Indicator:

- Acres of ground cover enhancement

28. Log hauling would damage road surfaces which would increase erosion.

Indicator:

- Not measureable, discussed qualitatively.

1.7.2.5 Botany

29. Soil disturbance and compaction would result in an increase in noxious weeds.

Indicator:

- Risk of introduction and spread of invasive plant species

30. Soil disturbance and compaction would affect sensitive plants.

Indicator:

- Not measured, discussed qualitatively.

1.7.2.6 Heritage Resources

31. Soil disturbance and compaction would result in damage to heritage resources

Indicator:

- Not measured, discussed qualitatively.

1.7.2.7 Scenery

32. Post-fire logging would change visual characteristics.

Indicator:

- Percent of each visual quality objective (retention, partial retention, and modification) salvaged

1.7.2.8 Recreation and Mining

33. Post-fire logging activities would cause a short-term reduction of public access and displacement of recreational users.

Indicators:

- Miles of public access roads
- Duration of delays or closures for public access roads

1.7.3 Issues Eliminated from Detailed Study

The IDT found that some of the potential issues were outside the scope of the defined analysis, related to resources that do not exist in the project area, or had a faulty cause and effect relationship. The following section lists these issue statements along with an explanation of why each was eliminated from detailed study. No further information on these concerns appears in this Environmental Impact Statement (EIS).

1.7.3.1 Economics

1. Concentrating snag retention in California spotted owl PACs, where the largest and most valuable trees are, would reduce economic benefits to local communities.

Approximately 1,732 acres (10 percent) of the proposed treatment units would be identified as snag retention areas. Approximately 39 percent of the acreage in snag retention areas (671 acres) are within former PACs. The estimated volume for these snag retention areas is approximately 4.9 mmbf and accounts for less than five percent of the volume proposed to be removed under alternative A. Consequently, it is anticipated that these snag retention areas would not substantially reduce economic benefits to local communities.

2. Implementing Stewardship Contracts would reduce economic benefit to local communities, specifically funds for Plumas County schools and roads.

The Moonlight and Wheeler Project has not identified the need for Stewardship Contracting. Currently there are no actions identified where Stewardship Contracting would be appropriate to implement.

1.7.3.2 Forest Vegetation

1. Post-fire seeding generally damages natural ecological values.

Post-fire seeding is not included as an activity within the proposed action.

2. The Forest Service is likely to be logging significant numbers of important live green trees without an assessment of mortality that is based on a green needle assessment done well into the growing season of 2008.

The proposed action includes the removal of fire-killed trees, therefore no tree mortality guidelines would be used on the project.

1.8 Laws, Regulations, or Planning Documents Influencing the Scope of this Environmental Analysis

Management proposals by the PNF are determined by direction contained in the PNF Land and Resource Management Plan (1988), which was amended by the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) (1999, 2003), and the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS) and ROD (2004). In addition, the HFQLG/SNFPA Implementation Consistency Crosswalk, revised December 2007, provides direction for applying standards and guidelines for 2004 SNFPA FSEIS and ROD (HFQLG / SNFPA Implementation Consistency Crosswalk and cover letter, December 12, 2007).

The proposed action follows the standards and guidelines found under the heading Management Standards and Guidelines and subheading Salvage within the SNFPA ROD (2004, pages 52 and 53).

Table 2 of the SNFPA ROD (2004) provides standards and guidelines applicable to the HFQLG Pilot Project area for the life of the pilot project. Standards and guidelines that are applicable to this project from table 2 include those for down wood and snags (page 69). In addition, table 2 identifies a 30 inch dbh upper diameter limit that is applicable to live vegetation, not fire-killed vegetation (pages 68 and 69). There is no

upper diameter limit identified for this project (HFQLG / SNFPA Implementation Consistency Crosswalk 2007).

Per the SNFPA ROD (2004, page 37) the Forest Service is to evaluate habitat conditions after a stand replacing event within a 1.5 mile radius around the activity center to identify opportunities for re-mapping the PAC. If there is insufficient suitable habitat for designating a PAC within the 1.5 mile radius, the PAC may be removed from the network. The Moonlight and Wheeler fires impacted twenty-five PACs.

1.9 Applicable Permits, Licenses, and Other Consultation Requirements

State requirements based on federal laws for air quality management would be followed. These requirements include burning only on permissive burn days, or receiving a special authorization prior to ignition. Smoke permits are required from the Northern Sierra Air Quality Management District. Silviculture Waiver for waste discharge would be required from the California Regional Water Quality Control Board.

2 Alternatives, Including the Proposed Action

2.1 Introduction

This chapter describes and compares the alternatives considered for the Moonlight and Wheeler Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a basis for choice among options by the decision maker.

The acres and volumes displayed are estimates based on aerial photography, map interpretation, on-the-ground estimates, and collected information. The estimated acres of harvest treatment and planting acres discussed throughout this document are the maximum that would be considered for logging and planting. The actual figures may be less when implemented, but would not exceed the stated acres.

2.2 Alternatives Considered in Detail

The Forest Service developed three alternatives, including the no action and two action alternatives developed in response to the project objectives.

2.2.1 Alternative A – Proposed Action

The proposed action includes three groups of activities: salvage timber harvest, construction of temporary roads and landings for access, and reforestation.

2.2.1.1 Salvage Timber Harvest

Merchantable trees would be felled and removed (up to 15,568 acres) and would be harvested from Riparian Habitat Conservation Areas (RHCAs) within treatment units.

Table 1. Design elements for salvage timber harvest actions for alternative A.

CRITERION	DESIGN
Vegetation Burn Severity	▪ Harvest activities would occur in moderately high and high vegetation burn severity areas, up to 15,568 acres, within the project area. Logging systems used on these areas are described below.
Ground-based Logging System (up to 7,639 acres)	▪ Trees greater than 14 inches dbh would be removed as sawlog product and trees less than 14 inches dbh would be removed, up to 7,639 acres, as a biomass product. ▪ Ground-based equipment would be restricted to slopes less than 35 percent except on decomposed granitic soils where equipment would be restricted to slopes less than 25 percent. ▪ All ground-based logging would remove

CRITERION	DESIGN
	trees using whole tree yarding.
Skyline Logging System (up to 2,649 acres)	▪ Harvest and remove trees greater than 16 inches dbh, up to 2,649 acres, as sawlog product. ▪ Limbs and tops would be lopped and scattered to a depth of less than 18 inches in height. ▪ Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams.
Helicopter Logging System (up to 5,280 acres)	▪ Harvest and remove trees greater than 16 inches dbh, up to 5,280 acres, as sawlog product. ▪ Limbs and tops would be lopped and scattered to a depth of less than 18 inches in height.
RHCA Equipment Constraints	▪ No ground-based mechanical equipment operations on slopes steeper than 25 percent. ▪ Equipment restriction zones adjacent to stream channels would be established based on stream type and slope class (Table 2). ▪ Extend the equipment restriction zones to 25 feet beyond the outer or upslope extent of the "green line" (actual or potential extent of riparian vegetation) or the inner channel slope break, where these features are present and these widths would exceed the above-listed widths. ▪ Exclude equipment from unstable slopes (landslide-prone areas or unstable mined lands) outside the riparian equipment restriction zones. ▪ Harvesting and removal of products within equipment exclusion zones would require directional felling and end-lining. ▪ Allow low ground pressure equipment to travel into the outer RHCA zone (outside the equipment restriction zone) to retrieve harvest trees and bring them to skid trails. ▪ Locate skid trails at angles acute or perpendicular to stream channels to minimize erosion into the channel, and allow skidders to enter 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.

CRITERION	DESIGN
Snag Retention (up to 1,723 acres)	▪ Retain the number of snags per acre appropriate for each forest type on a landscape basis. 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. Retaining 4-6 snags per acre includes snag retention areas within treatment units and RHCAs, and remaining snags outside of treatment units. ▪ Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline. ▪ "Snag retention areas" about 10 acres in size would be designated, up to 1,723 acres, throughout 10 percent of the treatment areas. ▪ Primary selection criteria for snag retention areas are: 1) areas formerly identified as spotted owl PACs, 2) along treatment unit boundaries adjacent to non-burned and low severity areas, 3) within RHCAs, and 4) in stands that supported a minimum of 40 percent canopy cover pre-fire. ▪ No harvesting would occur within snag retention areas. ▪ Incidental removal of snags may occur to allow for operability.
Landing Piles and Fireline	▪ Excess fuels on landings would be piled, firelines constructed around the piles, and the piles burned. ▪ Firelines would be hand or machine line as appropriate and would incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features where logical and feasible.

Table 2. Equipment restriction zones for ground-based equipment based on stream type and slope class.

STREAM TYPE	SLOPE CLASS		
	0-15% (feet)	15%-25%	Greater than 25%
Perennial	100	150	No mechanical
Intermittent	50	100	No mechanical
Ephemeral	25	50	No mechanical
Meadows and Wetlands	25	50	No mechanical

2.2.1.2 Access

Approximately 33 miles of temporary roads would be constructed to access the treatment units; these temporary roads would be constructed according to current standards for short-term use. Fourteen temporary helicopter landings would be constructed (about 30 acres).

Table 3. Design elements for access actions for alternative A.

CRITERION	DESIGN
Temporary Roads and Landings	Temporary roads and landings would be subsoiled to a minimum of 18 inches in depth, reforested, and closed following the completion of harvest.
	Incidental removal of green trees may occur to allow for temporary road and landing construction.

2.2.1.3 Reforestation

Reforestation includes site preparation and planting of native conifer seedlings in areas of moderately high and high vegetation burn severity, up to 17,474 acres.

Table 4. Design elements for reforestation for alternative A.

CRITERION	DESIGN
Reforestation of Fire-killed Stands (up to 17,474 acres)	Reforestation would be accomplished through a combination of planting and natural regeneration. Areas that burned with moderately high and high vegetation burn severity resulting in inadequately stocked forest land would receive preference for planting, up to 17,474 acres.

CRITERION	DESIGN
Site Preparation for Planting	Manual grubbing and/or removal of competing vegetation down to mineral soil five feet in diameter around the planting site.
Tree Species	Species to be planted would include ponderosa pine, Jeffrey pine, Douglas-fir, incense cedar, and rust resistant sugar pine.
Planting Spacing	One hundred to two hundred trees per acre would be planted in widely-spaced clusters.

2.2.2 Alternative B – No Action

Under the no action alternative, current management plans would continue to guide management of the project area. Under the no action alternative, there would be no removal of fire-killed trees, construction of temporary roads and landings, or planting of tree seedlings, except for Burned Area Emergency Rehabilitation (BAER) activities. The following ongoing activities would occur: firewood cutting, fire suppression, Christmas tree cutting, right-of-way maintenance for telephone and power lines, road use and maintenance, mining operations, and recreational use. The no action alternative could be viewed as passive management as described by Beschta and others (1995).

2.2.3 Alternative C – Tractor Only

Alternative C includes three groups of activities: salvage timber harvest, construction of temporary roads and landings for access, and reforestation. Alternative C does not include harvest, access, or reforestation activities within the areas designated in alternative A for skyline or helicopter logging systems.

2.2.3.1 Salvage Timber Harvest

Merchantable trees would be felled and removed (up to 7,639 acres) and would be harvested from Riparian Habitat Conservation Areas (RHCAs) within treatment units.

Table 5. Design elements for salvage timber harvest actions for alternative C.

CRITERION	DESIGN
Vegetation Burn Severity	Harvest activities would occur with moderately high and high vegetation burn severity areas, up to 7,639 acres, within the project area.
Ground-based Logging System (up to 7,639 acres)	▪ Trees greater than 14 inches dbh would be removed as sawlog product and trees less than 14 inches dbh, up to 7,639 acres, would be removed as a biomass product. ▪ Ground-based equipment would be restricted to slopes less than 35 percent except on decomposed granitic soils where equipment would be restricted to slopes less than 25 percent. ▪ All ground-based logging would remove

CRITERION	DESIGN
	trees using whole tree yarding.
RHCA Equipment Constraints	▪ No ground-based mechanical equipment operations on slopes steeper than 25 percent. ▪ Equipment restriction zones adjacent to stream channels would be established based stream type and slope class (Table 2). ▪ Extend the equipment restriction zones to 25 feet beyond the outer or upslope extent of the "green line" (actual or potential extent of riparian vegetation) or the inner channel slope break, where these features are present and these widths would exceed the above-listed widths. ▪ Exclude equipment from unstable slopes (landslide-prone areas or unstable mined lands) outside the riparian equipment restriction zones. ▪ Harvesting and removal of products within equipment exclusion zones would require directional felling and end-lining. ▪ Allow low ground pressure equipment to travel into the outer RHCA zone (outside the equipment restriction zone) to retrieve harvest trees and bring them to skid trails. ▪ Locate skid trails at angles acute or perpendicular to stream channels to minimize erosion into the channel, and allow skidders to enter 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.
Snag Retention (up to 935 acres)	▪ Retain the number of snags per acre appropriate for each forest type on a landscape basis. 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. ▪ "Snag retention areas" about 10 acres in size would be designated throughout 10 percent of the treatment areas, up to 935 acres. ▪ Primary selection criteria for snag retention areas are 1) areas formerly identified as

CRITERION	DESIGN
	spotted owl PACs, 2) along treatment unit boundaries adjacent to non-burned and low severity areas, 3) within RHCAs, and 4) in stands that supported a minimum of 40 percent canopy cover pre-fire. ▪ No harvesting would occur within snag retention areas. ▪ Incidental removal of snags may occur to allow for operability.
Landing Piles and Fireline	▪ Excess fuels on landings would be piled, firelines constructed around the piles, and the piles burned. ▪ Firelines would be hand or machine line as appropriate and would incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features where logical and feasible.

2.2.3.2 Access

Construct approximately 27 miles of temporary roads to access the treatment units; these temporary roads would be constructed according to current standards for short-term use.

Table 6. Design elements for access actions for alternative C.

CRITERION	DESIGN
Temporary Roads and Landings	Temporary roads and landings would be subsoiled to a minimum of 18 inches in depth, reforested, and closed following the completion of harvest.
	Incidental removal of green trees may occur to allow for temporary road and landing construction.

2.2.3.3 Reforestation

Reforestation includes site preparation and planting of native conifer seedlings in areas of moderately high and high vegetation burn severity, up to 8,758 acres.

Table 7. Design elements for reforestation for alternative C.

CRITERION	DESIGN
Reforestation of Fire-killed Stands (up to 8,758 acres)	Reforestation would be accomplished through a combination of planting and natural regeneration. Areas that burned with moderately high and high severity resulting in inadequately stocked forest land would receive preference for

CRITERION	DESIGN
	planting, up to 8,758 acres.
Site Preparation for Planting	Manual grubbing and/or removal of competing vegetation down to mineral soil about five feet in diameter around the planting site.
Tree Species	Species to be planted would include ponderosa pine, Jeffrey pine, Douglas-fir, incense cedar, and rust resistant sugar pine.
Planting Spacing	One hundred to two hundred trees per acre would be planted in widely-spaced clusters.

2.2.4 Mitigation Common to All Alternatives

The Forest Service also developed the following mitigation measures to be used as part of both action alternatives.

2.2.4.1 Air Quality

Prior to implementation, notification of proposed prescribed burning would occur through local newspapers and radio stations.

2.2.4.2 Watershed

All landings would be subsoiled, reforested , and closed after project completion.

2.2.4.3 Noxious Weeds

Any new populations of noxious weeds would be analyzed for incorporation into the District noxious weed program for treatment.

2.3 Alternatives Considered but Eliminated from Detailed Study

During the development of the proposed action, other action alternatives were considered. These alternatives varied from the proposed action in terms of methods and amounts of recovery and restoration treatments.

2.3.1 Alternative D – Natural Regeneration and Wildland Fire Use, Prescribed Fire, and Pile Burning

This alternative would incorporate natural regeneration and a combination of wildland fire use, prescribed fire, and pile burning as a basis for aiding restoration and treating excess small diameter trees in the burned area.

This alternative was eliminated from detailed study for the following reasons:

- Alternative D would not meet objective one within section 1.3.1, because it does not include the harvest of any fire-killed merchantable trees.
- Wildland fire use is not authorized by the PNF LRMP (1988) within the Moonlight and Wheeler Project.
- This alternative would require an extended time frame to implement. Currently, the Mt. Hough Ranger District uses prescribed fire (pile and underburning) to treat

approximately 1,000-2,000 acres per year. Past and current trends with air quality restrictions, limited burn days, and extended fire seasons, are expected to continue. Given these factors, treating up to 15, 568 acres of excess small diameter trees in Moonlight and Wheeler Project area using prescribed fire and pile burning would take nearly two decades to implement.

- Stand snags and deterioration rate of fire-killed timber would result in an unsafe environment for workers.
- Although alternative D results in economic recovery related to jobs and employee income, it would not generate revenue.
- Natural conifer regeneration is expected to occur and would be analyzed under alternative B, the no action alternative.

2.3.2 Alternative E – Reduce Upper Diameter Limit of Harvested Fire-killed Trees to 24 inches dbh

This alternative would include significantly less post-fire logging while retaining all larger diameter fire-killed trees. All other design criteria would remain identical to the proposed action.

This alternative was eliminated from detailed study for the following reasons:

- Although alternative E results in economic recovery in terms of jobs and employee income, the costs of the project outweigh the value of the sawlogs and biomass by over $6 million. Table 8 displays the subsequent effects of alternative E on estimated volume, value, costs, revenues, and employment as compared to alternative A, the proposed action.
- Based on the values provided in Table 8 it is unlikely that this alternative would be pursued by a timber sale purchaser due to the high cost and low revenue.

Table 8. Comparison of objective 1 measurement indicators between alternatives A and E.

REVENUE/COST/EMPLOYMENT	ALTERNATIVE A	ALTERNATIVE E
Sawlog Volume	121,599 mbf	34,945 mbf
Total Sawlog and Biomass Value	$39,106,707	$9,511,285
Total Costs	$40,955,763	$15,715,238
Net Revenue	- $1,849,056	-$6,203,953
Percent above value	-5%	-65%
Potential Receipts to Local Counties	$463,528	$138,577
Total direct and indirect jobs	**2106**	**980**
Total employee-related income	**$90,558,582**	**$42,119,164**

2.3.3 Alternative F – Harvest by CWHR Density and Size Classes, Not to Exceed 20 inches dbh, and Excludes Former PACs and HRCAs

This alternative would include significantly less post-fire logging while retaining all larger diameter fire-killed trees, where harvest would occur in California Wildlife Habitat Relationship (CWHR) size classes 2 and 3, and size and density classes 4S and 4P and

not exceed 20 inches dbh. Ground-based logging and road construction and reconstruction would not occur within high vegetation burn severity areas. No activities would occur within former California spotted owl PACs and HRCAs.

This alternative was eliminated from detailed study for the following reasons:

- Alternative F would salvage harvest approximately 7,220 acres. Although alternative F results in economic recovery in terms of jobs and employee income, this would be substantially reduced relative to the action alternatives. The anticipated volume removed would be approximately 11 mmbf, and the costs of the project outweigh the value of the sawlogs and biomass by over $2.5 million.
- It is unlikely that alternative F would be pursued by a timber sale purchaser due to the high cost and low revenue.

2.4 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the Table 9 is focused on activities and Table 10 is focused on effects where different levels of effects or outputs can be distinguished quantitatively, or qualitatively, between alternatives.

Table 9. Comparison of activities.

ACTIVITY	ALT. A	ALT. B	ALT. C
Acres of ground-based salvage	7,639	0	7,639
Acres of skyline salvage	2,649	0	0
Acres of helicopter salvage	5,280	0	0
Acres of planting	17,474	0	8,758
Miles of temporary road construction	33	0	27

Table 10. Comparison of effects.

OBJECTIVE	INDICATOR	ALT. A	ALT. B	ALT. C
Provide for short-term local economic benefit by creating jobs from the sale of fire-killed merchantable trees, as well as contribute to local and regional areas with net revenues and receipts.	Employee Income	$90,558,582	0	$51,949,609
	Costs	$40,955,763	0	$20,846,671
	Net revenue	($1,849,056)	0	$1,785,306
	Number of jobs	2,106	0	1,208
	Receipts to Local Counties	$463,528	0	$701,134
Promote long term economic recovery through restoration by re-establishing forested conditions through	Percent of Moonlight and Antelope Complex Fires (Forest	25.8%	0	13.0%

OBJECTIVE	INDICATOR	ALT. A	ALT. B	ALT. C
planting.	System land) reforested			

3 Affected Environment and Environmental Consequences

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in chapter 2.

The following resource specialist analyses are incorporated by reference: Moonlight and Wheeler Fires Recovery and Restoration Project Forest Vegetation, Fuels, Fire, and Air Quality Report (Ryan Tompkins and Jason Moghaddas, June 2008), Moonlight and Wheeler Fires Recovery and Restoration Project Wildlife Biological Assessment/Biological Evaluation (Chris Collins, June 2008), Moonlight and Wheeler Fires Recovery and Restoration Project Management Indicator Species Report (Chris Collins and Kristine Van Stone Hopkins, June 2008), Moonlight and Wheeler Fires Recovery and Restoration Project Watershed Report (Eric Moser, Vincent Archer, and Bill Overland, June 2008), Moonlight and Wheeler Fires Recovery and Restoration Project Botanical Biological Evaluation (James Belsher-Howe, June 2008), Moonlight and Wheeler Fires Recovery and Restoration Project Noxious Weed Risk Assessment (James Belsher-Howe, June 2008), and Moonlight and wheeler Fires Recovery and Restoration Project Heritage Resource Inventory Report ARR# 02-40-2008 (Cristina Weinberg, June 2008).

3.1 Past, Present, and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) 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 determining cumulative effects, the past, present, and future actions displayed in appendix B were added to the direct and indirect effects of the proposed action and alternatives.

Affected environments have been divided by resource areas, where as environmental consequences have been divided by resource areas and then by alternative, where alternatives A and C are discussed together. Further, minor issue statements and associated measurement indicators, as well as effects analyses that are required by law are discussed per alternative, where alternatives A and C are discussed together.

3.2 Economics

3.2.1 Affected Environment

The PNF 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 PNF 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. The PNF lands account for approximately 72 percent of Plumas County. Consequently, management of National Forest System (NFS) lands has a notable effect on the regional economy of Plumas County.

The two employment sectors most related to forest planning processes are the timber industry and tourism. They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal employers generally do not break down employment data into these categories.

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, (2) timber yield taxes, and (3) Receipt Act payments or payments from the Secure Rural Schools and Community Self-Determination Act of 2000. Of these, the Receipt Act or Secure Rural Schools and Community Self-Determination Act payments are by far the most significant in terms of total contributions to each county and are therefore most likely to be affected by forest land management decisions.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

This economic analysis focuses on those revenues and treatment costs associated with implementing salvage harvest and reforestation treatments in the Moonlight and Wheeler Project area. The analysis is limited to those activities occurring within the project area (61,701 acres) throughout the implementation phase (12 to 24 months) of the project.

The anticipated timber volume, value, costs, jobs, and revenues are displayed for all alternatives in Table 11. Salvage harvesting and reforestation treatments would directly generate 2,106 direct and indirect jobs under alternative A. In addition to the direct employment that would result from the salvage harvesting and reforestation treatments in alternative A, and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. 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. There would also be an induced effect driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

Table 11. Comparison of economic effects by alternative.

	Alternatives		
Revenue/Cost/Employment	**A**	**B**	**C**
Sawlog Volume	121,599 mbf	0 mbf	65,940 mbf
Total Sawlog and Biomass Value	$39,106,707	$0	$22,631,978
Total Costs	$40,955,763	$0	$20,846,671
Net Revenue	- $1,849,056	$0	$1,785,306
Percent above value	-5%	0%	8%
Potential Receipts to Local Counties	$463,528	$0	$701,134
Total direct and indirect jobs	**2106**	**0**	**1208**
Total employee-related income	**$90,558,582**	$0	**$51,949,609**

Under alternative A, helicopter and skyline salvage harvesting treatments contribute more volume to the overall economic analysis, but also contribute more costs. The low value of the fire-killed trees in relation to the high costs of helicopter and skyline logging contribute to negative net revenue for alternative A. Including the treatment of these units as subject to agreement under the timber sale contract would improve the net revenue of alternative A by allowing flexibility for purchasers to negotiate with the Forest Service to treat such units where the capacity of the local forest products industry exists. Allowing for such flexibility would likely reduce the amount of volume and acres subject to salvage harvesting, but could improve net revenues and receipts to local counties.

Salvage harvesting and reforestation treatments would directly generate 1,208 direct and indirect jobs under alternative C (Table 11). In addition to the direct employment that would result from the salvage harvesting and reforestation treatments in alternative C, and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. 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. There would also be an induced effect driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

Under alternative C, ground-based salvage harvesting treatments contribute less volume to the overall economic analysis, but also contribute lower costs. The low value of the fire-killed trees in relation to the lower costs of ground-based logging contributes to positive net revenue for alternative C.

3.2.2.1.1 Minor Issues

Log hauling would increase congestion, noise levels, and decrease safety.

Indicator:

- Total number of trips of loaded and unloaded log trucks and chip vans

The estimated number of trips for loaded and unloaded log trucks and chip vans is 54,044 trips. The log trucks and chip vans would contribute to a negligible increase in

traffic in the communities of Indian and American Valleys and to California State Highway 70/89. Due to the location of these communities in relation to Highway 70/89, the log trucks and chip vans would contribute a negligible amount of noise. Provided that all traffic laws are followed, these vehicles would not cause a decrease in safety along these roads. An erosion control plan would be implemented according to BMPs.

Cumulatively, trucks hauling forest products from private land salvage logging operations would continue for an unknown duration. These hauls would contribute negligible effects to congestion, noise, safety, and road damage.

The estimated number of trips for loaded and unloaded log trucks and chip vans for alternative C is 29,306 trips. The log trucks and chips vans would contribute to a negligible, less than alternative A, increase in traffic in the communities of Indian and American Valleys and to California State Highway 70/89. Due to the location of these communities in relation to Highway 70/89 the log trucks and chip vans would contribute a negligible amount of noise. Provided that all traffic laws are followed these vehicles would not cause a decrease in safety along these roads. An erosion control plan would be implemented according to BMPs.

Cumulatively, trucks hauling forest products from private land salvage logging operations would continue for an unknown duration. These hauls would contribute negligible effects to congestion, noise, safety, and road damage.

3.2.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.2.2.2.1 Minor Issues

Log hauling would increase congestion, noise levels, and decrease safety.
Indicator:
▪ Total number of trips of loaded and unloaded log trucks and chip vans

No project activities would occur under the no action alternative, therefore any loaded or unloaded log trucks or chip vans would be traveling from the project area to their destinations. There would be no change in congestion, noise levels, safety, or road damage as a result of project activities.

Cumulatively, trucks hauling forest products from private land salvage logging operations would continue for an unknown duration. These hauls would contribute negligible effects to congestion, noise, safety, and road damage.

3.3 Forest Vegetation, Fire, Fuels, and Air Quality

3.3.1 Affected Environment

3.3.1.1 Forest Vegetation, Fire, and Fuels

Direct effects 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 are 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.

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 effect analysis.

The analysis area used to analyze the direct, indirect, and cumulative effects on forest vegetation, fire, fuels, and air quality is the 87,647 acre area where the Moonlight and Antelope Complex fires burned. The analysis area is based on 1) acres burned in a distinct geographic area and administrative setting, 2) impacts to forest vegetation from the wildfire and subsequent effects of timber salvage harvest and reforestation, including cumulative effects, are limited to the burned area, and 3) the area includes forest vegetation occurring within the treatment areas as well as the vegetation outside the treatment areas, but within the fire and represents the furthest measurable extent that effects on forest vegetation and fuels would occur as a result of implementing any of the proposed alternatives. Ecologically, the dynamics between vegetation and fire and fuels are inherently linked; fire has a profound effect on vegetation establishment and development and conversely, vegetation treatments (and the absence thereof) have a profound effect on fuels accumulations and fire behavior. The analysis area considers this relationship on the landscape level by including the entire fire perimeter of both fires, and allows for a congruent analysis of forest vegetation, fuels, and fire at the stand and landscape levels.

The direct, indirect, and cumulative effects analyses are based on a temporal scale. Documented past projects, including timber harvesting, wildfires, watershed improvements, and other activities described in Appendix B: Past, Present, and Reasonably Foreseeable Future Actions ranging as far back as 1974 were considered past actions within the analysis area. In a broader sense, current vegetation structure and composition reflects the historical management regimes prior to 1974. This vegetation structure and composition includes attributes of the current landscape including existing vegetation types, fuel treatments, burned areas, past sanitation harvest, and plantations.

For the purpose of the vegetation, fire, and fuels analysis, the temporal bounds include a 30-year horizon for future effects because modeling indicates that, within 30 years, the treated stands would approach stocking levels corresponding with forest development. In addition, past stand replacing fires within the project vicinity such as the Elephant fire (1981) that were treated with similar management actions (salvage fire-killed timber and reforestation) developed into young forested stands within 30 years. This stand development is commensurate with the modeling performed in this analysis. Stand development modeling was extended beyond this to examine general trends and trajectories of stand development under no further management beyond those documented in Appendix B: Past, Present, and Reasonably Foreseeable Future Actions. The air quality analysis considers potential impacts to communities within 20 miles of the project area as these are the communities that would be most impacted by any activities within the alternatives.

Post-fire conditions were assessed through field observations, stand exams, and remote sensing. The areas burned by the Moonlight and Antelope Complex fires were prone to burning under high severity, and did so during these fire events. Together, the Moonlight and Antelope Complex fires burned approximately 88,000 acres, with over 54,000 acres (62 percent) of the total area burning under what is classified as high

vegetation burn severity (Table 12) (Safford et al. in press; Miller 2007; Miller and Fites 2006; Miller and Thode 1997). Areas which burned with low severity typically consumed up to 90 percent of existing surface fuels with the majority of trees killed in the less than 10 inches dbh size class; the majority of trees greater than 20 inches dbh have signs of needle scorch, but are still alive. Within the moderate severity size class, large pockets, several acres in size are completely killed with some larger trees in the overstory being completely scorched and now fire-killed. Within the high severity class, up to 100 percent of all trees are fire-killed, showing extensive signs of bark char and with most not having any foliage. Due to high consumption of existing surface fuels and a lack of scorch needle foliage, surface fuels and associated ground cover in high severity burn areas is low to non-existent.

Table 12. Acres by vegetation burn severity class for lands within the perimeter of the Moonlight and Antelope Complex fires.

Acres	Unclassified due to Satellite Imagery [1]	Low Severity	Moderate Severity		High Severity	Total for all severity classes
		BA Mortality 0-25%	BA Mortality 25-50%	BA Mortality 50-75%	BA Mortality 75-100%	
Total within Analysis Area	258	16679	8401	7770	54539	87647
Percent of Analysis Area	0.3%	19%	10%	9%	62%	100%
Total on Private Land	258	3078	1418	1240	13245	19238
Percent of Private Land	1%	16%	7%	6%	69%	100%
Total on NFS lands	0	13600	6983	6531	41294	68408
Percent of NFS lands	0%	20%	10%	10%	60%	100%

[1] Unclassified area is within private lands on the Northwest portion of the Moonlight Fire (See figure 2.1). This area was unclassified as it was off the edge of the satellite imagery. BA=basal area.

Over 54,000 acres or 62 percent of the total NFS lands burned under high severity. This is equivalent to over 85 square miles that burned resulting in 75-100 percent mortality of forest vegetation. The large scale of these fires, including the vast areas that burned under high severity, are well outside the natural range of variability in fire size and severity experienced on the PNF in the past and are uncharacteristic of the "natural" fire regimes typically described for the dry Sierra Nevada forests (Safford et al. in press; Miller and Fites 2006; Gruell 2001). In addition, proximity and adjacency of these two fires and similar severity effects has had a major effect on this landscape.

The effect of the fires caused a large scale vegetation type change from mid to late seral closed canopy forested conditions to non-forest vegetation types which is expected to be dominated by brush. California Wildlife Habitat Relationship (CWHR) (Mayer and Laudenslayer 1988) typing is used to examine changes in forest vegetation as it classifies vegetation by vegetation type, size, and density. Conifer forest types include ponderosa pine, Sierra mixed conifer, white fir, red fir, eastside pine, and lodgepole pine forest vegetation. Hardwood forest types include aspen, montane hardwood, montane hardwood conifer, and montane riparian vegetation. Non-forest vegetation types include montane chaparral, wet meadow, perrenial grassland, and sage brush types, as well as water and rock substrate types.

A large majority of CWHR 4 and 5 stands in conifer forest types were converted to non-forest vegetation types as a direct result of the fires. Of these post-fire non-forest vegetation types, over 95 percent (52,000 acres of NFS lands) are expected to be

dominated by brush such as Ceanothus and manzanita species. In addition, early seral forest conditions characterized by CWHR size classes 1, 2, and 3 are converted to non-forest vegetation types (brushfields) due to high mortality in young trees and vigorous post-fire basal sprouting of brush species which can rapidly colonize the site effectively out-competing natural regeneration. Table 13 displays the change in acres by CWHR type as a result of the fire.

Table 13. Pre- and post-fire vegetation as classified by CWHR (includes all private and NFS lands within the forest vegetation analysis area)

Forest Type	CWHR Size Class	CWHR Density	Pre-Fire Acres	Pre-Fire Percent of Acres	Post-Fire Acres	Pre-Fire Percent of Acres	Percent Change
Conifer Forest Types	**1**	**Total**	**63**	**0.1%**	**62**	**0.1%**	-1%
	2	**Total**	**3279**	**3.7%**	**540**	**0.6%**	-84%
	3	**Total**	**3824**	**4.4%**	**1538**	**1.8%**	-60%
	4	D	3282	3.7%	383	0.4%	-88%
		M	36620	41.8%	3861	4.4%	-89%
		P	9525	10.9%	15767	18.0%	66%
		S	2045	2.3%	6537	7.5%	220%
		Total	**51471**	**58.7%**	**26548**	**30.3%**	-48%
	5	D	3858	4.4%	110	0.1%	-97%
		M	16809	19.2%	519	0.6%	-97%
		P	1225	1.4%	557	0.6%	-55%
		S	153	0.2%	288	0.3%	88%
		Total	**22044**	**25.2%**	**1474**	**1.7%**	-93%
Hardwood Forest Types		**Total**	**3604**	**4.1%**	**2603**	**3.0%**	-28%
Non-Forest Types		**Total**	**3361**	**3.8%**	**54883**	**62.6%**	1533%

Table 14 displays existing post-fire stand conditions within primarily CWHR 4 and 5 stands in conifer forest types contained by the proposed treatment units. The treatment units were designed to encompass areas of moderately high and high severity where the vast majority, if not all, trees within the stands are fire-killed and economic recovery treatments are appropriate.

Table 14. Average existing stand conditions by severity and site class within the burned area.

Time Frame	Live Trees Per Acre by Diameter Class					Fire-killed Trees Per Acre by Diameter Class					Live Basal Area
	Total	0-10"	10-16"	16-30"	>30"	Total	0-10"	10-16"	16-30"	>30"	
High to Moderate Severity Conditions (> 50% BA Mortality); Region 5 sites III & IV											
Existing	11.6	2.1	4.1	3.8	1.0	434.7	354.1	40.9	32.9	5.7	23
High to Moderate Severity Conditions (> 50% BA Mortality); Region 5 site V											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Low to Moderate Severity Conditions (< 50% BA mortality); Region 5 sites III & IV											
Existing	84.1	0.0	40.9	34.7	8.4	42.6	33.3	5.2	1.4	2.6	213
Low to Moderate Severity Conditions (< 50% BA mortality); Region 5 site V											
Existing	96.7	40.0	40.7	12.1	4.0	187.4	180.0	4.3	2.4	0.6	94

In areas that burned under moderately high and high burn severity (areas with greater than 50 percent basal area mortality), the high numbers of fire-killed trees relative to live trees underscores high levels of mortality that exist within these areas. Subsequently, these are the areas where proposed action alternatives focus economic recovery treatments. In low to moderate burn severity (areas with less than 50 percent basal area mortality), tree survival, particularly in codominant and dominant overstory trees (10 inches in diameter and greater), underscores that forest vegetation remains and, consequently, green trees or low to moderate fire severity areas are not targeted for removal or treatment respectively.

3.3.1.2 Air Quality

The entire analysis area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin. The air quality attainment status for ozone, carbon monoxide, sulfur dioxide, and other compounds was derived directly from the NSAQMD Annual Air Monitoring Report (2005).

Currently, Plumas County is in non-attainment status for particulate matter $(PM)_{10}$ (county wide) and $PM_{2.5}$ (Portola Valley only). The analysis area is 20 miles northwest of Portola Valley at its closest point. According to the NSAQMD 2005 report, the major contributors to both PM_{10} and $PM_{2.5}$ levels include forestry management burns, woodstoves, residential open burning, vehicle traffic, and windblown dust. These problems can be relieved or made worse by local meteorology, winds, and temperature inversions. In addition, large areas in and adjacent to local communities can be heavily impacted by smoke for extensive summer periods (several weeks) due to wildfire such as in the 3,500-acre Stream Fire, 3,000 acre Boulder Fire, and the Antelope Complex and Moonlight fires (USDA 2003). The community of Quincy is subject to strong inversions and stagnant conditions in the wintertime. Those conditions, coupled with intensive residential wood burning, can result in very high episodic $PM_{2.5}$ levels (NSAQMD 2005). Levels of PM_{10} have been greatly decreased due to a reduction of non-EPA (Environmental Protection Agency) approved woodstoves in existing residences.

Current sources of particulate matter from the burned area include smoke from large wildfires, smoke from underburning and pile burning, emissions and dust from standard and off-highway vehicles, dust and emissions from harvest activities occurring on private lands, smoke from campfires, emissions from boats at Antelope Lake, and wind-generated dust from exposed soil surfaces. The amount and duration of these emissions vary by season, with most emissions from wildfires, timber harvest, and recreational activities occurring between May and late August, and emissions from prescribed burning occurring from late September through mid-November.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

3.3.2.1.1 Minor Issues

3.3.2.1.1.1 Forest Vegetation, Fire, and Fuels

Post-fire logging of fire-killed trees in high vegetation burn severity areas would reduce snags in both the short- and long-term.

Indicator:

- Number of snags/acre (greater than 15 inches dbh) retained across the Moonlight and Antelope Complex fire perimeters

The direct effect of harvesting fire-killed trees, including fire-killed conifers in RHCAs and excluding snag retention areas, under the action alternatives are displayed in Table 15and Table 16 by treatment.

Table 15. Predicted effects of treatment prescriptions on stand structure (Site class V) for all action alternatives.

Time Frame	Live Trees Per Acre by Diameter Class					Fire-killed Trees Per Acre by Diameter Class					Basal Area
	Total	0-10"	10-16"	16-30"	>30"	Total	0-10"	10-16"	16-30"	>30"	
Alternative A: Helicopter & Skyline Salvage Harvest-- Harvest Trees > 16 inches DBH											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	15.6	0.0	0.0	13.6	2.0	--
Post	9.6	0.0	7.9	1.5	0.2	272.1	223.6	48.5	0.0	0.0	12
10 years	9.4	0.0	5.8	3.4	0.2	127.7	98.6	29.1	0.0	0.0	16
20 years	101.0	91.7	2.4	6.1	0.4	14.5	4.3	10.2	0.0	0.0	22
30 years	100.1	90.9	0.1	8.6	0.4	1.1	0.8	0.2	0.0	0.0	30
Alternative A: Helicopter & Skyline Salvage Harvest within RHCA's -- Harvest Trees > 16 inches DBH, Retain 4 Snags per Acre											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	12.0	0.0	0.0	10.6	1.4	--
Post	9.6	0.0	7.9	1.5	0.2	275.7	223.6	48.5	3.0	0.6	12
10 years	9.4	0.0	5.8	3.4	0.2	128.7	98.6	29.1	0.7	0.3	16
20 years	101.0	91.7	2.4	6.1	0.4	15.2	4.3	10.2	0.5	0.2	22
30 years	100.1	90.9	0.1	8.6	0.4	1.6	0.8	0.2	0.4	0.2	30
Alternatives A and C: Ground-based Salvage Harvest -- Harvest Trees > 14 inches DBH, Biomass Harvest or Site Prep Trees < 14 inches DBH											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	103.3	39.2	48.5	13.6	2.0	--
Post	9.6	0.0	7.9	1.5	0.2	184.4	184.4	0.0	0.0	0.0	12
10 years	9.4	0.0	5.8	3.4	0.2	77.5	77.3	0.2	0.0	0.0	16
20 years	101.0	91.7	2.4	6.1	0.4	1.3	1.0	0.3	0.0	0.0	22
30 years	100.1	90.9	0.1	8.6	0.4	1.0	0.8	0.1	0.0	0.0	30
Alternatives A and C: Ground-based Salvage Harvest within RHCA's -- Harvest Trees > 14 inches DBH, Biomass Harvest or Site Prep Trees < 14 inches DBH; Retain 4 Snags per acre											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	99.3	39.2	48.0	10.6	1.4	--
Post	9.6	0.0	7.9	1.5	0.2	188.4	184.4	0.5	3.0	0.6	12
10 years	9.4	0.0	5.8	3.4	0.2	78.5	77.3	0.2	0.7	0.3	16
20 years	101.0	91.7	2.4	6.1	0.4	2.1	1.0	0.3	0.5	0.2	22
30 years	100.1	90.9	0.1	8.6	0.4	1.5	0.8	0.1	0.4	0.2	30
All Action Alternatives: Snag Retention Areas											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	--	--	--	--	--	--
Post	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
10 years	9.4	0.0	5.8	3.4	0.2	139.3	98.6	29.1	9.9	1.8	16
20 years	101.0	91.7	2.4	6.2	0.4	22.2	4.3	10.2	6.1	1.5	22
30 years	100.1	90.9	0.1	8.2	0.4	4.5	0.0	0.4	2.9	1.3	30
Note: For low sites, all stands for helicopter, skyline, and ground-based systems were averaged.											

Table 16. Predicted effects of treatment prescriptions on stand structure (Site classes III & IV) for all action alternatives.

Time Frame	Live Trees Per Acre by Diameter Class					Fire-killed Trees Per Acre by Diameter Class					Basal Area
	Total	0-10"	10-16"	16-30"	>30"	Total	0-10"	10-16"	16-30"	>30"	
Alternative A: Helicopter and Skyline Salvage Harvest–Harvest Trees > 16 inches DBH											
Existing	5.5	4.2	0.6	0.5	0.2	452.1	355.8	49.1	41.9	5.3	4
Harvest	--	--	--	--	--	47.2	--	--	41.9	5.3	
Post	5.5	4.2	0.6	0.5	0.2	404.9	355.8	49.1	0.0	0.0	4
10 years	4.8	2.7	1.4	0.4	0.3	174.2	146.8	27.4	0.0	0.0	5
20 years	96.4	93.6	2.1	0.5	0.3	20.6	11.8	8.8	0.0	0.0	9
30 years	95.2	92.3	0.9	1.7	0.4	1.0	0.8	0.1	0.0	0.0	18
Alternative A: Helicopter and Skyline Salvage Harvest within RHCA's – Harvest Trees > 16 inches DBH, Retain 4 Snags per Acre											
Existing	5.5	4.2	0.6	0.5	0.2	452.1	355.8	49.1	41.9	5.3	4
Harvest	--	--	--	--	--	43.2	--	--	38.4	4.7	
Post	5.5	4.2	0.6	0.5	0.2	408.9	355.8	49.1	3.4	0.6	4
10 years	4.8	2.7	1.4	0.4	0.3	175.5	146.8	27.4	1.1	0.2	5
20 years	96.4	93.6	2.1	0.5	0.3	21.4	11.8	8.8	0.8	0.1	9
30 years	95.2	92.3	0.9	1.7	0.4	1.5	0.8	0.1	0.6	0.0	18
Alternative A and C: Ground-based Salvage Harvest – Harvest Trees > 14 inches DBH, Biomass Harvest or Site Prep Trees < 14 inches DBH											
Existing	16.5	0.0	7.7	7.0	1.8	415.1	352.5	32.7	24.0	6.0	43
Harvest	--	--	--	--	--	150.1	87.4	32.7	24.0	6.0	
Post	16.5	0.0	7.7	7.0	1.8	265.0	265.0	0.0	0.0	0.0	43
10 years	16.3	0.0	6.5	7.3	2.4	108.0	107.1	0.6	0.3	0.0	46
20 years	96.0	80.4	5.1	7.9	2.6	9.1	7.9	0.8	0.4	0.0	50
30 years	103.6	88.6	3.6	8.6	2.9	2.0	0.7	0.8	0.4	0.0	60
Alternative A and C: Ground-based Salvage Harvest within RHCA's – Harvest Trees > 14 inches DBH, Biomass Harvest or Site Prep Trees < 14 inches DBH; Retain 4 Snags per acre											
Existing	16.5	0.0	7.7	7.0	1.8	415.1	352.5	32.7	24.0	6.0	43
Harvest	--	--	--	--	--	125.7	71.6	27.9	21.2	5.0	
Post	16.5	0.0	7.7	7.0	1.8	289.4	280.9	4.8	2.8	1.0	43
10 years	16.3	0.0	6.5	7.3	2.4	112.6	109.9	1.1	1.2	0.4	46
20 years	96.0	80.4	5.1	7.9	2.6	10.3	7.9	1.0	1.1	0.2	50
30 years	103.6	88.6	3.6	8.6	2.9	2.6	0.7	0.8	1.0	0.1	60
All Action Alternatives: Snag Retention Areas											
Existing	11.6	2.1	4.1	3.8	1.0	434.7	354.1	40.9	32.9	5.7	23
Harvest	--	--	--	--	--	--	--	--	--	--	
Post	11.6	2.1	4.1	3.8	1.0	434.7	354.1	40.9	32.9	5.7	23
10 years	10.4	1.5	3.8	3.7	1.3	200.4	148.4	23.5	22.7	5.0	24
20 years	10.0	1.0	3.6	3.9	1.4	40.1	13.2	8.0	14.2	4.4	26
30 years	9.6	0.8	2.2	4.9	1.5	10.8	0.1	0.6	6.2	3.8	28

The action alternatives provide for snag retention within RHCAs and within snag retention areas that would be excluded from harvest. In addition, the action alternatives were designed to maintain areas where no post-fire harvesting activities would occur; approximately 68 percent of the NFS lands within these fires would not be treated under alternative A (Table 17). Consequently, at least 46,000 acres of NFS lands (over 32,000 of

which burned with high burn severity), would maintain and recruit snags across the landscape.

Table 17. Percent of vegetation burn severity acres affected by the proposed and current post-fire harvest treatments under alternative A.

	Unclassified due to Satellite Imagery	Low Severity	Moderate Severity		High Severity	Total for all severity classes
		BA Mortality 0-25%	BA Mortality 25-50%	BA Mortality 50-75%	BA Mortality 75-100%	
Total within Analysis Area	258	16679	8401	7770	54539	87647
Percent of Analysis Area	0.3%	19%	10%	9%	62%	100%
Total on Private Land	258	3078	1418	1240	13245	19238
Total on NFS lands	0	13600	6983	6531	41294	68408
Antelope RSHTR Projects	0%	3%	3%	4%	3%	3%
Moonlight RSHTR Projects	0%	7%	6%	6%	6%	6%
Dry Flat RSHTR Project	0%	4%	3%	2%	1%	2%
Camp 14 Project	0%	0.1%	0.1%	0.2%	1%	0.4%
North Moonlight (Project)	0%	0%	0%	1%	0.4%	0.3%
Moonlight & Wheeler Fires Recovery Project under Alternative A	0%	3%	6%	9%	29%	20%
Percent of Total Harvest Proposed on NFS lands	0%	17%	18%	22%	41%	32%
Percent of Total Harvest Proposed on Public & Private Lands within analysis area[1]	0%	17%	18%	21%	39%	31%

Post-fire logging would change the diversity of fire effects (low, moderate, and high vegetation burn severity) across the landscape.

Indicators:

- Percent of Moonlight and Antelope Complex fire perimeters with low, moderate, and high vegetation burn severity
- Percent of low vegetation burn severity salvaged
- Percent of moderate vegetation burn severity salvaged
- Percent of high vegetation burn severity salvaged

Refer to Table 12 for percentages of each severity type within the Moonlight and Antelope Complex fires perimeters for alternative A. Refer to Table 17 for the cumulative effects of post-fire logging projects by of vegetation burn severity within the analysis area for alternative A.

Treatments proposed under action alternatives primarily target areas that burned with moderately high and high vegetation severity; however, when considered cumulatively with other post fire projects within the analysis area, the diversity of fire effects (as represented by vegetation burn severity) is maintained on NFS lands under alternative A. Alternative A results in 31 percent of the analysis area being harvested from all vegetation burn severity types.

Yarding, road building, and landing construction would result in the removal of green trees.

Indicator:

- Estimated number of green trees incidentally felled and removed due to yarding, road building, and landing construction relative to total amount of trees harvested

Construction of skid trails, landings, and temporary roads would require incidental removal of trees beyond those described for silvicultural purposes. This may include incidental removal of live trees for operability. However, the location and size of skid trails, landings, and temporary roads, and the trees harvested for the construction of such facilities must be approved and agreed upon by the Forest Service. Live tree removal would be permitted by necessity to facilitate such facilities, and would be avoided whenever practicable; it is estimated that removal of green trees would account for less than one percent of harvested trees. Therefore, the removal of trees for operability would be an incidental component of harvesting activities, of minimal size and scale, and highly dispersed, and would have negligible effects on stand structure.

Lop and scatter would damage, bury, and hinder natural regeneration.

Indicators:

- Not measurable, discussed qualitatively.

Post-fire logging activities may damage, kill or otherwise hinder natural regeneration, particularly in ground-based harvesting treatments. Mortality of natural regeneration due to crushing or compaction by equipment would be limited in size and scale to skid trails, and dispersed throughout the timber stand.

Under all action alternatives, treatment units would be reforested with a mixture of species native to the ecological stand type utilizing the wide-spaced cluster planting design. This cluster planting is designed to establish planted seedlings in order to meet desired stocking levels or desired species within acceptable temporal bounds while allowing for any natural regeneration that may occur. This would enhance re-establishment of forested conditions while allowing for and mimicking the heterogeneity and pattern of a naturally occurring forest.

Lop and scatter would cause a short-term increase in fuel loading and potential fire severity.

Indicators:

- Average tons/acre of surface fuels (1, 10, and 100 hour fuels)
- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Surface fuels loading in lop and scatter material (as represented by surface fuel loads) would not substantially increase in treated areas compared to the no action alternative. Lopping and scattering of limbs and tops may also bury or hinder natural regeneration under all alternatives; however, this material may also provide ancillary benefits as “fire-killed shade”, particularly for those species such as Douglas-fir and true fir types that prefer partial shading.

Table 18. Issue indicator measures for surface fuel loadings and potential fire severity caused by lop and scatter slash treatments.

	Alternative A	Alternative B	Alternative C
Avg. Tons/Ac of Lop and Scatter material (Surface Fuel Load –post Harvest)	9.9 -13.0	9.1	9.9 - 10.4
Avg. Tons/Ac of Lop and Scatter material (Surface Fuel Load –10 years post Harvest)	9.1 - 20.0	19.0	9.1 – 14.9
Total Flame Length (ft) under 90th percentile weather conditions (Post harvest)	6.1	4.0	6.1
Total Flame Length (ft) under 90th percentile weather conditions (10 years)	6.3	7.7	6.3
Percent of basal area killed under 90th percentile weather conditions (Post harvests)	88.9 %	58.3 %	88.9%
Percent of basal area killed under 90th percentile weather conditions (10 years)	87.3 %	93.2 %	87.3 %

Planting would increase future potential fire severity.

Indicators:

- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Under all action alternatives, treatment units would be reforested with a mixture of species native to the ecological stand type utilizing the wide-spaced cluster planting design. Clusters of three trees per cluster would be spaced 25-33 feet apart, resulting in a stocking of approximately 100-200 trees per acre.

Typical high density plantations (300 to 400 trees per acre planted 10 to 12 feet apart) that have close spacing would burn under high severity (Stephens and Moghaddas 2005b; Thompson et al. 2007) and this is acknowledged. High density plantations would not be established under any action alternatives, though variable density stands of naturally regenerated conifers would likely occur on sites favorable for natural regeneration and would also be susceptible to burning under high severity (Thompson et al. 2007).

Trees planted utilizing the wide-spaced cluster arrangement are expected have a lower likelihood of propagating a high severity crown fire under 90th percentile weather conditions as their live crowns would be well separated. One to two years following planting, a manual release would occur around the clusters to reduce competition with grasses and brush and enhance tree survival and growth. This reduction of fine shrub, grass, and associated surface fuels around the planted clusters would break up the continuity of shrub and surface fuels, and would contribute to a reduction in flame lengths and rates of spread in the immediate vicinity of planted trees, leading to decreased potential for torching of individual trees.

Table 19. Issue indicator measures for shrub habitat and future potential fire severity.

	Alternative A	Alternative B	Alternative C
Acres proposed for reforestation	17,474	0	8,758
Percent of NFS lands reforested (cumulative)	38 %	12 %	25 %
Avg. Tons/Ac of Surface fuels	7.5 – 25.0	29.5	7.5 – 13.8
Total Flame Length (ft) under 90th percentile weather conditions (30 years)	6.9	10.9	6.9
Percent of basal area killed under 90th percentile weather conditions (30 years)	84.7 %	94.3 %	84.7 %

The combination of the proportion to be planted, the previously mentioned wide tree spacing and manual grubbing of vegetation, would result open canopied forested stands with an overall lower likelihood of a high severity crown fire initiating in or moving through the planted stands. It is expected that due to the small size of both naturally regenerated and planted trees, wildfire under 90th percentile and above conditions would result in high mortality of these trees as well as shrubs. While the risk of potential high severity fire in the future is real, this risk should not warrant rational to forgo reforesting burned areas and promoting the re-establishment of previously forested conditions on NFS lands as described in NFMA (1976). In addition, future high severity fire would likely perpetuate shrub habitat as discussed in Thompson et al. (2007).

Planting would accelerate the replacement of shrub habitat by forest habitat.

Indicator:

- Acres of reforestation compared to acres not reforested

While reforestation activities would enhance the re-establishment of open canopy forested conditions, it is reasonably expected that these plantations would continue to have substantial shrub components, particularly in the first twenty to thirty years of growth.

Finally, the total cumulative reforestation activities would be approximately 25 to 38 percent of the NFS lands that burned in the Moonlight and Antelope Complex fires and 37 to 56 percent of the NFS lands within the Moonlight and Antelope Complex fires areas that burned under high vegetation burn severity. The relative size and distribution of the planted areas compared to the total area would greatly limit spread of fire between planted areas. In addition, the remaining NFS lands within the Moonlight and Antelope Complex fire areas that burned would be available to grow into shrub habitat without any reforestation activities.

3.3.2.1.1.2 Air Quality

Pile burning would cause a short-term production of smoke and reduced air quality.

Indicator:

- Total predicted PM_{10} (tons) and $PM_{2.5}$ emitted from project

Under alternative A pile burning would be concentrated in helicopter and/or tractor harvest landings. Smoke generated from these piles would be blown to the northeast towards Susanville and Janesville by typically southwest winds during the day. At night, smoke from burn piles in the project area would move down the Indian Creek drainage towards to the community of Genesee Valley or down Moonlight and Lights Creek towards North Arm/Indian Valley. Due to the dispersed nature of the burn piles, the near complete combustion of piled material, and the control over ignition times for favorable burning weather, it is not anticipated that pile burning resulting from the proposed action would impact the communities of Susanville, Janesville, Genesee Valley, Indian Valley. All burning would be completed under approved burn and smoke management plans. Piles would be constructed to minimize mixing of soil and burned under weather conditions that would allow efficient combustion. Particulate matter generated by alternative is summarized below in Table 20.

Table 20. Issue indicator measures for smoke production and air quality.

	Alternative A	Alternative B	Alternative C
Particulate Matter 10 (tons)	181	0	174
Particulate Matter 2.5 (tons)	163	0	157

3.3.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.3.2.2.1 Minor Issues

3.3.2.2.1.1 Forest Vegetation, Fire, and Fuels

Post-fire logging of fire-killed trees in high vegetation burn severity areas would reduce snags in both the short- and long-term.

Indicator:

- Number of snags/acre (greater than 15 inches dbh) retained across the Moonlight and Antelope Complex fire perimeters

Table 21 displays the existing and projected stand structure within proposed treatment units under the no action alternative. Hundreds of fire-killed trees and very few live trees per acre characterize the forest structure.

Additional snag recruitment would be expected through delayed mortality in the few live trees per acre. Those live trees injured during the fire may be more susceptible to biotic and abiotic agents that hasten delayed conifer mortality due to reduced tree vigor. This phenomenon has occurred on past local fires (Storrie 2000; Stream 2001), and is well documented in the scientific literature (Hood et al. 2007).

Table 21. Existing and projected stand structure for alternative B, the no action alternative.

Time Frame	Live Trees Per Acre by Diameter Class					Fire-killed Trees Per Acre by Diameter Class					Basal Area
	Total	0-10"	10-16"	16-30"	>30"	Total	0-10"	10-16"	16-30"	>30"	
Alternative B: No Action (Site V) -- No Salvage Harvest, No Reforestation											
Existing	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
Harvest	--	--	--	--	--	--	--	--	--	--	--
Post	9.6	0.0	7.9	1.5	0.2	287.7	223.6	48.5	13.6	2.0	12
10 years	9.4	0.0	5.8	3.4	0.2	139.3	98.6	29.1	9.9	1.8	16
20 years	9.2	0.0	2.4	6.2	0.4	22.2	4.3	10.2	6.1	1.5	20
30 years	9.0	0.0	0.1	8.2	0.4	4.5	0.0	0.4	2.9	1.3	24
Alternative B: No Action (Site III & IV) -- No Salvage Harvest, No Reforestation											
Existing	11.6	2.1	4.1	3.8	1.0	434.7	354.1	40.9	32.9	5.7	23
Harvest	--	--	--	--	--	--	--	--	--	--	
Post	11.6	2.1	4.1	3.8	1.0	434.7	354.1	40.9	32.9	5.7	23
10 years	10.4	1.5	3.8	3.7	1.3	200.4	148.4	23.5	22.7	5.0	24
20 years	10.0	1.0	3.6	3.9	1.4	40.1	13.2	8.0	14.2	4.4	26
30 years	9.6	0.8	2.2	4.9	1.5	10.8	0.1	0.6	6.2	3.8	28
Note: Stands combined for all harvest systems.											

Under the no action alternative, the harvesting of fire-killed trees would be limited to the roadside hazard projects currently underway. The maximum extent of these activities would be limited to approximately 150 to 200 feet of either side of the roadways—

roughly 11 percent of the NFS lands within the analysis area (Table 22). This would provide for safe travel along forest roads; however, due to the scale and scope of the project, large areas of untreated burned areas would exist. Brush species and standing snags would dominate these areas, and, over time, these snags would fall resulting in a brush field with high fuel loads arranged in a jackstraw pattern.

Table 22. Percent of vegetation burn severity acres affected by the proposed and current post-fire harvest treatments under alternative B.

	Unclassified due to Satellite Imagery	Low Severity	Moderate Severity		High Severity	Total for all severity classes
		BA Mortality 0-25%	BA Mortality 25-50%	BA Mortality 50-75%	BA Mortality 75-100%	
Total within Analysis Area	258	16679	8401	7770	54539	87647
Percent of Analysis Area	0.3%	19%	10%	9%	62%	100%
Total on Private Land	258	3078	1418	1240	13245	19238
Total on NFS land	0	13600	6983	6531	41294	68408
Antelope RSHTR Projects	0%	3%	3%	4%	3%	3%
Moonlight RSHTR Projects	0%	7%	6%	6%	6%	6%
Dry Flat RSHTR Project	0%	4%	3%	2%	1%	2%
Camp 14 Project	0%	0.1%	0.1%	0.2%	1%	0.4%
North Moonlight (Project)	0%	0%	0%	1%	0%	0.3%
Moonlight & Wheeler Fires Recovery Project under Alternative B	0%	0%	0%	0%	0%	0%
Percent of Total Harvest Proposed on NFS lands	0%	14%	12%	12%	11%	12%
Percent of Total Harvest Proposed on Public & Private Lands within analysis area[1]	0%	15%	13%	14%	17%	16%

Post-fire logging would change the diversity of fire effects (low, moderate, and high vegetation burn severity) across the landscape.

Indicators:

- Percent of Moonlight and Antelope Complex fire perimeters with low, moderate, and high vegetation burn severity
- Percent of low vegetation burn severity salvaged
- Percent of moderate vegetation burn severity salvaged
- Percent of high vegetation burn severity salvaged

Refer to Table 22 for the cumulative effects of post-fire logging projects by of vegetation burn severity within the analysis area for the no action alternative. With other post fire projects within the analysis area, the diversity of fire effects (as represented by vegetation burn severity) is maintained on NFS lands under the no action alternative. The no action alternative results with 16 percent of the analysis area being harvested from all vegetation burn severity types.

Yarding, road building, and landing construction would result in the removal of green trees.

Indicator:

- Estimated number of green trees incidentally felled and removed due to yarding, road building, and landing construction relative to total amount of trees harvested

Project activities would not occur such that construction of skid trails, landings, and temporary roads would not be necessary; therefore incidental removal of trees would not occur as a result of alternative B.

Cumulatively, some incidental tree removal may occur with other projects that occur in the analysis area. The removal of incidental trees would have a negligible effect.

Lop and scatter would damage, bury, and hinder natural regeneration.

Indicators:

- Not measurable, discussed qualitatively.

Lop and scatter would cause a short-term increase in fuel loading and potential fire severity.

Indicators:

- Average tons/acre of surface fuels (1, 10, and 100 hour fuels)
- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Lop and scatter would not occur as a result of the no action alternative. Cumulatively, where negligible amounts of lop and scatter occured from other projects within the analysis area, this material may also provide ancillary benefits as "dead shade", particularly for those species such as Douglas-fir and true fir types that prefer partial shading. Refer to tables 18 and 19 for measurement indicators specific to alternative B, the no action alternative.

Planting would increase future potential fire severity.

Indicators:

- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Planting would accelerate the replacement of shrub habitat by forest habitat.

Indicator:

- Acres of reforestation compared to acres not reforested

No planting would occur under the no action alternative, only natural regeneration. The predicted percentage of basal area killed under 90th percentile weather conditions in 30 years is the highest at 94.3 percent for the no action alternative. The average tons per acre of surface fuels and total flame length under 90th percentile weather conditions in 30 years are also the highest at 29.5 tons per acre and 10.9 feet respectively.

3.3.2.2.1.2 Air Quality

Pile burning would cause a short-term production of smoke and reduced air quality. Indicator: ▪ Total predicted PM_{10} (tons) and $PM_{2.5}$ emitted from project

No pile burning is proposed under the no action alternative. Other projects in the analysis area that propose pile burning would contribute negligible effects to smoke and reduced air quality.

3.3.2.3 Alternative C – Direct, Indirect, and Cumulative Effects

3.3.2.3.1 Minor Issues

3.3.2.3.1.1 Forest Vegetation, Fire, and Fuels

Post-fire logging of fire-killed trees in high vegetation burn severity areas would reduce snags in both the short- and long-term.

Indicator:

- Number of snags/acre (greater than 15 inches dbh) retained across the Moonlight and Antelope Complex fire perimeters

Refer to Table 15 and Table 16 in section 3.3.2.1 for predicted effects of treatment prescriptions on stand structure specific to alternative C. The action alternatives provide for snag retention within RHCA's and within snag retention areas that would be excluded from harvest. In addition, the action alternatives were designed to maintain areas where no post-fire harvesting activities would occur; approximately 79 percent of NFS lands within these fires would not be treated under alternative C (Table 23). Consequently, at least 46,000 acres of NFS land (over 32,000 of which burned with high burn severity), would maintain and recruit snags across the landscape.

Table 23. Percent of vegetation burn severity acres affected by the proposed and current post-fire harvest treatments under alternative C.

	Unclassified due to Satellite Imagery	Low Severity	Moderate Severity		High Severity	Total for all severity classes
		BA Mortality 0-25%	BA Mortality 25-50%	BA Mortality 50-75%	BA Mortality 75-100%	
Total within Analysis Area	258	16679	8401	7770	54539	87647
Percent of Analysis Area	0.3%	19%	10%	9%	62%	100%
Total on Private Land	258	3078	1418	1240	13245	19238
Total on NFS land	0	13600	6983	6531	41294	68408
Antelope RSHTR Projects	0%	3%	3%	4%	3%	3%
Moonlight RSHTR Projects	0%	7%	6%	6%	6%	6%
Dry Flat RSHTR Project	0%	4%	3%	2%	1%	2%
Camp 14 Project	0%	0.1%	0.1%	0.2%	1%	0.4%
North Moonlight (Project)	0%	0%	0%	1%	0.4%	0.3%
Moonlight & Wheeler Fires Recovery Project under Alternative C	0%	2%	3%	4%	14%	10%
Percent of Total Harvest Proposed on NFS lands	0%	15%	15%	16%	25%	21%
Percent of Total Harvest Proposed on Public & Private Lands within analysis area[1]	0%	16%	15%	17%	28%	23%

Post-fire logging would change the diversity of fire effects (low, moderate, and high vegetation burn severity) across the landscape.

Indicators:

- Percent of Moonlight and Antelope Complex fire perimeters with low, moderate, and high vegetation burn severity
- Percent of low vegetation burn severity salvaged
- Percent of moderate vegetation burn severity salvaged
- Percent of high vegetation burn severity salvaged

Refer to Table 15 and Table 16 for percentages of each severity type within the Moonlight and Antelope Complex fires perimeters for alternative C. Refer to Table 23 for the cumulative effects of post-fire logging projects by vegetation burn severity within the analysis area for alternative C.

Treatments proposed under action alternatives primarily target areas that burned with high vegetation severity; however, when considered cumulatively with other post fire projects within the analysis area, the diversity of fire effects (as represented by vegetation burn severity) is maintained on NFS lands under alternative C. Alternative C results in 23 percent of the analysis area being harvested from all vegetation burn severity types.

Yarding, road building, and landing construction would result in the removal of green trees.

Indicator:

- Estimated number of green trees incidentally felled and removed due to yarding, road building, and landing construction relative to total amount of trees harvested

The removal of trees for operability within the projects listed in appendix B would be an incidental component of harvesting activities, of minimal size and scale and highly dispersed, and would have negligible effects on stand structure.

Lop and scatter would damage, bury, and hinder natural regeneration.

Indicators:

- Not measurable, discussed qualitatively.

Lop and scatter would cause a short-term increase in fuel loading and potential fire severity.

Indicators:

- Average tons/acre of surface fuels (1, 10, and 100 hour fuels)
- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Refer to Table 18 for surface fuels loads specific to alternative C. The effects of alternative A would be similar to alternative C.

Planting would increase future potential fire severity.

Indicators:

- Total flame length (feet) (90th percentile weather conditions)
- Percent of basal area killed (90th percentile weather conditions)

Planting would accelerate the replacement of shrub habitat by forest habitat.

Indicator:

- Acres of reforestation compared to acres not reforested

3.3.2.3.1.2 Air Quality

Pile burning would cause a short-term production of smoke and reduced air quality.

Indicator:

- Total predicted PM_{10} (tons) and $PM_{2.5}$ emitted from project

The effects for alternative C would be slightly less than alternative A. Refer to Table 20 for alternative C specific details.

3.4 Wildlife – Terrestrial and Aquatic

3.4.1 Affected Environment

The treatment units are defined as the areas to be treated with fire-killed tree removal (15,568 acres) and reforestation (17,474 acres). The wildlife analysis area is defined as the 87,647 acre area (68,408 acres or 78 percent is NFS lands) where the Moonlight and Antelope Complex fires burned, with the exception of 82 acres of spot fires which occurred outside of the main fire perimeters. The analysis area is located in predominately Sierra mixed conifer forest habitat ranging in elevation from 3,800 feet in the North Arm of Indian Valley to 7,500 feet at the top of Eisenheimer Peak. The analysis area is largely along the cusp of the Transition and Eastside ecological zones (USDA 1999).

The Moonlight and Antelope Complex fire perimeters (87,647 acres) were chosen as the wildlife analysis area for the following reasons: 1) proximity and adjacency of these two fires and similar severity effects has had a major effect on the landscape. 2) The proposed actions would treat and modify burned areas only. Therefore, selection of the total area that burned within both fires for analysis provides a more appropriate context for reasonable determination of effects to habitat (and the species associated with this habitat) proposed for treatment. 3) Relevant cumulative effects, particularly other projects that have or will treat burned habitat resulting from the two fires, are more effectively addressed. 4) The impacts to habitat as a result of the wildfires and the effects from cumulative actions within this burned landscape are not diluted by expanding the analysis area boundary to include larger parcels of unburned habitat outside the wildfire boundary.

Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) habitat classifications was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after various fires (including the 2001 Stream fire within the wildlife analysis area) and in 2008 updated again to reflect the Moonlight and Antelope Complex fires. Existing updated Vestra maps, vegetation severity maps and 2007 infra-red aerial photos were used to generate the post fire vegetation map used for this analysis. Vegetation severity maps were further evaluated using infra-red aerial photography flown post burn to verify the adequacy of the vegetation severity maps. Discrepancies were few, and these usually resulted in some moderate and low severity clumps that appear to have survived being lumped within high severity polygons; the post fire updated vegetation mapping and CWHR types used in this analysis reflect post-fire existing conditions (**Error! Reference source not found.**).

The updated layer produced by this typing is used in this analysis. All vegetation information is displayed using the CWHR vegetation codes and serves as the baseline acres for analysis. **Error! Reference source not found.** summarizes the CWHR types within the project area. Other sources of information used in the assessment of effects were aerial photos, burn severity maps generated from satellite imagery, data generated from common stand exam plots, and field reconnaissance.

Table 24. Summary of CWHR acres within the wildlife analysis area* from VESTRA 2002, updated with fire severity maps and 2007 aerial photography.

CWHR Type**	Pre-fire	Post Fire (first five years)	CWHR Type	Pre-Fire	Post Fire (first five years)	CWHR Type	Pre-Fire	Post Fire (first five years)
SMC1	23	57	RFR3P	50	27	EPN4S	299	1133
SMC2S	1704	174	RFR3M	5	0	EPN4P	2059	1960
SMC2P	45	36	RFR4S	2	33	EPN4M	996	325
SMC2M	0	2	RFR4P	51	102	EPN4D	118	43
SMC2D	138	0	RFR4M	136	41	EPN5S	0	63
SMC3S	296	422	RFR4D	6	0	EPN5P	32	40
SMC3P	231	178	RFR5P	18	0	EPN5M	108	42
SMC3M	172	31	RFR5M	38	0	EPN5D	42	0
SMC3D	168	7	PPN1	0	26	JPN5M	0	20
SMC4S	620	3305	PPN2S	1065	224	LPN3P	0	5
SMC4P	4053	7539	PPN2P	163	54	LPN3M	0	6
SMC4M	17368	2224	PPN2M	0	3	LPN3D	0	11
SMC4D	1461	234	PPN3S	141	147	LPN4S	3	16
SMC5S	88	202	PPN3P	635	141	LPN4P	0	28
SMC5P	907	418	PPN3M	965	163	LPN4M	0	11
SMC5M	11082	330	PPN4S	258	455	LPN4D	13	0
SMC5D	3244	105	PPN4P	646	920	LPN5P	0	3
WFR2S	104	19	PPN4M	1613	180			
WFR3S	337	164	PPN4D	198	5	AGS	315	970
WFR3P	111	33	PPN5S	25	18	ASP	879	489
WFR3M	189	1	PPN5P	163	24	MCP	1487	52394
WFR3D	53	0	PPN5M	77	0	MHC	5	21
WFR4S	863	1614	EPN1	40	0	MHW	2122	1379
WFR4P	2716	5205	EPN2S	33	22	MRI	598	716
WFR4M	16507	1060	EPN2P	0	5	PGS	62	469
WFR4D	1486	101	EPN2M	26	0	SGB	189	132
WFR5S	39	4	EPN3S		21	WTM	1100	482
WFR5P	105	51	EPN3P	400	176	ROCK	201	263
WFR5M	5505	147	EPN3M	71	0	BAR	0	157
WFR5D	571	6	EPN3D	0	5	Water	7	7
					Total		87647	87647

* includes public (68,408 acres) and private (19,238 acres) lands

**1 = seedling tree <1" dbh, 2 = Sapling tree 1-6" dbh, 3 = Pole tree 6-11" dbh, 4=small 11-24"dbh, 5=medium/large >24"dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, SMC=Sierra Mixed Conifer, PPN = Ponderosa Pine, WFR = White Fir, EPN = Eastside Pine, RFR = Red Fir, MHC = Montane Hardwood Conifer, MHW = Montane Hardwood, PGS = Perennial Grassland, MCP = Montane Chaparral, MRI = Montane Riparian, WAT = Water, WTM = Wet Meadow.

Error! Reference source not found. indicates the following: 1) as a result of the wildfire, within the analysis area, 97 percent of the late seral closed canopy habitat (CWHR 5M, 5D) was consumed by wildfire (20,667 acres reduced to 649 acres); 2) a large majority of CWHR 4 and 5 stands were converted to non-forested vegetation types

that are expected to be dominated by brush; 3) 618 acres of wet meadow were either converted to dry meadow (expressed as PGS) or some other CWHR type as a result of more precise mapping of this particular type; 4) losses in aspen habitat actually resulted from more precise mapping of this particular type; no aspen loss is anticipated as a result of wildfire or project actions.

3.4.1.1 Federally Threatened and Endangered Species,

A list of T&E species was provided by the "Federal Endangered and Threatened Species that may be affected by Projects in the Plumas National Forest" (PNF), updated January 31, 2008, accessed via USFWS county list web page (http//sacramento.fws.gov/es/spp_lists/NFActionPage.cfm). There are no Federally Proposed species identified by the USFWS as occurring on the PNF. 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 Moonlight and Wheeler Project would have no affect on the two Federally listed species present on the Plumas National Forest.

Table 25. Federally-Listed Species

Scientific Name	Common Name	Suitable Habitat in area	Observed in Project area (Y/N)	Finding
Desmoceras californicus dimorphus	Valley Elderberry Longhorn Beetle	No	No	No affect
Rana aurora draytonii	California Red-legged Frog	No	No	No affect

3.4.1.2 USDA Forest Service R5 Sensitive Species

The USFS sensitive species brought forward in this draft EIS are those in which a determination has been made that project activities may affect individuals. These species are: Mountain yellow-legged frog, bald eagle, California spotted owl, Northern goshawk, American marten, pallid bat, and Western red bat (see Table 40 in Environmental Consequences section).

3.4.1.2.1 Mountain Yellow-legged Frog (MYLF)

In summary, three subwatersheds (and their associated creeks) within the wildlife analysis area have had MYLF detections; West Branch Lights Creek, Lower Lone Rock Creek, and Pierce Creek. A fourth watershed, Lower Indian Creek, which is located adjacent to Pierce Creek and Lone Rock Creek watersheds and flows into Antelope Lake, is suspected of having MYLF, although no individuals have been detected (Tina Hopkins, pers. comm.). Lone Rock Creek supports a well distributed, moderate to low-density, population of MYLF. This population is isolated due to the dam at Antelope Lake.

3.4.1.2.2 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 USDA Forest Service R5 sensitive wildlife species (R5 sensitive species list, October 15, 2007).

The closest known nesting area is at Antelope Lake, within the northern portion of the project area, where two active nesting pairs (Antelope I and Antelope III) have been present since 1995. These two nests have produced a total of 20 fledglings between 1995 and 2007 (Antelope Lake Bald Eagle Management Plan, 2006 and 2007 nesting records). In 2008, both nests were again active, with one young in Antelope I and two young in Antelope III.

The Antelope Complex encroached into two of the three territories within the Antelope Lake Bald Eagle Management Area (BEMA). The BEMA is approximately 8,220 acres including the 940 acre lake. Both nests successfully fledged two young each in 2007 after the Antelope Complex was extinguished. Approximately forty-one percent of the BEMA land acres were burned in the Moonlight and Antelope Complex fires (**Error! Reference source not found.**). A reduction of 1,431 acres of suitable nesting habitat within the BEMA resulted from the Antelope Complex wildfires (**Error! Reference source not found.**)

Table 26. Acres of Antelope Lake BEMA burnt by Moonlight and Antelope Complex fires.

BEMA	Total Acres	Acres in Burn	% in burn
Antelope Lake	7,280 (land acres)	2,963	41%

The Moonlight and Antelope Complex fires resulted in an additional incremental reduction in the availability of suitable nesting habitat. **Error! Reference source not found.** displays the cumulative reduction of available suitable nesting habitat within the BEMA (as defined in the Antelope Lake BEMA Plan; 4P, 4M, 4D, 5P, 5M, 5D). Since 2001, approximately 2,004 acres of live green suitable nesting habitat has been consumed by wildfire.

Table 27. Changes in nesting habitat within Antelope Lake BEMA resulting from wildfire since 2001.

Suitable Nesting CWHR	Post Stream Fire Acres 2001	Post Boulder Fire Acres 2006	Post Moonlight and Antelope Complex Fires - 2007		
			Acres Reduced	Acres Gain	Total Remaining
5D	59	41	41	0	0
5M	316	272	144	0	128
5P	459	516	0	8	524
4D	94	79	79	0	0
4M	3083	2362	1285	0	1077

4P	1502	1695	25	85	1780
Total	5513 (75% of land base)*	4965 (67% of land base)	1524	+93	3509 (48% of land base)

*Baseline acres reported in January 2006 Antelope Lake BEMA Plan

The Antelope Complex burned within portions of two of the three nesting territories within the Antelope Lake BEMA (Moonlight fire did not enter any territory). Both territory I and III nest sites are located within the area consumed by the Stream fire in 2001. No vegetative changes in the nest stands resulted from the Antelope Complex, as a large number of the acres reported below in **Error! Reference source not found.** were acres within the Stream fire that re-burned with the 2007 Antelope Complex.

Table 28. Acres within individual bald eagle territories burnt by Antelope Complex.

Territory	Mgt Zone*	Total Acres within Territory	Acres within Burn & Project Area	% in burn
Antelope I	Primary/Secondary	321	9	2.8%
Antelope III	Primary	345	153	44%
Antelope III	Secondary	296	280	95%
TOTAL		962	442	46%

*Zones described in the 2006 Antelope Lake Bald Eagle Management Plan.

3.4.1.2.3 California Spotted Owl

Error! Reference source not found. displays the effects of the Moonlight and Antelope Complex fires on suitable spotted owl habitat within the analysis area. Approximately 18,301 acres of suitable nesting habitat was rendered unsuitable and 22,536 acres of foraging habitat was rendered unsuitable on NFS lands as a result of the stand replacing wildfire.

Table 29. Effects of Moonlight and Antelope Complex fires on spotted owl suitable habitat within the wildlife analysis area (all acres approximate and all are NFS lands).

Habitat	Pre-Fire Acres	Post Fire Acres	Reduction in suitable habitat (%)
Suitable Nesting Habitat (5M, 5D, 6)*	18,861	560	97%
Suitable Foraging Habitat (4M, 4D)*	25,622	3,086	88%
Total	44,483	3,646	**92%**

*SMC, PPN, WFR, RFR, LPN

The majority of the fire complex is classified as site class 4 or 5 (Tompkins, pers. comm.). Natural regeneration is predicted to take over 125 years before habitat recovery occurs on high and moderate severity areas to be considered owl foraging habitat (CWHR 4M) and at least 160 years before nesting habitat is replaced (5M). Eastside Pine habitat east of the project area perimeter is not considered owl habitat on the PNF (PNF 1993; USDA Forest Service 1999; Rotta 2000).

All or a portion of twenty-five spotted owl Protected Activity Centers (PACs) are located within the perimeters of the Moonlight and Antelope Complex fires. Twenty PACs and their associated HRCAs are completely within the fire perimeter. Vegetation severity maps indicate that over 19,000 acres within PACs/HRCAs burned at either moderately high severity (50-75 percent basal area killed) or high severity (greater than 75 percent basal area killed), resulting in changing suitable owl nesting/foraging habitat to unsuitable habitat. **Error! Reference source not found.** displays acres of PACs/HRCAs that burned at moderately high and high severity.

Table 30. Spotted owl PACs/HRCAs moderately high and high burn severity analysis.

PAC #	Total Acres		Total Mod-High Severity		PAC#	Total Acres		Total Mod-High Severity	
			Acres	%				Acres	%
PL005	PAC	345	260	75%	PL126	PAC	457	439	96%
	HRCA	550	407	74%		HRCA	457	380	83%
	total	895	667	75%		total	914	819	90%
PL006	PAC	316	308	98%	PL167	PAC	386	11	3%
	HRCA	498	366	74%		HRCA	687	185	27%
	total	814	675	83%		total	1,073	196	18%
PL041	PAC	360	203	56%	PL198	PAC	356	345	97%
	HRCA	797	405	51%		HRCA	861	819	95%
	total	1,157	608	53%		total	1,217	1164	96%
PL042	PAC	417	353	85%	PL199	PAC	396	209	53%
	HRCA	758	647	85%		HRCA	593	482	81%
	total	1,175	1000	85%		total	989	691	70%
PL043	PAC	316	314	99%	PL201	PAC	452	367	81%
	HRCA	613	608	99%		HRCA	743	610	82%
	total	929	922	99%		total	1,195	977	82%
PL044	PAC	387	360	93%	PL229	PAC	323	126	39%
	HRCA	662	402	61%		HRCA	909	736	81%
	total	1,049	761	73%		total	1,232	862	70%
PL071	PAC	383	209	54%	PL230	PAC	321	0	0%
	HRCA	645	308	48%		HRCA	649	29	4%
	total	1,028	516	50%		total	970	29	3%
PL073*	PAC	661	496	75%	PL253	PAC	359	225	63%
	HRCA	699	480	69%		HRCA	637	244	38%
	total	1,360	976	72%		total	996	470	47%
PL106	PAC	392	284	72%	PL262	PAC	409	409	100%
	HRCA	551	526	95%		HRCA	654	615	94%
	total	943	810	86%		total	1,063	1024	96%
PL107	PAC	290	164	57%	PL263	PAC	326	326	100%
	HRCA	755	270	36%		HRCA	398	391	98%
	total	1,045	434	42%		total	724	717	99%
PL109	PAC	336	0	0%	PL284	PAC	314	213	68%
	HRCA	761	86	11%		HRCA	680	474	70%
	total	1,097	86	8%		total	994	686	69%
PL122	PAC	322	266	83%	PL286	PAC	423	62	15%
	HRCA	800	558	70%		HRCA	660	203	31%
	total	1,122	824	73%		total	1,083	265	24%
PL123	PAC	301	300	100%	PL287	PAC	322	2	1%
	HRCA	708	584	83%		HRCA	750	538	72%
	total	1,009	885	88%		total	1,072	540	50%
PL125	PAC	499	397	80%	PL303	PAC	321	317	99%
	HRCA	508	433	85%		HRCA	391	359	92%
	total	1,007	830	82%		total	712	676	95%

*PL073 PAC boundaries were adjusted in 2002 after the Stream Fire and then adjusted again after a nest site was discovered in 2003. These adjustments resulted in the larger than normal PAC size reported above.

The existing amount of suitable nesting and foraging habitat available in each PAC and HRCA impacted by the Moonlight and Antelope Complex fires is presented in **Error! Reference source not found.**.

Table 31. Existing amount of suitable owl habitat present for each PAC/HRCA post Moonlight and Antelope Complex fires.

PAC/ HRCA #	PAC Suitable Acres		HRCA Suitable Acres		PAC/ HRCA #	PAC Suitable Acres		HRCA Suitable Acres	
	Nesting (5M,5D)	Foraging (4M,4D)	Nesting (5M,5D)	Foraging (4M,4D)		Nesting (5M,5D)	Foraging (4M,4D)	Nesting (5M,5D)	Foraging (4M,4D)
PL005	28	27	0	33	PL126	0		29	0
PL006	0	4	0	20	PL167*	179	138	102	266
PL041	3	47	93	79	PL198	0	10	2	14
PL042	0	16	0	15	PL199	0	22	0	12
PL043	0	0	0	5	PL201	0	26	1	51
PL044	0	8	0	105	PL229	0	32	0	16
PL071	5	49	0	221	PL230*	144	125	186	323
PL073	0	1	22	14	PL253	0	0	39	89
PL106	0	24	0	0	PL262	0	0	0	25
PL107	0	0	0	124	PL263	0	0	0	0
PL109*	134	175	79	437	PL284	0	0	0	38
PL122	0	2	33	120	PL286*	93	221	137	272
PL123	0	1	0	57	PL287*	239	44	110	15
PL125	0	43	0	2	PL303	0	0	0	1

^ based on post-fire vegetation mapping, crosswalked to CWHR

* PACs not affected by fire (PL109, PL230, PL287) or minimally affected by fire (PL167 – 3% burned at high severity, PL286 -15% burned at high severity. Both with 300+ existing suitable acres). These PACs will remain as PACs and are not carried forward in PAC evaluation process.

Direction for evaluating a PAC for retention or removal after a stand replacing event is found on page 37 of the SNFPA 2004 ROD. The process is as follows:

1. Evaluate habitat conditions within a 1.5-mile radius around existing 300 acre PACs.
    a. If opportunities exist (i.e. suitable habitat remains within a 1.5 mile radius) for re-mapping the PAC, re-map the PAC at a minimum of 300 acres. Based on SNFPA 2004, as well as GTR-133 (Verner et al. 1992), the PAC is 300 acres of the best possible owl habitat available, blocked up into as compact a unit as possible around an owl activity center (nest site, best roost, or repeated daytime detections). The existing PAC number could be retained or a new PAC number could be established.
    b. If opportunities do not exist (i.e. no suitable habitat remains within a 1.5 mile radius, 300 acres of contiguous suitable not present, suitable habitat scattered across the area and not arranged to logically create a compact unit, or an adjacent existing PAC already exists) for re-mapping, the PAC may be removed from the network. PAC may be removed after rationale has been documented for removal without the need to conduct owl surveys.

This process was conducted for the PACs within the Moonlight and Antelope Complex fires. **Error! Reference source not found.**displays areas of existing and available suitable acres within 1.5 mile radius of activity centers impacted by the Moonlight and Antelope Complex fires.

Table 32. Habitat analysis within 1.5 mile radius of activity centers impacted by the Moonlight and Antelope Complex fires.

	Existing Suitable Habitat within 1.5 mile radius (acres)*			Suitable Habitat Block Size within 1.5 mile radius			Suitable acres within other PAC/HRCA	Available suitable acres
PAC #	4M4D	5M5D	Total	>60 ac	<60 ac >1 ac	300+ ac		
PL005	133	145	278	1	11	0	PL041 = 74 LS009 = 73	131
PL006	522	153	676	1	26	1 (482 ac)	PL005 = 88 PL044 = 89 LS009 = 522	43
PL041	206	63	269	1	16	0	PL042 = 28	241
PL042	14	0	14	1	9	0	0	178
PL043	14	0	14	0	1	0	0	14
PL044	386	57	443	1 (297ac)	11	0	PL006 = 9 PL286 = 113 LS027 = 196	125
PL071	669	63	731	2 (269 ac)	18	0	PL109 = 53 PL287 = 35	644
PL073	362	588	950	1	9	1 (893 ac)	PL106 = 24 PL167 = 353 PL287 = 84	488
PL106	116	0	116	0	10	0	PL073 = 12 PL201 = 59	44
PL107	415	8	423	1	13	1 (323 ac)	PL109 = 82	341
PL122	115	35	149	0	9	0	0	149
PL123	285	13	297	0	19	0	PL107 = 9 PL284 = 25	263
PL125	53	7	60	0	3	0	PL126 = 7	53
PL126	164	86	250	0	12	0	PL073 = 22 PL125 = 36	192
PL198	139	20	159	1	12	0	PL201 = 23	136
PL199	183	58	241	1	6	0	PL043 = 3 PL262 = 25 PL284 = 28 PL303 = 1	184
PL201	272	138	410	1 (234 ac)	13	0	PL167 = 68 PL198 = 19	323

	Existing Suitable Habitat within 1.5 mile radius (acres)*			Suitable Habitat Block Size within 1.5 mile radius				
PL229	92	0	92	0	7	0	PL043 = 3 PL284 = 10	80
PL253	212	55	267	1	6	0	PL122 = 148	119
PL262	69	0	69	0	3	0	PL043 = 3 PL199 = 3	64
PL263	0	0	0	0		0	0	0
PL284	181	0	181	0	10	0	PL123 = 46 PL199 = 31 PL303 = 1	102
PL303	276	58	334	2	10	0	PL041 = 78 PL042 = 16 PL199 =17 PL262 = 18 PL284 = 9	197

* NFS lands only

Based on this analysis, and the information provided in **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.** the following 21 PACs will be removed from the PNF PAC network: PL005, PL006, PL041, PL042, PL043, PL044, PL106, PL107, PL122, PL123, PL125, PL126, PL198, PL199, PL201, PL229, PL253, PL262, PL263, PL284, PL303. None of these areas have any of the following: 1) enough suitable habitat to create a 300 acre PAC in a compact unit that is not already assigned to another PAC, 2) enough contiguous habitat in large (greater than 60 acre) blocks to make up 300 acres, and 3) an identified occupied activity center within the 1.5 mile radius circle that does not already have an assigned PAC number and boundary delineation.

In summary, of the twenty-five spotted owl PACs affected by the Moonlight and Wheeler fires, twenty-one PACs have been lost due to high severity wildfire effects and will be removed from the PNF PAC network. Two PACs (PL167, PL286) were minimally affected by the fires and will remain in the network. PL071 and PL073 were severely affected by the fires and have been tentatively re-mapped to the best available suitable acre blocks (greater than 300+ acres), which happen to fall outside of the analysis area. These two PACs may be modified in the future, based on owl survey results, to reflect more defined activity center locations.

Direction for evaluating Spotted Owl Habitat Areas (SOHAs) for retention after a stand replacing event is found in Appendix Q, HFQLG EIS (1999) and further clarified in the HFQLG / SNFPA Implementation Consistency Crosswalk (revised 12/11/2007). The process is as follows:

1. If SOHAs have large scale mortality, follow direction under Appendix Q, HFQLG EIS, to determine if a SOHA should be retained or removed from the network. Follow appendix Q evaluation and undesignate areas that are rendered unsuitable. Salvage is acceptable in those areas, but not in the

remainder of the SOHA. If the SOHA is determined to be completely within unsuitable habitat, then salvage may occur in the entire SOHA.

2. If a SOHA or a portion thereof is rendered unsuitable by a catastrophic event such as wildfire, the remaining suitable habitat within the SOHA shall be maintained as base habitat. However there is no requirement that these SOHAs be replaced or that additional habitat is added to the SOHAs.

There were five 1000 acre based SOHAs within the wildlife analysis area. Using the post-fire habitat conditions represented by the updated CWHR vegetation map, each SOHA was evaluated to determine if it should be retained or removed from the network.

Table 33. Habitat analysis for the five SOHAs within the wildlife analysis area.

SOHA #	SOHA Acres	Existing Suitable Habitat to be Maintained as Base Habitat			% of SOHA unsuitable
		4M4D	5M5D	Total	
S1	1083	0	0	0	100%
S2	1068	108	0	108	90%
S3	1130	87	41	128	89%
T2	1223	52	416	467	38%
T3	1127	43	0	43	96%

Based on the evaluation summarized in **Error! Reference source not found.**, SOHA S1 has been completely lost due to fire effects rendering all acres unsuitable. As a result, SOHA S1 will be removed from the PNF network. SOHAs S2, S3, T2, and T3 experienced severe fire effects as well but some suitable habitat still exists within each SOHAs boundary. Following the direction stated in Appendix Q of the HFQLG EIS, salvage is acceptable in areas rendered unsuitable while the remaining suitable habitat within each SOHA (746 total acres) will be maintained as base habitat.

3.4.1.2.4 Northern Goshawk

Five goshawk PACs were impacted by the fire, all of which are completely within the burn area.

Error! Reference source not found. displays the effects of the Moonlight and Antelope Complex fires on suitable goshawk habitat on NFS lands within the analysis area. Approximately 41,605 acres of suitable nesting habitat was rendered unsuitable on NFS lands as a result of the stand replacing wildfire.

Table 34. Effects of Moonlight and Antelope Complex fires on goshawk habitat (all acres approximate and all are NFS lands).

Habitat	Pre-Fire Acres	Post Fire Acres	Reduction in suitable habitat (%)
Suitable Habitat (5M, 5D,4M, 4D)*	45,660	4,055	41,605 acres 91% reduction

*SMC, PPN, WFR, RFR, LPN, EPN

Error! Reference source not found. shows the existing condition of the five goshawk PACs within the analysis area. Four PACs burned at high to moderately high severity over greater than 60 percent of all acreage. PAC T14 burned at these severity levels on only 27 percent. The fire effects rendered most habitat within each PAC unsuitable with high severity burn areas converting to MCP or SMC1 and lower severity burn areas opening up the canopy to a CWHR closure class of P (25-39 percent canopy closure).

Table 35. Existing condition of Northern goshawk PACs within analysis area.

PAC #	PAC Acres	Acres Burned at High or Moderately High Severity (BAM* ≥ 50%)	% of PAC burned at High or Moderately High Severity	Remaining Suitable CWHR 4M/4D/5M/5D Acres*
T07	177	109	62%	48
T08	182	120	66%	4
T13	206	171	83%	0
T14	124	34	27%	15
T29	231	166	72%	36
TOTAL	920	600	65%	103

*SMC, PPN, WFR, RFR, LPN, EPN; BAM=basal area mortality

The SNFPA ROD (2004) defines Northern goshawk PAC land allocation and associated desired conditions. It also addresses what actions can be taken after a stand-replacing event, such as a wildfire. The SNFPA ROD states: "PACs may be removed from the network after a stand-replacing event if the habitat has been rendered unsuitable as a Northern goshawk PAC and there are no opportunities for re-mapping the PAC in proximity to the affected PAC" (SNFPA ROD 2004, pg. 38). There doesn't appear to be any opportunities to re-map any of the five PACs, based upon no large (200 acres or more), contiguous patches of suitable habitat present within close proximity to each PAC. Therefore, goshawk PACs T7, T8, T13, T14, and T29 have been lost and will be removed from the PNF PAC network.

3.4.1.2.5 American Marten

American martens have not been detected in the watersheds impacted by the Moonlight and Antelope Complex fires. Extensive surveys using both soot covered track plates and baited photo stations have been conducted since the mid-90s across the majority of the Mt. Hough Ranger District landscape; no martens have been found (documented survey results on file). Based on project surveys conducted within and adjacent to the project area between 2000 and 2003 (project surveys include Antelope/Border, Cold, Wild, Diamond, and Treatment Units 9 and 10 for Plumas Lassen Administrative Study (PLAS)), that have not detected marten, it is suspected that marten are likely not present in the project area. Based on Zielinski (2005), trends in marten detections in Plumas

County, and by inference PNF, from the early 1900's to the late 1900's are downward, and according to Zielinski, primarily due to relatively small amounts of late seral/old growth forest attributes.

The American marten is no longer considered a management indicator species (MIS) on the PNF (USDA 2007b).

Table 36. Effects of Moonlight and Antelope Complex fires on suitable marten habitat (all acres approximate and all are NFS lands).

Habitat	Pre-Fire Acres	Post Fire Acres	Reduction in suitable habitat (%)
Suitable Habitat (5M, 5D,4M, 4D)*	44,055	3,874	40,181 acres 91% reduction

* SMC, WFR, RFR, LPN, EPN

Error! Reference source not found. shows the effects of the Moonlight and Antelope Complex fires on marten habitat within the analysis area. Approximately 40,181 acres of suitable denning and foraging habitat was rendered unsuitable on NFS lands as a result of the stand replacing wildfire.

The PNF draft carnivore network consists of scattered known marten locations, large habitat management areas, and wide dispersal or connecting corridors. The management intent of the network is to provide a continuously connected system of habitats focused on the needs of marten and other mesocarnivores (fisher, wolverine, Sierra Nevada red fox). This network is not incorporated into the PNF LRMP as a land allocation with standards and guidelines; it is a plan to project analysis tool designed to maintain future options.

There are 22,309 acres of the carnivore network in the Moonlight and Antelope Complex fire perimeters, much of which burned at moderately high to high severity. Based on the latest post fire vegetation map, crosswalked to CWHR, only 1,831 acres of suitable habitat exists in the carnivore network within the wildlife analysis area. The remaining 2,043 acres of post fire suitable carnivore habitat (3,874-1,831) occurs outside the draft network.

3.4.1.2.6 Pallid Bat

There are no records of this species within or adjacent to the analysis area. Survey efforts and detections of pallid bats have occurred at various locations across the Forest since 1992. A portion of Indian Creek within the analysis area was surveyed for bats but no pallid bats were detected during this effort (Lengas and Bumpus 1992, 1993). The closest detections of pallid bat were in 1991 at Lowe Flat north of Antelope Lake approximately 7 miles northeast of the project area.

The analysis area supports numerous rock outcrops with associated crevices; hollow trees and snags have been recruited over time within the project area as there has been no salvage or hazard tree removal on NFS land for many years in this area. Black oak is scattered throughout in limited amounts within the stands to be treated. Incidental fire-killed black oak trees are scattered throughout the western portion of the analysis area.

3.4.1.2.7 Western Red Bat

There are no records of this species within or adjacent to the analysis area. Survey efforts and detections of western red bats have occurred at various locations across the Forest since 1992. A portion of Indian Creek within the analysis area was surveyed for bats but no western red bats were detected during this effort (Lengas and Bumpus 1992, 1993).

3.4.1.3 Management Indicator Species (MIS)

MIS for the PNF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA 2007). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in **Error! Reference source not found.**. 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), and **Error! Reference source not found.** discloses whether or not the habitat of the MIS is potentially affected by the Moonlight and Wheeler Project (4th column).

Table 37. Selection of MIS for project-level habitat analysis for the Moonlight and Wheeler Project.

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	3
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Oak-associated Hardwoods & Hardwood/conifers	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	3
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	3
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree frog *Pseudacris regilla*	3
Early Seral Coniferous	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	mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red	mountain quail *Oreortyx pictus*	2

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis [2]
	fir (RFR), eastside pine (EPN), tree size 4, all canopy closures		
Late Seral Open Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	sooty (blue) grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		northern flying squirrel *Glaucomys sabrinus*	3
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	3

[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **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] (Mayer and Laudenslayer 1988).

[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.

The two MIS carried forward in this draft EIS is the black-backed wood pecker (BBWP) due to the proposal to remove only fire-killed trees, which is the habitat component for this MIS and benthic macroinvertebrates.

3.4.1.3.1.1 Black-backed Woodpecker

Habitat factors utilized for this analysis include: (1) medium (15-30 inches dbh) snags per acre within burned forest created by stand-replacing fire, and (2) large (greater than 30 inches dbh) snags per acre within burned forest created by stand-replacing fire.

This burned habitat supporting snags is reflected in **Error! Reference source not found.**. Based on Russell et al. (2007), which indicated that BBWP was positively associated with burned areas that supported moderate or high pre-fire crown closure (greater than 40 percent), pre-fire CWHR 4M, 4D, 5M and 5D that burned at high severity is used to determined trends in BBWP habitat.

Table 38. Summary of burned forest acres potentially supporting medium and large snags within the wildlife analysis area (from VESTRA 2002, updated with fire severity maps and 2007 aerial photography) (all acres are approximate and all are NFS lands).

CWHR Type (pre-fires)	Created BBWP Habitat in Analysis Area as a result of the Moonlight and Wheeler Fires
CWHR 4M/4D	17,961
CWHR 5M/5D	14,734
Total	32,659

*CWHR types include SMC, WFR, EPN, PPN
**High and moderately high severity ≥ 50% BAM is considered stand replacement

Error! Reference source not found. discloses the estimated snag densities existing within the analysis area. This fire-killed tree (snag) data was collected using common stand exam plots located within the proposed treatment units. Weighted averages are displayed to more accurately represent the proportion of areas which burned at different severities on different soil site classes.

Table 39. Estimated snag densities on NFS lands within analysis area.

Diameter class of fire-killed tree (all species)	Number of fire-killed trees/acre
10-14.9 dbh	31.9
15 or greater dbh	16.4

Ecosystem Component Status and Trend. The current (based on 2001-2004 inventory sources) average number of medium-sized and large-sized snags (≥ 15 inches dbh, all decay classes) per acre across major coniferous and hardwood forest types (Westside mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.4 per acre in eastside pine to 8.3 per acre in white fir. Detailed information by forest type, snag size, and snag decay class can be found in the SNF Bioregional MIS Report (USDA 2008b). These data include snags in both green forest and burned forest. Between 2000 and 2007, 211,000 acres have undergone high severity wildfire in the Sierra Nevada (this figure includes the Antelope Complex and Moonlight Fire on the PNF in 2007). In addition, over 176,000 acres have burned at moderate severity (also includes Antelope and Moonlight), resulting in a mixture of effects on the structurally dominant vegetation Sierra-wide.

Data from the mid-to-late 1990s were compared with the current data to calculate the trend in total snags per acre by Regional forest type for the 10 Sierra Nevada National

Forests and indicate that, during this period, snags per acre increased within westside mixed conifer (+0.80), white fir (+1.98), and red fir (+0.68) and decreased within ponderosa pine (-0.17), productive hardwoods (-0.17), and eastside pine (-0.16).

Population Status and Trend. The black-backed woodpecker has been monitored in the Sierra Nevada at various sample locations by avian point counts, spot mapping, mist-netting, and breeding bird survey protocols, including: on-going monitoring through California Partners in Flight Monitoring Sites (CPIF 2002); 2002 to present - Plumas and Lassen National Forests (Sierra Nevada Research Center 2007); 1992 to 2005 – Sierra Nevada Monitoring Avian Productivity and Survivorship (MAPS) stations (Siegel and Kaschube 2007); 1970 to present – various Sierra Nevada monitoring and study efforts (USDA 2008b, table BLWO-IV-1); and 1971 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that black-backed woodpecker continue to be distributed across the Sierra Nevada, and current data at the range wide, California, and Sierra Nevada scales indicate that the distribution of black-backed woodpecker populations in the Sierra Nevada is stable.

3.4.1.3.1.2 Benthic Macroinvetabrates

One of two MIS carried forward in this draft EIS is benthic macroinvetebrates for riverine and lacustrine habitat in the Sierra Nevada. They have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Resh and Price 1984; Karr et al. 1986; Hughes and Larsen 1987; Resh and Rosenberg 1989). They are sensitive to changes in water chemistry, temperature, and physical habitat; factors of particular importance are: flow, sedimentation, and water surface shade.

Habitat factors utilized for this analysis include: flow; sedimentation; and water surface shade (water temperature).

There are 790 miles of channel in the project area, including 604 miles of ephemeral, 80 miles of intermittent and 106 miles of perennial according to Forest GIS records. The fact that listed perennial miles are greater than intermittent probably points more to the difficulties in determining flow regime than an actuality.

About 27 miles of channel, mostly ephemeral and intermittent in nature, have been surveyed for indication of flow regime and function, such as bank stability and amounts of LWD. Most of the survey reaches are in Pierce and Upper Indian creeks drainages with minor amounts in Cold Stream, Middle Lights Middle Creek, Moonlight and Moonlight Valley (Forest GIS records). About 6 percent of the total surveyed reaches or 1.6 miles had prevalent or extensive bank instability, primarily in Upper Indian Creek, and almost entirely within ephemeral and intermittent channels. About 1.4 miles of channel, all intermittent or ephemeral in nature were listed in the survey as having poor, inadequate amounts of LWD. All these reaches were in Middle and Upper Indian creek drainages (Moser et al. 2008).

3.4.2 Environmental Consequences

3.4.2.1 Alternative A (Proposed Action) and Alternative C – Direct, Indirect, and Cumulative Effects

3.4.2.1.1 Threatened, Endangered, and USDA Forest Service R5

Sensitive Species

The implementation of the project may affect individuals of the following USDA Forest Service R5 sensitive wildlife species listed in **Error! Reference source not found.** but the proposed project would not result in a trend toward federal listing, or result in a loss of viability, for any of these species. All other wildlife species resulted with either a "no affect" or "Will Not Affect" determination and a complete analysis regarding these species can be found in the Moonlight and Wheeler Fires Recovery and Restoration Project Biological Assessment/Biological Evaluation, Chris Collins, June 2008.

Table 40. USDA Forest Service R5 Sensitive Wildlife Species "May Affect Individuals" determination.

Scientific Name	Common Name	Suitable Habitat Present	Observed in Project Area (Y/N)	Finding
Rana sierrae	Mountain Yellow-legged Frog	Yes	Yes	MAI
Haliaeetus leucocephalus	Bald Eagle	Yes	Yes	MAI
Strix occidentalis occidentalis	California Spotted Owl	Yes	Yes	MAI
Accipiter gentilis	Northern Goshawk	Yes	Yes	MAI
Martes americana	American Marten	Yes	No	MAI
Antrozous pallidus	Pallid Bat	Yes	No	MAI
Lasiurus blossevilli	Western Red Bat	Yes	No	MAI

Finding:
MAI = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability.

3.4.2.1.1.1 Mountain Yellow-legged Frog

Potential direct effects from the proposed project include impacts to individual frogs 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 the RHCA and the potential location of landings within RHCAs has the potential of directly injuring or killing animals. The burning of hand piles within the RHCA also has the potential of directly killing animals. Although helicopter and 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.

There are three subwatersheds that have known MYLF populations approximately 919 acres under alternative A and 501 acres under alternative C would be treated for fire-killed tree removal (**Error! Reference source not found.**). Treatments within these

subwatershed's RHCAs would increase the potential for direct effects, as frogs are put at risk of being killed/injured with falling and yarding activities.

Table 41. Treatment acres within watersheds with MYLF populations.

Subwatersheds with MYLF Populations	Subwatershed Acres Treated	Acres Treated in RHCA		RHCA Acres Treated by Logging System			
				Alternative A		Alternative C	
		Alt A	Alt C	Heli/Sky	Tractor	Heli/Sky	Tractor
L. Lone Rock C.	727	191	97	94	97	0	97
Pierce C.	104	22	22	0	22	0	22
West Branch Lights C.	3111	706	382	324	382	0	382

In the helicopter and skyline cable units, because of the lop and scatter of limbs and tops, and the leaving of trees under 16 inches dbh, the resultant ground cover within RHCAs immediately post harvest is likely to be higher than in untreated RHCAs outside of units. The same is not true for ground-based units which would transport most of the standing fire-killed material out. There would be some amount of breakage that would be left on the ground but this volume is not easily quantifiable.

Sheltering habitat for amphibian species also includes landscape features that provide cover and moisture during the dry season within 300 feet of a riparian area. This could include boulders or rocks and organic debris such as downed trees or logs. A reduction in fire-killed wood would result in a lack of connectivity and cover for frogs that could possibly move out of Lone Rock Creek and into the floodplain, the RHCAs, and upland habitats. Possible indirect effects to frogs using the RHCA for dispersal, and over wintering may include a reduction in cover provided by woody debris, warmer and drier microclimate conditions due to removal of fire-killed trees in RHCA areas, and reduction in connectivity provided by woody debris between aquatic habitats, RHCAs, and uplands. Cover for aquatic-dependent species and effective soil cover in this post-fire environment are very important for the proper functioning of aquatic and riparian habitats until vegetation can reestablish and provide these habitat elements (5-30+ years). As vegetation reestablishes, the role of the standing fire-killed and downed wood would be reduced.

The following discussion on watershed conditions within the analysis area is drawn from the Moonlight and Wheeler Fires Recovery and Restoration Project Watershed Report (Moser and Archer 2008), which is hereby incorporated by reference.

Two of the three watersheds with known MYLF populations, Lower Lone Rock Creek and West Branch Light Creek, currently exist well above TOC (**Error! Reference source not found.**). These two watersheds are susceptible to very high cumulative effects risk, such as erosion and large movement of sediment into streams. Lower Indian Creek watershed, suspected of having MYLF but with no detections to date, is also over TOC and at very high risk. Pierce Creek watershed exists below TOC but the risk of cumulative effects is still considered high.

Table 42. Cumulative condition of subwatersheds with known/suspected MYLF populations.

SubWatersheds	ERA % TOC	ERA (% of the TOC)*			Cumulative Effects Risk		
		Existing	Alt A	Alt C	Alt A	Alt B	Alt C
Lower Lone Rock Creek	13	120%	125%	124%	Very High	Very High	Very High
Pierce Creek	12	83%	84%	84%	High	High	High
West Branch Lights C.	13	149%	166%	162%	Extreme	Very High	Extreme
Lower Indian Creek	12	135%	137%	137%	Very High	Very High	Very High

* ERA is shown as the percent of the TOC for each subwatershed. For example, a subwatershed that is above the TOC will have a total value greater than 100. Total ERA contributions less than 100 are below the TOC. As disturbance approaches and exceeds the TOC, the risk of detrimental watershed effects increases.

As **Error! Reference source not found.** shows, the two action alternatives for the Moonlight and Wheeler Project would increase the percentage of TOC from existing conditions for all four watersheds. The cumulative risk assessment in three of these watersheds is not expected to change from what exists currently. The cumulative risk to the West Branch Lights Creek watershed is expected to change from very high to extreme as a result of treatment activities under both alternatives. The bulk of the Moonlight and Wheeler Project's harvest activities, particularly by tractor, are concentrated in this watershed, and therefore greater adverse effects are expected.

There are over 19,000 acres of private land within the analysis area. Cumulative effects from private land use (timber and gravel extraction, fire salvage harvest, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting. Of particular concern is the heavy logging on Sierra Pacific lands within the Lights Creek and Lone Rock drainages, which have known MYLF populations.

The analysis area occurs within the boundaries of nine active livestock grazing allotments (Table 60), the majority of which is composed of the Clarks Creek, Lights Creek, and Lone Rock allotments. Grazing capacity within allotments is based on the primary range (meadow systems) and not on secondary or transitory range. At this time there are no plans to increase livestock stocking rates or use due to the increase in transitory range created by the fire. Based on the existing stocking rates and current range conditions, the season of use, the distribution of primary range across the project area, as well as no increased stocking due to increase in transitory range, there should be no change in livestock effects to habitat conditions over the long term (5+ years).

Two allotments, Lone Rock and Antelope Lake, will receive no livestock use in 2008 (Scott Lusk, pers. comm.). For the remaining seven active allotments within the fire perimeter there are no plans to adjust livestock numbers, season of use or livestock distribution in the short term (2008 or 2009 grazing season). This means that there would be no rest period, or allowance for a non-grazed growing season, to occur to allow for vegetation recovery without livestock. It is expected that first year flush of grasses/forbs and riparian species would occur along wetter sights (stream courses, meadows) and this would attract livestock, leading to concentrated use along these sensitive areas. This would probably have a short term effect on recovery of riparian vegetation, including willow, aspen, and wet meadow. Concentrated livestock use in these areas would delay and possibly impede stream bank recovery and increase compaction around wet sites. Thus it is anticipated that some short term delay in recovery of riparian habitat would occur.

Determination: Fire-killed tree removal adjacent to riparian/perennial creeks, with implementation of BMP's and standards to meet Riparian Management Objectives, should have minimal impact on MYLF individuals or habitat, especially when compared to the effects from the wildfires themselves. It is my determination that the Moonlight and Wheeler Project may affect individuals but not likely to result in a trend toward Federal listing or loss of viability for the mountain yellow-legged frog.

3.4.2.1.1.2 Bald Eagle

Error! Reference source not found. indicates that approximately 442 acres assigned to an eagle territory are present within the project area. The proposed salvage project would not occur within the BEMA or within either active nesting territory at Antelope Lake (no treatment units are present in either the BEMA or territories). There would be no habitat modification within these sites. The potential haul of salvage material could occur on roads 29N43 (Forest Service Road 172), 28N03 and 27N42 and logging truck activity could be disruptive during the nesting season, depending on number of trucks per hour. Historically the activity on paved roads within these territories has not caused any nesting failures or territory abandonment. To limit disturbance to nesting eagles, the following is recommended:

1. A Limited Operating Period (LOP) should be implemented not allowing the cutting of any hazard/fire-killed trees within Antelope III territory between January 1 and August 15 along road 28N03 and the first half mile of road 27N42.

2) No log haul is to occur on the northern portion of 27N42 to the intersection of 28N03 during this LOP. This affects essentially a ½ mile of road. This LOP forces haul south down 27N42 to Babcock Crossing.

3) No log haul is to occur on road 26N54 north through the Stream Fire to 28N03 during this LOP to protect the Antelope I nest site.

4) There is an existing helicopter landing within the primary nesting zone for Antelope III nesting territory (located in Stream fire and used for Boulder fire rehabilitation work). Helicopter use of this landing is problematic during the eagle nesting period as helicopter approach and take-off would be line of sight with both nest sites (Antelope I and III) and could provide a disturbance element that the birds are not used to. A LOP is required to eliminate and dissuade helicopter use of this landing during the nesting season (January 1 and August 15). Before the LOP could be lifted, both nest sites would have to be declared non-nesting, which could be determined by May 1.

Table 43. Acres within Individual bald eagle territories burnt by Antelope Complex.

Territory	Mgt Zone*	Total Acres within Territory	Acres within Burn & Project Area	% in burn
Antelope I	Primary/Secondary	321	9	2.8%
Antelope III	Primary	345	153	44%
Antelope III	Secondary	296	280	95%
TOTAL		962	442	46%

*Zones described in the 2006 Antelope Lake Bald Eagle Management Plan.

The Stream fire burned a total of 3,600 acres in 2001, with approximately 1,379 acres within the Antelope BEMA, including at the time both designated Antelope Lake nesting territories. Shortly after the fire, a third nesting territory was established on the south side of Antelope Lake, which later was determined to be the pair that occupied Antelope II territory. Portions of the fire were salvage logged in 2003/2004. This included removal of hazard trees, merchantable sawlogs, and subsequently reforestation in all three nesting territories.

In 2006 the Boulder fire burned approximately 3,000 acres, of which 2,389 were located in the BEMA, including 508 acres within the Antelope II territory. Approximately 249 acres, including portions of Antelope II Territory were logged to remove hazardous trees from the recreational use areas. Since both Stream and Boulder fire/salvage has occurred, the birds at Antelope Lake have produced a total of 11 young between 2002 and 2007, including four in 2007. Thus fire and salvage logging cumulatively have not resulted in a decrease in nest occupancy or production.

Thus between 2001 – 2007, approximately 6,195 land acres within the BEMA, or 85 percent, have experienced wildfire, including stand replacement wildfire. These fires have created conditions that, within the next 25 years, as residual, fire stressed trees die and snags fall, the reduction in the amount and distribution of available habitat supporting nest trees could increase competition between the two nesting pairs for territorial space, which could reduce the number of nesting pairs from two to one. Approximately 48 percent of existing land acres within the BEMA support live green habitat in size classes capable of providing nesting habitat (**Error! Reference source not found.**). Fire-killed tree removal in the proposed treatment areas would not occur within the BEMA and would not exacerbate this eventual habitat loss within the BEMA.

The Moonlight and Antelope Complex Roadside Hazard Tree Removal projects would be implemented prior to implementation of this salvage/recovery project. **Error! Reference source not found.** indicates that the maximum potential acres treated in Antelope III territory is 120 acres and within Antelope I territory is 36 acres. Total amount of suitable habitat within each nesting territory was not changed within either management zone as a result of hazard tree removal. (USDA 2007a, USDA 2008a).

Table 44. Maximum potential hazard tree removal acres in bald eagle territories.

Territory	Road #	Primary Mgt. Zone		Secondary Mgt. Zone	
		Miles	Acres	Miles	Acres
Antelope I	29N43 (NFS 172)	0.75	36	0	0
Antelope III	28N03	1.0	48	0.25	12
	27N42	0.75	36	0.5	24
Total Antelope III		2.5	120	0.75	36

Within the entire Antelope Lake BEMA approximately 15.5 miles, totaling approximately 735 acres would be treated for hazard tree reduction (**Error! Reference source not found.**). This is approximately 10 percent of the entire 7,280 land acres within the BEMA.

Table 45. Maximum potential Acres of Hazard Tree Removal in Antelope Lake Bald Eagle Management Area (BEMA).

Road #	Miles	Acres
From table 44	3.25	156
28N03	2.63	122
28N00	0.06	4
27N07C	0.35	14
26N54	0.5	24
27N60	1.5	77
27N41	2.5	121
27N41B	1.0	48
27N41D	0.25	12
27N41E	0.25	12
27N62	2.75	133
27N59	0.25	12
TOTAL	15.5	735

The BA/BE for the Moonlight and Antelope hazard tree removal projects (USDA 2007a, USDA 2008) concluded that the direct, indirect and cumulative effects of the action would not result in any change in population trends to meet the identified PNF LRMP goal for nesting pairs.

Approximately 630 acres of reforestation are planned to occur within the BEMA, with 25 acres located within the secondary zone of the Antelope III territory. Reforestation efforts should hasten restoration of large tree forest conditions, especially in establishment of preferred nest tree species such as ponderosa, Jeffrey and sugar pine.

Approximately 80 acres within the BEMA is private land. This land is primarily residential with 5-10 structures (cabins and trailers) and supports meadow, open shrub and open forest. This land was burned by the Antelope Complex, although no structures were lost. At this time there is no plan put forward to remove any fire-killed trees from this land.

The proposed action alternatives, with implementation of LOPs that have proved effective in the past for salvage and restoration projects (Stream and Boulder fires) within nesting territories at Antelope Lake, would not have any additional cumulative effects on habitat within the BEMA, individual nesting territories or cause any change in population distribution across the PNF or the Sierra Nevada range.

Determination: The implementation of the project may affect individuals but the proposed project would not result in a trend toward federal listing, or result in a loss of viability, for the bald eagle.

3.4.2.1.1.3 California Spotted Owl

Fire-killed tree removal would occur on 15,568 acres using helicopter, skyline, and tractor logging systems under alternative A. No PACs within the PNF PAC network would be entered for fire-killed tree removal.

Under both action alternatives there would be no new system road construction so no long-term increases in human activities are expected as a result of this action. There would be approximately 33 miles of temporary road constructed to accommodate logging systems; these would be decommissioned upon completion of the project. Road density would remain the same as pre-fire conditions, which is 2.62 miles of open road/square mile.

Under alternative A approximately 4,029 acres of fire-killed tree removal would occur in areas formerly known as PACs and approximately 5,692 acres would occur in what was formerly designated as HRCA (**Error! Reference source not found.**). This combined 9,721 acres proposed for fire-killed tree removal is not suitable owl habitat due to moderately high and high severity fire, and the PAC numbers listed in **Error! Reference source not found.** are removed from the PNF spotted owl network of PACs.

Table 46. Accounting of acres treated for fire-killed tree removal in areas formerly known as spotted owl PACs.

PAC #	Former Land Designation	Acres proposed for Fire-killed Tree Removal ALT A	Acres proposed for Fire-killed Tree Removal ALT C	PAC #	Former Land Designation	Acres proposed for Fire-killed Tree Removal ALT A	Acres proposed for Fire-killed Tree Removal ALT C
PL005	PAC	173	54	PL125	PAC	246	38
	HRCA	284	158		HRCA	270	137
	TOTAL	457	212		TOTAL	516	175
PL006	PAC	270	129	PL126	PAC	268	28
	HRCA	213	113		HRCA	102	35
	TOTAL	483	242		TOTAL	370	63
PL041	PAC	52	2	PL198	PAC	0	0
	HRCA	91	75		HRCA	0	0
	TOTAL	143	77		TOTAL	0	0
PL042	PAC	284	1	PL199	PAC	56	0
	HRCA	245	48		HRCA	486	44
	TOTAL	529	49		TOTAL	542	44
PL043	PAC	281	63	PL201	PAC	69	0
	HRCA	554	286		HRCA	207	79
	TOTAL	835	349		TOTAL	276	79
PL044	PAC	322	41	PL229	PAC	1	0
	HRCA	243	46		HRCA	532	216
	TOTAL	565	87		TOTAL	533	216
PL071 *	PAC	66	50	PL253	PAC	119	55
	HRCA	2	2		HRCA	74	62
	TOTAL	68	52		TOTAL	193	117
PL073 *	PAC	399	202	PL262	PAC	368	368
	HRCA	330	69		HRCA	525	398
	TOTAL	729	271		TOTAL	893	766
PL106	PAC	190	104	PL263	PAC	289	230
	HRCA	2	0		HRCA	372	140
	TOTAL	192	104		TOTAL	661	370
PL107	PAC	2	0	PL284	PAC	156	58
	HRCA	60	0		HRCA	385	36
	TOTAL	62	0		TOTAL	541	94
PL122	PAC	166	46	PL303	PAC	0	0
	HRCA	306	304		HRCA	0	0
	TOTAL	472	350		TOTAL	0	0
PL123	PAC	252	184				
	HRCA	409	335				
	TOTAL	661	519				

Under alternative C dead tree removal would occur on 7,607 acres using tractor logging systems on slopes <25%. No PACs within the Plumas PAC network would be entered with dead tree removal.

Approximately 1,653 acres of dead tree removal under alternative C would occur in areas formerly known as PACs (Table 46). Approximately 2,583 acres would occur in what was formerly designated as HRCA. This combined 4,236 acres proposed for dead tree removal is not considered suitable owl habitat due to high severity fire.

The Stream fire burned a total of 3,600 acres in 2001. Prior to the burn the Stream fire area supported 2,428 acres of suitable spotted owl nesting and foraging habitat; after the fire there was 129 acres of suitable habitat located across the fire landscape in five isolated stands. Three spotted owl PACS were impacted by the Stream fire: PL073, PL106 and PL126. In 2002, PACs and HRCAs for these three PACs impacted by fire were re-drawn. Re-drawing these PACs was based on availability of suitable habitat around the fire perimeter and 2002 owl detections (BA/BE Stream Fire Restoration Project, January 21, 2003). Thus there was no net loss of PACs from the PNF owl network. As described earlier, PL073 has been re-mapped and PL106 and PL126 have now been rendered unsuitable as PACs as the result of the Moonlight and Antelope Complex fires.

In 2006 the Hungry fire burned 547 acres within the Middle Creek drainage; approximately 325 acres burned at low severity, 113 acres of moderate severity and 109 acres of high severity. A total of 170 acres of suitable habitat (5M and 4M) was rendered unsuitable habitat as a result of the fire. The Hungry fire burned within PAC PL167 and its associated HRCA. Approximately 114 acres of the 386 acre PAC (30 percent) was burnt, the entire 114 acres was composed of CWHR5M. Approximately 25 acres burnt at high/moderate severity, and 89 acres at low severity. The high severity was stand replacement and converted the existing habitat to CWHR type 1 and 2, while the low severity did not change the CWHR type. Therefore 25 acres were changed from CWHR 5M to CWHR 2 and 89 acres did not change. Approximately 47 acres of the 686 acre HRCA (7 percent) burnt, with 33 acres at high/moderate severity, and 14 acres burnt at low severity; the high severity was stand replacement and converted the existing habitat to CWHR type 1 and 2, while the low severity did not change the CWHR type.

PL167 was re-configured based on fire severity and field reconnaissance. Habitat created unsuitable in the PAC and HRCA was excluded from these areas. In addition, habitat that was isolated as a result of the fire was also removed. Approximately 7 acres of HRCA was excluded. After reconfiguration, PAC PL167 contains over 300 acres of the best available habitat. This habitat contains the known nest stand which is located at the south end of the PAC along Middle Creek. Overall, the PAC/HRCA contains 1007 acres (Hungry Fire Salvage Project BA/BE, 3-06-07).

In 2007 the Hungry fire salvage project removed fire-killed trees from 75 acres. All 75 acres were high burn severity acres and were analyzed as 75 acres of CWHR 1 and 2 (early seral grass/forb/brush). No suitable owl habitat was impacted by this project, and no fire-killed tree removal occurred within the PAC. The Hungry Fire Salvage Project did not result in any additional unsuitable spotted owl habitat.

Two roadside safety and hazard tree removal projects (Moonlight and Antelope Complex) would be implemented prior to implementation of the Moonlight and Wheeler Project. These two projects would remove hazard trees from approximately 7,270 acres (USDA 2007a, USDA 2008a). The BA/BE for these projects was completed prior to the analysis described above for PACs (1.5mile radius circle methodology). The Beckwourth

Ranger District has approximately 1,437 acres of roadside hazard tree removal planned with the Dry Roadside Hazard Sale, scheduled to occur in 2008. Based on the PAC evaluation completed for the analysis and subsequent retention or removal of PACs, these three roadside hazard projects would enter into four existing PACs with fire-killed tree removal occurring on approximately 260 acres. **Error! Reference source not found.** displays total acres of potential hazard tree removal within these four PACs.

Table 47. Potential hazard tree removal within spotted owl PACS/HRCAS within wildlife analysis area (revised from table 7 in USDA 2007a and table 9 in USDA 2008a).

PAC #	Acres of Hazard Tree Removal from PAC	Acres of Hazard Tree Removal from HRCA	Total Acres Hazard Tree Removal from PAC/HRCA	Percent of PAC/HRCA treated for Hazard Tree Removal
PL109	0	52	52	5%
PL167	10	41	51	5%
PL286	26	18	44	4%
PL287	0	113	113	11%

There are two additional Forest Service projects currently being planned that would remove fire-killed trees within the analysis area. One is on the Beckwourth Ranger District (Camp 14 Salvage Project) and one falls on Lassen National Forest, Eagle Lake Ranger District (North Moonlight Salvage Project). In addition to these NFS lands projects, approximately 5,700 acres of the 19,238 acres of private land within the analysis area has been or is planned for salvage logging.

Error! Reference source not found. shows all acres of proposed or current treatments from fire-killed tree removal projects within the analysis area for alternatives A and C. Approximately 27,623 acres on public and private land (31 percent) is proposed for fire-killed tree removal within the analysis area under alternative A and approximately 20,095 acres (23 percent) is proposed under alternative C. On NFS lands, approximately 21,923 acres of fire-killed tree removal would occur under alternative A. This is 32 percent of the 68,408 NFS land acres within the analysis area. Under alternative C approximately 14,395 acres of NFS lands are proposed for treatment (21 percent of NFS land). Thus, from 46,485 to 54,013 acres (alternatives A and C, respectively) of the fire land base located on NFS lands would not be treated for fire-killed tree removal. This land base would be supporting various densities of fire-killed trees with the overall snag density from 11.7 snags/acre (Alt. A) to 13.3 snags/acre (Alt C). In the long-term, fire-killed tree removal would not result in any additional unsuitable spotted owl habitat above what was changed due to wildfire; but it does in the short term (one to two years) contribute cumulatively to overall habitat degradation when added to the conditions created by wildfire, primarily due to the removal of fire-killed structures supporting habitat.

Table 48. Acres of proposed and current post-fire treatments in the wildlife analysis area.

	Alt A acres proposed for fire-killed tree removal	% of analysis area	% on NFS lands	Alt C acres proposed for fire-killed tree removal	% of analysis area	% on NFS lands
Moon-Wheeler Project	15,568	18%	23%	7,636	9%	11%
Antelope RSHTR Project	2,900	3%	4%	2,900	3%	4%
Moonlight RSHTR Project	4,370	5%	6%	4,370	5%	6%
Dry Flat RSHTR Project	1,437	2%	2%	1,437	2%	2%
Camp 14 Project	249	0%	0%	249	0%	0%
North Moonlight Project	210	0%	0%	210	0%	0%
Private Land salvage*	5,700	7%	n/a	5,700	7%	n/a
Total on NFS land	21,923**	25%	32%	14,395**	19%	21%
Total on public and private land	27,623	31%	n/a	20,095	23%	n/a

* private land salvage on 3,400 acres in 2007 and 2,300 acres planned for salvage in 2008
** 2,811 overlapping acres removed for Alt A, 2,407 overlapping acres removed for Alt C

Based on spotted owl survey information, implementation of fire-killed tree removal could be subject to a LOP that would restrict tree removal during the nesting season (March 1 to August 15). Based on known information and as-needed implementation of a LOP, the fire-killed tree removal should not disturb known nesting pairs, and would not alter the current distribution of owl PACs across the PNF. The cumulative removal of fire-killed trees from 21 to 32 percent of NFS lands would modify burned habitat with fire-killed tree structure removal, but would not reduce spotted owl PAC/HRCA occupancy, distribution, or the spotted owl population on the PNF above that resulting from the wildfire. Fire-killed tree removal within the analysis area would not impact either habitat or population trends on the PNF.

In 2008, portions of the Moonlight and Wheeler Project would be implemented. This project consists of planting conifers in portions of the Moonlight and Antelope Complex fires that are not being treated for fire-killed tree removal. Conifers would be planted in clusters of three trees per cluster, with clusters spaced 25- 33 feet apart, resulting in approximately 100-200 trees per acre. Manual release (hand grubbing) would occur one to two years following planting. Approximately 2,175 acres of reforestation are planned to occur within the analysis area. No fire-killed tree removal is planned with this project. Reforestation efforts should hasten restoration of large tree forest conditions that could provide CWHR 4M stands in 50 to 100 years.

Barred owls (*Strix varia*) continue to have an apparent increase in distribution and numbers in the northern Sierra Nevada and may become an increasing risk factor to spotted owl (California Spotted Owl Module: 2007 Annual Report, 10 January 2008).The PLAS synthesis of barred-sparred owl records through 2007 indicates that there are a minimum of 41 individual site records across the northern Sierra Nevada. None of these detections have been located within either the Antelope Complex Fire or Moonlight Fire areas. It is uncertain as to what the long term impacts of wildfire and forest succession may have on barred owl abundance and distribution; in the short-term, suitable nesting

and foraging habitat for this species, as inferred by barred owl habitat use during detections on the PNF, has been rendered unsuitable by wildfire.

Bioregional Habitat Status and Trend: There are currently 994,000 acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on NFS lands in the Sierra Nevada (USDA Forest Service 2008b). The trend is slightly increasing (from 7 to 9percent within the last decade on NFS lands).

The Moonlight and Antelope Complex fires resulted in the reduction of 21 PACs on the PNF; thus currently there are 275 PACs across the PNF. It is expected that the spotted owl population on the PNF may decline in response to the loss of PACs and suitable nesting and foraging habitat to moderately high to high severity fire. The large scale fragmentation created by these stand replacement fires across 80,000 acres immediately reduced the spotted owl carrying capacity on the PNF that would not recover and support owl habitat for numerous decades. This large gap may also create a large gap and potential bottleneck impeding owl dispersion in the eastern most range of the species. The removal of fire-killed trees in unsuitable habitat would not cumulatively add to this potential population distribution decline. Restoration, in terms of accelerating the availability of mature conifer stands through reforestation as well as natural establishment, could eventually improve conditions for spotted owl re-occupancy.

Determination: Based on the changes to habitat expected from the fire-killed tree removal and subsequent reforestation, as well as incorporation of LOP's to reduce disturbance during critical periods if needed, the recovery and restoration project may affect, not likely to lead to federal listing or loss of viability, of the California spotted owl.

The proposed action would reduce long-term hazardous surface fuels on 15,568 acres that would accumulate over time if nothing was done. This fuel reduction would have a beneficial affect on future fire behaviors, including decreased fire intensity and rate of spread that could enhance suppression capabilities and firefighter safety. This could allow for increased protection of the developing stands, resulting from reforestation efforts, and possibly allow for restoration of forested habitat suitable for owls in 50-100 years.

3.4.2.1.1.4 Northern Goshawk

There would be no direct effects to individuals or goshawk habitat. The greatest impact to the goshawk and goshawk habitat was the Moonlight and Antelope Complex fires. Within the analysis area (burn perimeter), prior to the fires, there was 45,660 acres of NFS lands of suitable goshawk nesting/high quality foraging habitat (CWHR 5D, 5M, 4D, and 4M); after the fire there is currently approximately 4,055 acres of NFS lands that are suitable goshawk nesting/high quality foraging habitat located across the fire landscape within the analysis area

The proposed action and action alternatives would remove fire-killed trees from high and moderate severity burned areas that do not support habitat considered suitable for goshawk. This action would not remove live trees, would not reduce live tree canopy cover, or degrade any nesting and foraging habitat for goshawk. The present condition of late-successional forest habitat within the analysis area would not change from the existing condition created by the wildfire. Thus no post fire goshawk habitat would be logged, degraded and/or rendered unsuitable by the proposed action.

Table 49. Acres treated for fire-killed tree removal in areas formerly known as Northern goshawk PACs.

PAC #	ACRES PROPOSED FOR FIRE-KILLED TREE REMOVAL ALTERNATIVES A AND C
T07	104
T08	1
T13	128
T14	5
T29	107
Total	**345**

Approximately 345 acres of fire-killed tree removal would occur in areas formerly known as PACs (**Error! Reference source not found.**). This fire-killed tree removal acreage is not suitable goshawk habitat due to fire effects. **Error! Reference source not found.** is provided for information and for future acre accountability.

Removal of fire-killed trees that could be available for additional prey species if left on site may incrementally impose a decrease in habitat suitability for goshawks from pre and post treatment conditions. No suitable nesting or foraging habitat would be directly affected by fire-killed tree removal, as only fire-killed trees within moderately high and high severity burn areas would be removed.

More acres of fire-killed trees within the analysis area would be provided by alternative C than alternatives A because only 7,607 acres would be treated for fire-killed tree removal.

The Stream fire burned a total of 3,600 acres in 2001. Prior to the burn the Stream fire areas supported 2,428 acres of suitable goshawk nesting habitat; after the fire there was 129 acres of suitable goshawk nesting habitat located across the fire landscape in five isolated stands. The Stream fire burnt approximately 89 acres of a 270 acre PAC at high fire severity (suitable habitat no longer suitable) and 29 acres at low severity, maintaining suitable foraging habitat conditions). Thus approximately 181 acres of this PAC was still intact. No goshawk nesting activity has been documented in this PAC since 1983. This PAC did not burn with the Antelope Complex.

In 2006 the Hungry fire burned 547 acres within the Middle Creek drainage; approximately 325 acres burned at low severity, 113 acres of moderate severity and 109 acres of high severity. Approximately 109 acres of suitable habitat (5M/4M) was converted to unsuitable nesting/foraging habitat while 61 acres was converted to more open foraging habitat (4P/5P). No goshawk PACs were impacted by the Hungry fire and none were impacted by the 75 acre Hungry Salvage Project in 2007. The Hungry Fire Salvage Project did not result in any additional unsuitable goshawk habitat.

In 2006 the Boulder fire burned approximately 3,000 acres. Approximately 1000 acres of suitable goshawk nesting habitat was rendered unsuitable by high and moderate intensity fire. No goshawk PACs were impacted by this wildfire. The Boulder Fire Hazard Tree Removal Project harvested fire-killed trees on 249 of the 3000 burned acres, leaving 83 percent of the burn supporting fire-killed trees. There were no direct/indirect or cumulative effects of salvage removal on goshawks or goshawk habitat.

Thus stand replacing wildfires (Stream, Hungry, Boulder, and Antelope Complex fires) have resulted in a reduction of suitable goshawk nesting and foraging habitat of approximately 10,552 acres.

Two roadside safety and hazard tree removal projects on the Mt. Hough Ranger District (Moonlight and Antelope Complex) would be implemented prior to implementation of the Moonlight and Wheeler Project. These two projects would remove hazard trees from approximately 7,270 acres (USDA 2007a, USDA 2008a). The Beckwourth Ranger District has approximately 1,437 acres of roadside hazard tree removal planned with the Dry Roadside Hazard Sale, scheduled to occur in 2008. The BEBA for the Moonlight Safety and Hazard Tree Removal Project was completed prior to the PAC evaluation done for the Moonlight and Wheeler Project. The roadside hazard BEBA (2008a) stated potential hazard trees would be removed from five goshawk PACs, totaling 106 acres. These five PACs have now been removed from the PNF PAC network; therefore no roadside hazard treatments are scheduled to occur in any existing PAC.

Approximately 27,623 acres on public and private land (31 percent) is proposed for fire-killed tree removal within the analysis area under alternative A and approximately 20,095 acres (23 percent) is proposed under alternative C. On NFS lands, approximately 21,923 acres of fire-killed tree removal would occur under alternative A. This is 32 percent of the 68,408 NFS land acres within the analysis area. Under alternative C approximately 14,395 acres of NFS lands are proposed for treatment (21 percent of NFS land). Thus, from 46,485 to 54,013 acres (alternatives A and C, respectively) of the fire land base located on NFS lands would not be treated for fire-killed tree removal. This land base would be supporting various densities of fire-killed trees with the overall snag density from 11.7 snags/acre (Alt. A) to 13.3 snags/acre (Alt. C). In the long-term, fire-killed tree removal would not result in any additional unsuitable northern goshawk habitat above what was changed due to wildfire; but it does in the short term (one to two years) contribute cumulatively to overall habitat degradation when added to the conditions created by wildfire, primarily due to the removal of fire-killed structures supporting habitat.

The proposed action would reduce surface fuel loading on 15,568 acres that would accumulate over time if nothing was done. Alternative C would reduce fuel loading on 7,639 acres. These fuel loading reductions would have a beneficial affect on future fire behaviors, including decreased fire intensity and rate of spread that could enhance suppression capabilities and firefighter safety. This could allow for increased protection of the developing stands, resulting from reforestation efforts, and possibly allow for restoration of forested habitat suitable for goshawks in 50 to 100 years.

Determination: Based on the changes to habitat expected from the fire-killed tree removal and subsequent reforestation, the recovery and restoration project may affect, not likely to lead to federal listing or loss of viability, of the Northern goshawk.

3.4.2.1.1.5American Marten

The proposed action alternatives would remove fire-killed trees from high and moderate severity burned areas that do not support habitat considered suitable for marten. This action would not remove live trees, would not reduce live tree canopy cover, or degrade any denning, resting, and foraging habitat for marten. There would be no fire-killed tree removal from CWHR types still classified as 4M, 4D, 5M, 5D. The present condition of

late-successional forest habitat within the analysis area would not change from the existing condition created by the wildfire. Thus no marten habitat would be logged or rendered unsuitable by the proposed actions. There may be instances where individual live trees may be cut for safety purposes or to facilitate access to harvest fire-killed trees. These instances are expected to be rare and impacts to existing live tree stands minimal.

The cumulative effects on marten are essentially the same described for spotted owl. See cumulative effects discussion for spotted owl on page 47.

Error! Reference source not found. summarizes all acres of proposed or current treatments from fire-killed tree removal projects within the analysis area for alternatives A and C. Approximately 27,623 acres on public and private land (31 percent) is proposed for fire-killed tree removal within the analysis area under alternative A and approximately 20,095 acres (23 percent) is proposed under alternative C. On NFS lands, approximately 21,923 acres of fire-killed tree removal would occur under alternative A. This is 32 percent of the 68,408 NFS land acres within the analysis area. Under alternative C approximately 14,395 acres of NFS lands are proposed for treatment (21 percent of NFS land). Thus, from 46,485 to 54,013 acres (alternatives A and C, respectively) of the fire land base located on NFS lands would not be treated for fire-killed tree removal. This landbase would be supporting various densities of fire-killed trees with the overall snag density from 11.7 snags/acre (Alt. A) to 13.3 snags/acre (Alt C). In the long-term, fire-killed tree removal would not result in any additional unsuitable marten habitat above what was changed due to wildfire; but it does in the short term (one to two years) contribute cumulatively to overall habitat degradation when added to the conditions created by wildfire, primarily due to the removal of fire-killed structures supporting habitat.

Treatments are proposed within the PNF draft carnivore network. This project and the Moonlight Roadside Safety and Hazard Tree Removal would treat a total of 8,562 acres for fire-killed tree removal within the carnivore network (**Error! Reference source not found.**). As stated previously, little to no live trees would be removed or impacted by the project's actions and there is expected to be no change in present CWHR types. The remaining CWHR 4M/4D/5M/5D stands, which provide suitable habitat and connectivity for the marten and other mesocarnivores, would not be treated and only minimally affected by these two projects.

Table 50. Carnivore network acres proposed for fire-killed tree removal.

	Acres Treated within Carnivore Network
Moon-Wheeler Project	7781
Moonlight RSHTR*	781
Total	8562

*overlapping acres removed

The open road density within the project area is 2.62 miles of open road/square mile. Open road density would remain the same with this alternative. According to early habitat models (Freel 1991) this road density provides low-no habitat capability for the marten and other forest carnivores.

Determination: Based on past survey work, it is likely that marten do not occur in the analysis area. Fire-killed tree removal under this project would not impact either marten habitat or population trends on the PNF. Considering the rare chance that individuals are present in the analysis area, it is my determination that the Moon-Wheeler Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability.

3.4.2.1.1.6 Pallid Bat

Direct effects from the proposed actions are possible if this species occurs in the analysis area. Destruction of active roosts through felling or removal of fire-killed trees with hollows could displace or harm individual bats. Chain saw activity or the use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment resulting in lowered reproductive success. These effects would be most severe during the breeding season (May 20 to August 15) when the potential exists for disturbance to active breeding females and maternity colonies. Activities conducted during the winter months can potentially disturb hibernacula sites (winter shelters), causing species arousal and use of crucial energy reserves.

Both the Hungry and Boulder Fires in 2006 created abundant fire-killed tree habitat. Both fires combined to burn a total of around 3,547 acres; approximately 324 acres of fire-killed tree removal occurred on these burned acres (9 percent). The availability of fire-killed trees for bat use in the Antelope Lake area is abundant.

Habitat attributes like large fire-killed trees would be removed or modified by the proposed action, which could result in direct mortality of bat species that may be roosting within the fire-killed tree. Approximately 27,623 acres on public and private land (31 percent) is proposed for fire-killed tree removal within the analysis area under alternative A and approximately 20,095 acres (23 percent) is proposed under alternative C. On NFS lands, approximately 21,923 acres of fire-killed tree removal would occur under alternative A. This is 32 percent of the 68,408 NFS land acres within the analysis area. Under alternative C approximately 14,395 acres of NFS lands are proposed for treatment (21 percent of NFS land). Thus, from 46,485 to 54,013 acres (alternatives A and C, respectively) of the fire land base located on NFS lands would not be treated for fire-killed tree removal. This land base would be supporting various densities of fire-killed trees with the overall snag density from 11.7 snags/acre (Alt. A) to 13.3 snags/acre (Alt C).In the long-term, fire-killed tree removal would not result in any additional unsuitable marten habitat above what was changed due to wildfire; but it does in the short term (one to two years) contribute cumulatively to overall habitat degradation when added to the conditions created by wildfire, primarily due to the removal of fire-killed structures supporting habitat.

In 2008, portions of the Moonlight and Wheeler Project would be implemented. This project consists of planting conifers in portions of the Moonlight and Antelope Complex fires that are not being treated for fire-killed tree removal. Conifers would be planted in clusters of three trees per cluster, with clusters spaced 25- 33 feet apart, resulting in approximately 100-200 trees per acre. Manual release (hand grubbing) would occur one to two years following planting. Approximately 2,175 acres of reforestation are planned to occur within the analysis area. No fire-killed tree removal is planned with this project.

Reforestation efforts should hasten restoration of large tree forest conditions that could provide CWHR 4M stands in 50 to 100 years.

There would be no habitat disruption or modification to rock outcrops, caves and mining adits. No man-made structures that could provide habitat for bats are planned for removal or modification, other than roads and culverts, both of which do not provide habitat. The project does not indicate that it would create a high risk related to pallid bat.

Based on the changes to habitat expected from the fire-killed tree removal and subsequent reforestation, the recovery and restoration project may affect, not likely to lead to federal listing or loss of viability, of the pallid bat.

3.4.2.1.1.7 Western Red Bat

Effects are similar as described for Pallid Bat except that impacts for this analysis are tied directly to impacts on cottonwood trees. Mature cottonwood trees suitable for red bat roosts are located along many stretches of perennial streams within the analysis area. Many of these large cottonwoods died as a result of fire. No cottonwood or other hardwood trees would be removed with this salvage project. The previously analyzed roadside hazard projects (USDA 2007a, USDA 2008a) discussed that cottonwood removal would be very limited (may even be non-existent), but it was possible that some may be deemed hazardous and removed, thus there could be a minimal direct loss of habitat. It is unknown as to what extent fire-killed trees, especially preferred riparian trees such as cottonwoods, are used by red bats, but if bats are using cottonwoods that are felled, direct mortality could occur. Downstream of the fire, some cottonwood exists that could replace those consumed by fire and potentially removed as hazards.

In 2008, portions of the Moonlight and Wheeler Project would be implemented. This project consists of planting conifers in portions of the Moonlight and Antelope Complex fires that are not being treated for fire-killed tree removal. Conifers would be planted in clusters of three trees per cluster, with clusters spaced 25- 33 feet apart, resulting in approximately 100-200 trees per acre. Manual release (hand grubbing) would occur one to two years following planting. Approximately 2,175 acres of reforestation are planned to occur within the analysis area. No fire-killed tree removal is planned with this project. Reforestation efforts should hasten restoration of large tree forest conditions that could provide CWHR 4M stands in 50 to 100 years.

This species is relatively rare on the PNF but its presence in isolated areas, as well as the presence of cottonwood in the project area, warrants a may affect, not likely to lead to federal listing or loss of viability of the western red bat.

3.4.2.1.2 Minor Issues

Reductions in snags would affect old forest species.

Indicator:

- Acres of pre-wildfire old forest habitat impacted by fire-killed tree removal

Reduced recruitment of large woody debris would reduce terrestrial microhabitats.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

Reduced terrestrial microhabitats would affect early seral wildlife species.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

Post-fire logging activities would result in improved access while roads are open, which would increase disturbance to wildlife.

Indicator:

- Comparison of the amount of open road density pre and post project expressed as miles of open road/square mile.

There would be no new system road construction so no long-term increases in human activities are expected as a result of this action. There would be approximately 33 miles of temporary road constructed to accommodate logging systems; these would be decommissioned upon completion of the project. Road density would remain the same as pre-fire conditions, which is 2.62 miles of open road/square mile.

There would be no increase in the wildlife disturbance due to newly constructed roads, as any new temporary road construction would be decommissioned after project implementation. Project implementation is expected to occur for 12-24 months; therefore closure of specific roads at specific times to public access would result from project implementation activities and would diminish after project completion.

Cumulatively open road densities would increase slightly due to new constructed temporary roads from other projects within the analysis area; however those roads would be decommissioned after project implementation and would have a negligible effect on

disturbances to wildlife species in the vicinity of those projects and project implementation activities.

Post-fire logging activities would cause a short-term displacement of wildlife. Indicator: ▪ Not measured, discussed qualitatively.

There is the potential for short-term displacement of wildlife due to post-fire logging activities. Project implementation is expected to occur for 12-24 months; therefore closure of specific roads at specific times to public access would result from project implementation activities and would diminish after project completion.

Cumulatively wildlife displacement would increase slightly from other projects within the analysis area; however those activities would have a negligible effect on disturbances to wildlife species in the vicinity of those projects and project implementation activities.

3.4.2.1.3 MIS

3.4.2.1.3.1 Minor Issues

3.4.2.1.3.1.1 Black-backed Woodpecker

Reduction of snags would reduce habitat for snag-dependent wildlife species (particularly black backed woodpeckers). Indicator(s): ▪ Percent of total suitable black-backed woodpecker habitat available before and after treatments within the Moonlight and Antelope Complex fire perimeters ▪ Trends in habitat at the Bioregional scale

With alternative A, one hundred and forty-seven snag retention areas, ranging in size from 7 to 26 acres, were designated over approximately eleven percent (1,723 acres) of treatment areas. Under alternative C seventy-seven snag retention areas were designated over 12 percent (935 acres) of treatment areas. Fire-killed tree removal generally would not occur within these snag retention areas. Primary selection criteria for snag retention areas were 1) areas formerly identified as Spotted Owl PACs, 2) along treatment unit boundaries adjacent to non-burned and low severity areas, 3) within RHCAs, and 4) in stands that supported a minimum of 40 percent canopy cover pre-fire.

Within treatment units, the proposed action calls for the removal of fire-killed trees 14 inches or 16 inches dbh and larger. Within helicopter and skyline units this would result in the retention of smaller fire-killed trees (less than 15.9 inches dbh) scattered and clumped across all 7,929 acres of helicopter and skyline units. Small fire-killed tree density would be around 32 fire-killed trees/acre between 10 inches and 14.9 inches dbh. In the 7,607 acres of tractor units under both action alternatives, as a result of both sawlog and biomass proposed for harvest, there would be no small fire-killed tree availability, except in snag retention areas and RHCA equipment restriction zones.

For all alternatives, harvesting of fire-killed trees would occur; however, snags would be retained to meet RMOs for down woody debris recruitment. Snags greater than 15 inches dbh would be retained at 4 snags/acres in all treated RHCAs. RHCAs would be incorporated into the 10 acre (average) snag retention areas where appropriate.

With alternatives A 77 percent of the NFS lands within the analysis area has no fire-killed tree removal planned. Under alternative C 89 percent of NFS lands would not be subject to fire-killed tree removal. Untreated areas would contribute higher snag density clusters in large contiguous blocks to meet total required number of snags per acre across the analysis area. Maintaining from 77 percent to 89 percent of NFS lands within the analysis area in an unsalvaged condition can benefit species most-closely tied to early post-fire conditions, including the BBWP (Kotliar et al. 2002).

Prior to the Antelope Complex fires, there was approximately 1,488 acres of habitat classified as snags in burned forest within the analysis area (created from the 2001 Stream Fire). Within this portion of the Stream Fire area, approximately 221 acres in nine units were salvage logged in 2003. On average snags were distributed across the salvage units at 4-6 snags/acre. The remaining 1,267 acres of the Stream Fire area within the analysis area were not salvage logged (did not have fire-killed tree removal) and now are burnt forest habitat supporting a high density of medium and large snags/acre; this habitat is six to seven years old. Due to its age, habitat in the Stream Fire has probably declined in habitat suitability for BBWP.

Two roadside safety and hazard tree removal projects (Moonlight and Antelope Complex) on the Mt. Hough RD would be implemented prior to implementation of the Moon-Wheeler Project. These two projects would remove hazard trees from approximately 7,270 acres (USDA 2007a, USDA 2008a). The Beckwourth RD has approximately 1,437 acres of roadside hazard tree removal planned with the Dry Roadside Hazard Sale, scheduled to occur in 2008.

There are two additional Forest Service projects currently being planned that would remove fire-killed trees within the analysis area. One is on the Beckwourth RD (Camp 14 Salvage Project) and one falls on Lassen National Forest, Eagle Lake Ranger District (North Moonlight Salvage Project). In addition to these NFS lands projects, approximately 5,700 acres of the 19,238 acres of private land within the analysis area has been or is planned for salvage logging.

Cumulative amount of BBWP suitable habitat remaining post treatments (NFS lands).

		Alternative A Cumulative			Alternative C Cumulative		
CWHR Type (pre-fires)	Created BBWP Habitat in Analysis Area	Cumulative Acres (all projects) BBWP Habitat Planned for Fire-killed Tree Removal under Alt A	Post Moon-Wheeler Project Habitat Available for BBWP		Cumulative Acres (all projects) BBWP Habitat Planned for Fire-killed Tree Removal under Alt C	Post Moon-Wheeler Project Habitat Available for BBWP	
			Acres Remaining	% Remaining		Acres Remaining	% Remaining

CWHR 4M/4D	17,961	7,314	10,647	59%	4,456	13,505	75%
CWHR 5M/5D	14,734	7,056	7,678	52%	3,781	10,953	74%
Total	32,659	14,370	18,289	56%	8,237	24,422	75%

Approximately 32,659 acres of NFS lands are suitable BBWP habitat and are within the 87,647 acre analysis area as a result of high severity fire within CWHR types supporting 4M, 4D, 5M, and 5D pre-fire. **Error! Reference source not found.** shows the cumulative amount of BBWP habitat remaining on NFS lands. All proposed or ongoing fire-killed tree removal project acreage within the analysis area (this project, three roadside hazard projects, and two smaller salvage projects) are accounted for in **Error! Reference source not found.**. Approximately 14,370 acres under alternative A and approximately 8,237 acres under alternative C would be unsuitable post fire-killed tree removal, leaving from 18,289 (alterantive A) to 24,422 (alternative C) cumulative acres of suitable BBWP habitat.

Table 51. Cumulative amount of moderately high to high (>50 BAM) severity salvaged and unsalvaged in the wildlife analysis area (NFS lands).

High Fire Severity (> 50% basal area mortality)	Total Acres Mod-High Severity in Analysis Area	Moon-Wheeler Acres Proposed for Salvage		Acres Proposed for Salvage (all other projects)	Acres Un-salvaged	% of total Unsalvaged
		Alt A	Alt C			
Alternative A	47,825	14,575*	----	3,345	29,905	38%
Alternative C	47,825	----	7,123*	3,345	10,468	78%

* snag retention areas excluded

Error! Reference source not found. indicates that, under alternative A, 38 percent of the analysis area classified as high severity to moderately high severity burn would not be salvage logged. Alternative C would leave 78 percent in this same severity class untreated. Areas untreated would continue to be available as BBWP habitat somewhere between 5 and 7 years. After this time period, the quality of foraging habitat declines because the fire-killed wood habitat no longer supports prey species BBWP consume.

Snag density estimations post treatment on NFS lands within the analysis area has been done. Snag numbers reflect cumulative effects, that is, all Forest Service projects ongoing or proposed that are/would remove fire-killed trees, and are averaged across the landscape (NFS lands within the analysis area – 68,408 acres).

Implementation of all projects under alternative A results in an estimated post harvest snag density (greater than 15 inches dbh) across the 68,408 acres of NFS lands of 11.7 snags/acre. The cumulative amount of snags 10 inches- 14.9 inches dbh post harvest under this alternative is estimated to be 26 snags/acre.

Under alternative C, the cumulative estimate of snags greater than 15 inches dbh post harvest is estimated at 13.3 snags/acre. The estimated amount of snags 10 inches- 14.9 inches dbh remaining post harvest is the same as alternative A, 26 snags/acre.

In 2008, portions of the Moonlight and Wheeler Project would be implemented. This project consists of planting conifers in portions of the Moonlight and Antelope Complex fires that are not being treated for fire-killed tree removal. Conifers would be planted in clusters of three trees per cluster, with clusters spaced 25- 33 feet apart, resulting in approximately 100-200 trees per acre. Manual release (hand grubbing) would occur one to two years following planting. Approximately 2,175 acres of reforestation are planned to occur within the analysis area. No fire-killed tree removal is planned with this project. Reforestation efforts should hasten restoration of large tree forest conditions that could provide CWHR 4M stands in 50 to 100 years.

Private timberlands account for over 19,000 acres or approximately 22 percent of the analysis area. Since Fall 2007 through the present, fire salvage harvest has been occurring on these lands. Over 3,400 acres were salvage harvested in 2007 and new and ongoing salvage operations on private lands within the fires is to be expected. Fire salvage timber harvest plans filed to date in 2008 account for an additional 2,300 acres approximately. Based on current activity, private fire salvage projects occur mostly on productive, well-stocked stands that burned with moderate to high burn severity resulting in a notable reduction in densities of fire-killed and fire-injured trees on private lands. It is reasonably assumed based on state forest practice regulations and private timber practices that these areas would be re-planted and managed for maximizing tree growth.

Implementation of fire-killed tree removal on 7,639 acres (alternative C) to 15,568 acres (alternative A) of 68,408 acres of NFS lands as designed, in combination with past, present and reasonably foreseeable future actions would result in a decline in habitat availability, distribution, and hence population across the PNF. That being said, there would still be short term population increase (from 2002) resulting from the suitable habitat remaining after the proposed project.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Black-Backed Woodpecker Trend. The direct, indirect and cumulative effect of the Moon-Wheeler Project in terms of changes in medium-sized and large-sized snags per acre within burned forest habitat would change from the existing condition. With implementation of the Moon-Wheeler Project, there would be a reduction in burned forest habitat supporting snags thus potentially reducing habitat that could support BBWP. Thus the potential for the analysis area to support BBWP declines post project implementation. But overall, the analysis area still supports habitat (snags in burned forest) to support higher densities of BBWP over 2002 levels. The action would not alter the existing trend in the ecosystem component, nor would it lead to a change in the distribution of black-backed woodpecker across the Sierra Nevada bioregion."

All action alternatives, combined with ongoing and planned fire-killed tree removal projects, leave more area unharvested than harvested within the analysis area. The cumulative amount under alternative A (21923 acres total estimated treated) would leave about 68 percent of NFS lands unharvested. Cumulatively, actions under alternative C propose to treat around 14,395 acres, leaving 79 percent of NFS lands unharvested. Hutto (2006) recommends as a management priority retention of some burned forest 0-5 years

after a fire because that is the narrow window of time during which the biologically unique early postfire conditions become established and persist. Leaving the majority of the burn in an unharvested condition maintains an important component of biological diversity identified by Hutto (2006): "all the unique plants and animals that depend on those first few years of natural (postfire) succession. This includes the BBWP.

Table 52. Changes in potential BBWP pairs in wildlife analysis area.

Year	BBWP *K (# pair)*	Trends from Base
2002 (base)	2 to 39	-
2008 Post Fire & No Action Alternative	65 to 1020	upward
2008 (post Actions - cumulative)	37 to 571 (Alt A) 49 to 763 (Alt C)	upward

Prior to the Moonlight and Antelope Complex fires, there was approximately 1,267 acres of burned snag habitat within the analysis area (from the 2001 Stream Fire). Assuming BBWP densities @ 3.2/40 ha in burned forest (1 pair/32 acres) (Bock and Lynch 1970) or 1 pair/500 acres) (Raphael and White 1984 in NatureServe 2007 this habitat (snags in burned forest) potentially supported between 2 and 39 pair of BBWP's between 2002 to 2007.

In 2007, the Moonlight and Antelope Complex fires combined burnt over 87,000 acres. Within the 87,647 acre analysis area (the two fire perimeters), approximately 32,659 acres (**Error! Reference source not found.**) of suitable BBWP habitat was created by high severity fire. This provides enough habitat (snags in burned forest) to theoretically support an additional 65 to 1,020 pairs. Thus the Moonlight and Antelope Complex fires created an upward trend in BBWP habitat from existing conditions that could have increased the short term trends in woodpeckers in the analysis area.

With implementation of the Moon-Wheeler Project, when added to other ongoing or planned fire-killed tree removal projects, approximately 8,237 acres (under Alt C) and 14,370 acres (under Alt A) of habitat currently supporting snags would be rendered unsuitable, thus potentially reducing habitat that could support from 16 to 29 pairs. Thus the potential for the analysis area to support BBWP declines post project implementation. But overall, the analysis area still supports habitat (snags in burned forest) to support higher densities of BBWP over 2002 levels.

3.4.2.1.3.1.2 Benthic Macroinvertebrates

Reduce recruitment of large woody debris to streams would change stream channel morphology, reduce microhabitats for aquatic species, and reduce thermal cover for cold water fisheries.

Indicators:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term
- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

Increased sediment delivery would result in changes to stream channel morphology, water quality, and downstream fish habitat.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

Changes in stream flow, above the levels that may have increased due to vegetative removal by fire, are not expected to increase with removal of fire-killed trees. There are no direct affects to the other perennial or intermittent streams. Direct affects of fire-killed tree removal, reforestation and minor road construction would not impact this habitat.

The wildfire consumed both riparian and conifer vegetation that provide surface water shade. Thus up to 100 percent of existing vegetation providing shade has been removed. No live vegetation currently providing minimal shade would be removed by the action alternatives, thus no immediate change in water surface shade is expected. Fire-killed trees provide a minor amount of shade, thus some structural shade would be removed, but amount of shade provided by fire-killed trees is much less than prior to the fire and probably not very influential in terms of water temperatures. There would be some loss of large diameter snags adjacent to the perennial streams within helicopter units, yet the retention of four of the largest snags per acres within these RHCA's would minimize this effect. Large woody recruitment would remain within RHCAs of perennials and intermittents would have a large flush of woody material over the next 10 years and then no recruitment for the next 50+ years. Vegetative response post fire by riparian species would help recover surface water shade within two-five years (Moser, 2008).

Flow would change depending on the water year. There is a minimal change in the TOC/ERA values by the implantation of alternative A and the greatest effect to flow would be within those seventeen watersheds analyzed that are currently over threshold prior to the implementation of action alternatives and would remain over threshold. "Overland flow can be initiated when surface infiltration capacity is drastically reduced. The effect of wildfire in the event of high intensity rainfall is comparably much higher than roads or harvest" (Moser et al. 2008). "The overwhelming effect to hydrologic function, in any of the alternatives, is that of cover loss and potential for widespread overland flow. With a high water event there would be potential for a debris flow to occur within the stream courses in those watersheds. The existing flow condition should remain the same post fire unless large water event occurs thus impacting the existing macroinvertebrate habitat.

Water temperature has the potential to warm up slightly within the helicopter and skyline units due to removal of large diameter trees that provide some shading to the stream. This effect would be indirect and should be minimal. In addition within the tractor units; areas outside of the snag retention zones would be devoid of all snags greater than 14 inches dbh and thus any shade larger diameter snags provide would be lost. There is the potential for increased temperatures due to lack of forested or "snag" cover in the short term, and increased conifer cover in the long term (10-15 years) with the growth of the planted conifers throughout the units harvested. The potential for a

short term increase in temperature could affect the timing of life histories of sensitive aquatic macroinvertebrates.

Sediment delivery to streams is related to the cumulative watershed effects analysis (Moser et al. 2008), and findings are that there is little difference between the action alternatives and the no action alternatives due to the adverse effect of the wildfire. The impacts of both action alternatives would not be higher than that of the wildfire, though the salvage activities would prolong natural recovery from 2 to 5 years (Moser et al. 2008). "The steep slopes, though more erosive, would return to natural fire recovery within two years, while the shallow slopes where ground based systems are used would return fire recovery within 3-5 years. Slope restrictions for ground based harvest under 25 percent slope would lower erosion potential for 3724 acres for both action alternatives" (Moser et al. 2008).

3.4.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.4.2.2.1 Threatened, Endangered, and USDA Forest Service R5 Sensitive Species

3.4.2.2.1.1 Mountain Yellow-legged Frog

Degraded conditions within watersheds as a result of the fires would continue. Post-fire (0-5 years) sediment loading to aquatic habitats would be higher than pre-fire levels because of the decrease in ground cover and bank stability provided by live vegetation and the resulting increase in soil movement. Sediment inputs should decrease over time as groundcover increases, vegetation re-establishes, and stream banks stabilize.

Two of the three watersheds with known MYLF populations, Lower Lone Rock Creek and West Branch Light Creek, currently exist well above TOC (**Error! Reference source not found.**). These two watersheds are susceptible to very high cumulative effects risk, such as erosion and large movement of sediment into streams. Lower Indian Creek watershed, suspected of having MYLF but with no detections to date, is also over TOC and at very high risk. Pierce Creek watershed exists below TOC but the risk of cumulative effects is still considered high.

There is over 19,000 acres of private land within the analysis area. Cumulative effects from private land use (timber and gravel extraction, fire salvage harvest, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting. Of particular concern is the heavy logging on Sierra Pacific lands within the Lights Creek and Lone Rock drainages, which have known MYLF populations.

Cattle grazing would continue in the nine active allotments within the analysis area. There are no plans to adjust livestock numbers, season of use or livestock distribution in the short term (2008 or 2009 grazing season) in any of these allotments. This means that there would be no rest period, or allowance for a non-grazed growing season, to occur to allow for vegetation recovery without livestock. It is expected that first year flush of grasses/forbs and riparian species would occur along wetter sights (stream courses, meadows) and this would attract livestock, leading to concentrated use along these sensitive areas. This would probably have a short term effect on recovery of riparian vegetation, including willow, aspen, and wet meadow. Concentrated livestock use in these

areas would delay and possibly impede stream bank recovery and increase compaction around wet sites. Thus it is anticipated that some short term delay in recovery of riparian habitat would occur.

Determination: This alternative may affect individuals but not likely to result in a trend toward Federal listing or loss of viability for the Mountain yellow-legged frog.

3.4.2.2.1.2 Bald Eagle

There would be no direct or indirect effects on individual bald eagles or bald eagle habitat, similar to the action alternatives, as no action would occur within the BEMA or within territories. There would be no "out of normal" road use, thus no need for LOP's. The cumulative effects mirror those described above with the action alternatives.

Determination: The implementation of the no action alternative would not affect individual bald eagles or bald eagle habitat.

3.4.2.2.1.3 California Spotted Owl

There would be no direct effects to individuals or owl habitat. The greatest impact to the spotted owl and spotted owl habitat was the Moonlight and Antelope fires. Within the analysis area (burn perimeter for both fires), pre-fire, there was 59,304 acres (75 percent on NFS lands, 25 percent on private) of suitable spotted owl nesting/foraging habitat (CWHR 5D, 5M, 4D, and 4M); after the fire there is currently approximately 4,463 acres (82 percent NFS lands, 18 percent private lands) of suitable spotted owl nesting/foraging habitat located across the analysis area fire landscape (**Error! Reference source not found.**).

Twenty-one spotted owl PACs were present within the project area prior to the Moonlight and Antelope Complex fires and effects to habitat as a result of the fire are displayed in **Error! Reference source not found.**, **Error! Reference source not found.**, and table 31. These PACs no longer function as intended due to loss of habitat and are removed from the PNF PAC network.

The majority of the burn area is considered unsuitable habitat for spotted owl, and probably would remain unsuitable nesting habitat for 125+ years. Intraspecific competition for quality nesting and foraging habitat outside the burn may increase between owls that used the project area prior to the fire. Within the analysis area, there could be increased intra specific competition for nesting and foraging habitat as a result of a loss of 54,841 acres of owl habitat in the landscape, forcing owls to share less habitat acres. Elimination or modification of habitat may cause a shift in owl PAC/home range use. Owls may move out of the area affected and seek unoccupied suitable habitat elsewhere. When this shift occurs, displaced owls could be entering another pair's home range. Increasing the density of owls could result in an additional net loss of owl pairs in the area.

The Montane Chaparral type that would persist with the no action alternative provides unsuitable owl habitat. Prey species preferred by spotted owls (woodrats and flying squirrels) would likely avoid the recent burn area. As the MCP or SMC1-2 habitat matures, woodrats may re-colonize as they are known to utilize earlier successional habitats, especially along edges of shrub fields and conifer/oak stands (Mayer and Laudenslayer, 1990 and personal observation). Flying squirrels would likely be absent in

high intensity burn areas until mature conifer habitat develops. The edges between unburned forest or low severity burned patches along the fire perimeter could provide habitat for these prey species. The small patches of forested habitat within the burn that burned at low severity are isolated by large expanses of unsuitable habitat; these patches may be marginal for foraging spotted owls due to the isolation from the forest interior.

This alternative would not reduce long-term surface fuel loading on 15,568 acres that would accumulate over time. Thus there would be increased risk associated with future fire behaviors, including increased fire severity and rate of spread that could reduce suppression capabilities. This could allow for increased risk to habitat recovery by burning up any reforested (naturally or artificially) stands. Thus the no action alternative does not provide for accelerated recovery and restoration of owl habitat. This alternative may affect, not likely to lead to federal listing or loss of viability, of the California spotted owl.

3.4.2.2.1.4 Northern Goshawk

There would be no direct effects to individuals or goshawk habitat. The greatest impact to the goshawk and goshawk habitat was the Moonlight and Antelope Complex Fires. Within the analysis area (burn perimeter), prior to the Moonlight and Antelope fires, there was 45,660 acres of NFS lands are suitable goshawk nesting/high quality foraging habitat (CWHR 5D, 5M, 4D, and 4M); after the fire there is currently approximately 4,055 acres of NFS lands that are suitable goshawk nesting/foraging habitat located across the fire landscape within the analysis area.

The majority of the burn area is considered unsuitable habitat for goshawks, and probably would remain unsuitable nesting habitat for 125+ years. Intraspecific competition for quality nesting and foraging habitat outside the burn may increase between goshawks that may have used the project area prior to the fire.

The Montane Chaparral type that would persist with the no action alternative provides some low suitability foraging habitat in all seral stages for goshawks (CWHR Version 8.0). Goshawks prey on small mammals as well as catch birds on the wing. They then perch on plucking posts to feed. These plucking posts are usually located within forested stands, providing an element of security cover for feeding goshawks. The edges between unburned forest or low intensity burned patches within the interior of the burn are attractive edges to a variety of prey species for goshawk (jays, flickers, golden mantled ground squirrel). The small patches of forested habitat within the burn that burned at low intensity can serve as areas for plucking posts and where goshawks can perch and work the edges for foraging.

This alternative would not reduce surface fuel loading on 15,568 acres that would accumulate over time. Thus there would be increased risk associated with future fire behaviors, including increased fire severity and rate of spread that could reduce suppression capabilities. This could allow for increased risk to habitat recovery by burning up any reforested (naturally or artificially) stands. Thus the no action alternative does not provide for accelerated recovery and restoration of goshawk habitat. This alternative may affect, not likely to lead to federal listing or loss of viability, of the northern goshawk.

3.4.2.2.1.5 American Marten

There would be no direct effects to individuals or marten habitat. The greatest impact to the marten and marten habitat was the Moonlight and Antelope Complex Fires. Within the analysis area (burn perimeter), prior to the Moonlight and Antelope fires, there was 544,055 acres of NFS lands that are suitable marten denning/foraging habitat (CWHR 5D, 5M, 4D, and 4M); after the fire there is currently approximately 3,874 acres of NFS lands that are suitable marten nesting/foraging habitat located across the fire landscape within the analysis area.

The majority of the burn area is considered unsuitable habitat for marten, and probably would remain unsuitable nesting habitat for 125+ years. The Montane Chaparral type that would persist with the no action alternative does not provide any suitable habitat in all seral stages for marten. Since this species avoids areas of open canopy cover, if individuals are present they would likely avoid large areas of the Moonlight and Antelope Complex fires until a dense conifer overstory develops. This would include the 3,874 acres of NFS lands remaining suitable within the analysis area since they are largely in a discontinuous arrangement and isolated by large expanses of unsuitable habitat.

The open road density within the project area is 2.62 miles of open road/square mile. Open road density would remain the same with this alternative. According to early habitat models (Freel 1991) this road density provides low-no habitat capability for the marten and other forest carnivores.

This alternative would not reduce surface fuel loading on 15,568 acres that would accumulate over time. Thus there would be increased risk associated with future fire behaviors, including increased fire severity and rate of spread that could reduce suppression capabilities. This could allow for increased risk to habitat recovery by burning up any reforested (naturally or artificially) stands. Thus the no action alternative does not provide for accelerated recovery and restoration of marten habitat. This alternative may affect, not likely to lead to federal listing or loss of viability, of the marten.

3.4.2.2.1.6 Pallid Bat

The Moonlight and Antelope Complex fires created open habitats and large snags which are used by pallid bat. Insects invading fire-killed trees in the fire area would provide prey for this species in the area. As the montane chaparral matures and forms dense brush fields, foraging habitat quality would decline for pallid bats since they capture prey on the ground. The large snags would provide roosting habitat for pallids; the small amount of black oak (live and fire-killed) would be retained. Snag densities (greater than 15 inches dbh) with the no action alternative would be higher across the landscape than with the action alternatives (19 snags/acre with no actions versus11.7 to 13.3 snags/acre with cumulative actions). This alternative would not affect pallid bat.

3.4.2.2.1.7 Western Red Bat

There would be no reduction in fire-killed trees across the landscape or within RHCA's. The large cottonwoods along riparian corridors that survived the fires would provide for red bat roosts. The multiple edges produced by the mosaic burn pattern, as well as the fire perimeter, create habitat preferred by red bats. This alternative would not affect western red bat.

3.4.2.2.1.8 Minor Issues

Reductions in snags would affect old forest species.

Indicator:

- Acres of pre-wildfire old forest habitat impacted by fire-killed tree removal

Reduced recruitment of large woody debris would reduce terrestrial microhabitats.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

Reduced terrestrial microhabitats would affect early seral wildlife species.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment

Post-fire logging activities would result in improved access while roads are open, which would increase disturbance to wildlife.

Indicator:

- Comparison of the amount of open road density pre and post project expressed as miles of open road/square mile.

There would be no new system or temporary road construction so no long-term increases in human activities are expected as a result of this action. Road density would remain the same as pre-fire conditions, which is 2.62 miles of open road/square mile.

Cumulatively open road densities would increase slightly due to new constructed temporary roads from other projects within the analysis area; however those roads would be decommissioned after project implementation and would have a negligible effect on disturbances to wildlife species in the vicinity of those projects and project implementation activities.

Post-fire logging activities would cause a short-term displacement of wildlife.

Indicator:

- Not measured, discussed qualitatively.

Disturbances to wildlife would not result from project implementation activities as no project activities are proposed under the no action alternative.

Cumulatively wildlife displacement would increase slightly from other projects within the analysis area; however those activities would have a negligible effect on

disturbances to wildlife species in the vicinity of those projects and project implementation activities.

3.4.2.2.2 MIS

3.4.2.2.2.1 Minor Issues

3.4.2.2.2.1.1 Black-backed Woodpecker

Reduction of snags would reduce habitat for snag-dependent wildlife species (particularly black backed woodpeckers). Indicator(s): ▪ Percent of total suitable black-backed woodpecker habitat available before and after treatments within the Moonlight and Antelope Complex fire perimeters ▪ Trends in habitat at the Bioregional scale

No fire-killed tree removal would occur with this alternative. Snag densities (greater than 15 inches dbh) with the no action alternative would be approximately 16.4/acre.

Cumulatively the only fire-killed trees removed from the analysis area would be those within the three roadside hazard tree projects (8,707 acres) and the two salvage sales (459 acres). It was estimated that snag densities post hazard removal would average about 2 snags greater than 15 inchesdbh/acre within the hazard tree zones, as not all fire-killed trees created by fire would be deemed hazards. No trees greater than 15 inches dbh is expected to remain within the 459 acres of salvage treatments. Thus the remaining 59,242 untreated acres of NFS lands that would support all fire-killed trees created by the two fires.

Private timberlands account for over 19,000 acres or approximately 22 percent of the analysis area. Since Fall 2007 through the present, fire salvage harvest has been occurring on these lands. Over 3,100 acres were salvage harvested in 2007 and new and ongoing salvage operations on private lands within the fires is to be expected. It is reasonably assumed, based on current activity, that most of the productive, well-stocked stands that burned with moderate to high burn severity would be harvested under fire salvage operations resulting in a notable reduction in densities of fire-killed and fire-injured trees on private lands.

In 2008, portions of the Moonlight and Wheeler Project would be implemented. This project consists of planting conifers in portions of the Moonlight and Antelope Complex fires that are not being treated for fire-killed tree removal. Conifers would be planted in clusters of three trees per cluster, with clusters spaced 25- 33 feet apart, resulting in approximately 100-200 trees per acre. Manual release (hand grubbing) would occur one to two years following planting. Approximately 2,175 acres of reforestation are planned to occur within the analysis area. No fire-killed tree removal is planned with this project. Reforestation efforts should hasten restoration of large tree forest conditions that could provide foraging habitat for owls in 50 to 100 years (CWHR 4M) and nesting habitat (5M) in 160 years.

3.4.2.2.3 MIS

3.4.2.2.3.1 Minor Issues

3.4.2.2.3.1.1 Black-baked Woodpecker

Reduction of snags would reduce habitat for snag-dependent wildlife species (particularly black backed woodpeckers).

Indicator(s):

- Percent of total suitable black-backed woodpecker habitat available before and after treatments within the Moonlight and Antelope Complex fire perimeters
- Trends in habitat at the Bioregional scale

3.4.2.2.3.1.2 Benthic Macroinvertebrates

Reduce recruitment of large woody debris to streams would change stream channel morphology, reduce microhabitats for aquatic species, and reduce thermal cover for cold water fisheries.

Indicators:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term
- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

Increased sediment delivery would result in changes to stream channel morphology, water quality, and downstream fish habitat.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

Stream temperature would remain the same as the existing post fire condition. With the high fuel loading there would be a greater potential of another castrophic wildfire within these perennial and intermittent drainages, thus with a future potential of affecting the timing of life history activities of sensitive taxa.

Sedimentation rates into the perennial and intermittent drainages would remain the same post fire condition. TOC values would remain the same. The RIV PAC's score should remain the same, unless a high water event or rain on snow event occurs within the sensitive watersheds.

Summary of Aquatic Macroinvertebrate Status and Trend at the Bioregional Scale: The PNF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale Index of Biological Integrity and Habitat monitoring for aquatic macroinvertebrates; hence, the lacustrine and riverine effects analysis for the Moonlight-Wheeler Project must be informed by these monitoring data. The sections below

summarize the Biological Integrity and Habitat status and trend data for aquatic macroinvertebrates. This information is drawn from the detailed information on habitat and population trends in the Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

3.4.2.3 Alternative C – Direct, Indirect and Cumulative Effects

3.4.2.3.1 Threatened, Endangered, and USDA Forest Service R5 Sensitive Species

Direct, indirect, and cumulative effects for all wildlife species for alternative C are similar to those stated under alternative A with the exception of California spotted owl. All minor issue statement and associated measurement indicators for wildlife for alternative C have also been stated under alternative A.

3.4.2.3.1.1 California Spotted Owl

Fire-killed tree removal would occur on 7,607 acres using tractor logging systems on slopes less than 25 percent. No PACs within the PNF PAC network would be entered with fire-killed tree removal. Outside of PACs, there would be no removal of fire-killed trees from non-burned parcels or areas burnt at low severity (less than 50 percent basal area mortality). No fire-killed tree removal would occur within currently suitable spotted owl habitat (as defined above). Removal of fire-killed trees in non-suitable habitat would not change the existing condition of the amount of suitable and non-suitable habitat. Narrow corridors of dispersal (live-green forested) habitat within the analysis area, would not be treated for fire-killed tree removal.

Approximately 1,653 acres of fire-killed tree removal would occur in areas formerly known as PACs. Approximately 2,583 acres would occur in what was formerly designated as HRCA. This combined 4,236 acres proposed for fire-killed tree removal is not considered suitable owl habitat due to high severity fire.

There would be no new system road construction so no long-term increases in human activities are expected as a result of this action. There would be approximately 33 miles of temporary road constructed to accommodate logging systems; these would be decommissioned upon completion of the project. Road density would remain the same as pre-fire conditions, which is 2.62 miles of open road/square mile.

A cumulative effects discussion is included under alternative A.

3.4.2.3.2 MIS

3.5 Soil and Hydrology

3.5.1 Affected Environment

3.5.1.1 Soils

The defining soil characteristic is the current condition after the fire. Much of the burned area has sparse groundcover and wood debris. The BAER team found that the Moonlight

and Antelope Complex fires that covers most of the project area, burned with high burn severity (Rosel 2007). The sparse "moonscape" conditions together with highly erodible soils, in particular the granitics, create a high hazard for soil erosion. The worst area is at the confluence of Middle Lights Creek with several lower order watersheds, including East Branch Lights Creek, Smith Creek-Fant Creek, Morton Creek, and West Branch Lights Creek. In addition, the burned area has a high probability for a rain on snow event that would trigger flooding. The implication for soil productivity would be soil losses from debris flows and mudflows. Though these mass wasting events are not documented for the project area, at least some level of risk stems from a post burn environment where substantial storm events could occur. Erosion risk would be sustained for at least 2 years while hillslopes revegetate, then reduce quickly during years 3 through 5 (Rosel et al. 2007).

Burn severity for the Moonlight and Antelope Complex fire perimeters was 38 percent high severity, 37 percent moderate, 18 percent low and 7 percent unburned (Rosel et al. 2007). Ground observations of the high burn severity areas found soils still have good structure and intact fine roots, but soil cover and canopy was completely consumed. In limited areas hydrophobicity was found at 2 to 6 inches depth. Degraded root structure was also found in the top soil (Rosel et al. 2007).

The high severity conditions observed by the BAER team are due to the complete removal of vegetation cover. Hydrophobic layers only developed on metamorphic and volcanic soils and were from 2 to 6 inches deep (Rosel et al. 2007). However, hydrophobicity is a temporary condition (Shakesby et al. 2000) and not a substantial issue for soil drainage, especially on the prominently rocky metamorphic soils that are more robust to erosion.

3.5.1.1.1 Soil Cover

As stated above, soil cover was removed from the wildfire and ranged from 0 to 60 percent for the surveyed units. Most of the units in high burn severity areas have sparse groundcover. Only one unit, unit 15, had adequate amounts of ground cover. Ground cover was provided mostly by rock fragments greater than 3 inches on the intermediate axis, with minor amounts of basal vegetation. LRMP standards and guidelines direct that adequate ground cover for disturbed sites is to be determined for each Plumas NF project on a case-by-case basis. The forest plan offers guidelines for effective ground cover that vary by the soil erosion hazard rating. Effective ground cover should be maintained at 60 percent for soils with a high EHR, and 50 percent for soils with a moderate EHR (USDA 1990). Given that 65 percent of the treatment area soils have EHR of high or very high, effective ground cover should be considered no less than 60 percent in all units. Those units with ground cover $\geq$ 20 percent were underlain by Jurassic metamorphic and Tertiary volcanic rocks, which are more resistant to mechanical weathering than the granites, had large extents of outcrops, and stony. The remainder units in question were mostly in Cretaceous granites which weather relatively quickly into sandy textured, highly erodible soils. It is reasonable to assert that effective ground overall in the project is well below the PNF LRMP recommended guidelines virtually throughout the project area and would remain so until basal vegetation can re-establish.

3.5.1.1.2 Soil Compaction

Of the field reconnaissance proposed units, of which roughly half had signs of past harvest, no indication of past harvest impacts exceeding threshold for detrimental disturbance were found. The area of detrimentally compacted ground found during the survey was almost exclusively skid trails and landings, although not all skids and landings were deemed detrimentally compacted.

3.5.1.1.3 Down Woody Material

The average number of large down logs per acre in the surveyed, as might be expected, was very low. An amount of standing fire-killed should be retained that is adequate as eventual recruitment for downed wood to meet standards for number of logs per acre. The degree of decomposition among that down wood would obviously not be varied.

3.5.1.1.4 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. None of the units surveyed had any appreciable fine organics. There were significant areas in many units with a thin ash layer, on order of a few millimeters thickness. Although in some cases partially burned litter and duff existed, ash, when dried, may not present a sufficient buffer to rainfall and was not counted as effective cover.

3.5.1.2 Hydrology

Fire burned out the Large Woody Debris (LWD) in most channels, particularly first and second order streams. Sediment stored by LWD may be released, as well as new deliveries of sediment including ash may be freer to transport downstream (Faust 2007). In the larger channels LWD was only partially consumed. Burned trees on the banks have fallen into streams creating flow deflector that would divert water into stream banks create more erosion as well as destabilizing the banks themselves (Rosel et al. 2007). Observation during field visits was that those reaches within meadow areas were relatively untouched, and the burn severity was light on the meadow floodplain. Reaches in gorges such as Lower Lights Creek with large areas of out cropping were also only lightly burned.

Most of the survey reaches are in Pierce and Upper Indian Creek drainages with minor amounts in Cold Stream, Middle Lights Middle Creek, Moonlight and Moonlight Valley (Forest GIS records). About 6 percent of the total surveyed reaches or 1.6 miles had prevalent or extensive bank instability, primarily in Upper Indian Creek, and almost entirely within ephemeral and intermittent channels. About 1.4 miles of channel, all intermittent or ephemeral in nature were listed in the survey as having poor, inadequate amounts of LWD. All these reaches were in Middle and Upper Indian Creek drainages.

Moonlight Creek and Hungry Creek received an overall condition rating of good. Both the percentage of sediment in pool tails and the percentage of unstable banks were low, and these were also rated as good. Shade was also rated as good, with conditions of 96 percent. Sediment in pool tails however, was more than 15 percent, and rated as poor for Hungry Creek. Pierce Creek at Wheeler Sheep Camp and Boulder Creek at Hallett

Meadow rated at moderate to poor. Sediment in pool tail fines was high in both reaches, which rated at very poor and poor, respectively. Historic grazing activity has occurred around both reaches, and has contributed to bank instability.

Cooks, Moonlight, Lights and Indian Creeks had or have mining in or near the streambeds. Mining disturbed riparian areas and channels, creating at the very least over-steepened and unstable stream banks.

There is a confluence of many streams to form the main stem of Lights Creek: West Branch Lights Creek, upper Lights Creek, Bear Valley Creek, Morton Creek, Smith Creek, Fant Creek and East Branch Lights Creek. The channels in this area are broad and mobile with cobble/boulder dominate beds. Channels upslope of the confluence are steep with unstable banks. Prominent terraces have developed along Morton Creek immediately upstream of its confluence with East Branch Lights Creek. These features indicate that accelerated post-fire erosion and sedimentation is likely to increase channel instability and bank erosion in this area. The main channel of Lights Creek is likewise unstable with high sediment loading and a braided cobble-dominated channel for approximately one mile downstream of the confluence area. Abundant mine tailings and debris are present on the banks and in the channel. The tributary channels of Upper Lights Creek watersheds by contrast are steep and dominated by cobbles and boulders and appear to be stable. Mastication and mulching treatments were proposed under BAER to moderate the expected increase in sediment delivery to the streams (Faust 2007).

The Willow Creek channel and its tributary channels appear to be stable, armored as they are by large substrate or vegetation. Similarly, the main channel and tributaries of Pierce Creek, and Indian Creek are composed mostly of cobbles and boulders and appear stable. The channels of Moonlight Creek and its tributaries were fairly stable, though some areas of Moonlight Valley appear degraded. Middle Lights Creek is dominated by placer mining activity and the channels are degraded, and tailing piles cover banks and floodplains (Faust 2007).

3.5.2 Environmental Consequences

3.5.2.1 Alternative A (Proposed Action) and C– Direct, Indirect, and Cumulative Effects

The hydrology analysis area is based on state of California GIS watershed layers. The analysis area for soils effects are the treatment units themselves. The base layer was selected over the PNF corporate GIS layer for two reasons; it is more up to date and it contains the watershed numbering system that the Regional Water Quality boards use (common language).

3.5.2.1.1 Minor Issues

Post-fire logging would reduce large woody debris in the long-term.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

Reduced large woody debris would reduce soil productivity.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

Post-fire logging would reduce recruitment of large woody debris to streams.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

Post-fire logging, landing construction, road building, fireline construction, and road maintenance would cause soil disturbance and compaction.

Indicator:

- Not measured, discussed qualitatively.

Soil disturbance and compaction would increase erosion and subsequent delivery to streams.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

Increased erosion would result in reduced long-term soil productivity.

Indicator:

- Not measured, discussed qualitatively.

Soil disturbance and compaction would result in a reduction in soil productivity.

Indicator:

- Acres of ground cover enhancement

Log hauling would damage road surfaces which would increase erosion.

Indicator:

- Not measureable, discussed qualitatively.

Fine surface organic matter includes plant litter, duff, and woody material less than three inches in diameter that occurs over at least 50 percent of the activity area. This condition is not met in very high and high burn severity areas, nor would it be for up to 3 years or more after the fire.

Limbs and tops used for lop and scatter in helicopter and skyline units, and breakage during harvest in all units, would contribute to total LWD greater than 3 inches diameter in the immediate post-harvest condition. Fire ecology models (Tompkins and Moghaddas 2008) give estimates of over 7 tons per acre on average immediately after harvest, which exceeds the current and no action condition (Table 53). More increase is also due to fire-damaged trees dying within 3 to 5 years of the fire. Other areas that would contribute LWD, outside of treated ground but within the treatment units, are snag retention areas for wildlife and equipment exclusion zones within RHCAs.

Table 53. LWD values in tons per acre average in treatment units—summarized from fire ecology modeling and stand exam data (Tompkins and Moghaddas 2008).

Term	Alt A and C	Alt A and C	Alt. A	RHCAs	
	Tractor Units LWD > 3" diameter	Tractor Units, LWD > 12" diameter	Helicopter and Skyline Units LWD > 3" diameter	Tractor Units LWD > 3" diameter	Helicopter and Skyline Units LWD > 3" diameter
Post-Harvest	7.3	1.1	7.3	7.8	10.4
10 years after harvest	6.7	1.0	14.7	12.4	17.3
20 years after harvest	6.2	0.9	18.8	12.8	23.1
30 years after harvest	5.6	0.8	18.5	11.8	22.8

Limbs and tops used for lop and scatter in helicopter and skyline units, and breakage during harvest in all units, would contribute to total LWD greater than 3 inches diameter in the immediate post-harvest condition. Fire ecology models (Tompkins and Moghaddas 2008) give estimates of over 7 tons per acre on average immediately after harvest, which exceeds the current and no action condition (Table 53). More increase is also due to fire-damaged trees dying within 3 to 5 years of the fire. Other areas that would contribute LWD, outside of treated ground but within the treatment units, are snag retention areas for wildlife and equipment exclusion zones within RHCAs. It is expected that post-harvest LWD would improve soil cover over immediate post-fire conditions, as measured in the soil disturbance survey. Some soil cover gained in the interim, due to vegetative recovery however, would be lost by disturbance during harvest.

Because of biomass removal of standing fire-killed below 16 inched dbh, and harvest of standing fire-killed above 16 inches dbh, LWD amounts in tractor units are estimated to decrease in time from 7.3 tons per acre on average to 5.6 tons per acre on average 30 years after the fire. The reason is that removal of most standing fire-killed from the treatment units eliminates LWD recruitment. There would be some recruitment from those fire damaged trees that would die 3 to 5 years after the fire.

In the treated areas of tractor units, aside from wildlife snag retention areas and equipment exclusion zones in RHCAs, total LWD amounts greater than 3 inches dbh would be on low side of range of 5 to 10 tons per acre recommended for long term soil productivity (Graham et al. 1994; Brown et al. 2003).

Converting east side eco-type standards for 3 large logs a minimum of 12 inches dbh into tons per acre gives about 1.0 tons for ponderosa and Douglas fir type cover, using conversion factors from Brown et al. (2003). Therefore total tonnage of LWD greater than 12 inches dbh in the tractor units, would be marginal or below levels set by standards (Table 53).

All units would be hand planted with conifer seedlings. Preparation for planting is hand scalping of ground cover, of approximately 2 feet in diameter. The density of planting would be between 100 and 200 seedlings per acre, depending on burn severity and plant association groups of burn area. The total disturbance from planting constitutes about 1 percent of the planted area. These totals are not considered to be a significant detriment to the eventual recovery of ground cover, nor are the treatment plots large enough to be considered as detrimentally disturbed ground (USDA Forest Service, 1998).

In time, organic matter would gradually accumulate from litter, woody debris, forbs, and grasses. Nutrients would gradually accumulate due to inputs (in precipitation, dry deposition, throughfall, weathering of parent material, and nitrogen fixation) and retention. These processes would take decades.

Salvage logging impacts soil recovery after wildfire by extracting remaining organic matter in form of tree boles. The greatest impacts are within high intensity burn areas. Where wildfire burned hot, forest floor is missing and most of the trees are blackened. These areas are sensitive since live above-ground biomass is essentially removed. Site conditions are largely moderated with the remaining forest structure in the form of fire-killed wood. Fire-killed down and standing wood ameliorate site condition by forming micosites that shelter vegetation regrowth, harbor moisture and augment soil temperature with shade (Harvey et al. 1987; Franklin et al. 2002). These attributes improve soil growth potential, especially in dry areas such as south facing slopes. As standing fire-killed falls, this wood is further incorporated as brown cubicle rot that acts as a sponge for moisture.

A degree of activity within a watershed, beyond which an adverse effect might be expected is the TOC described previously in this report in units of ERA percent. An appropriate range for TOCs is 10 to 20 percent ERA (USDA Forest Service 1990). The TOC for a watershed is calculated by a numeration of sensitive ground within that watershed. The closer the calculated ERA value for the watershed is to the threshold value the greater risk the activities would have an overall detrimental impact to the watershed. The effect of activities decreases over time although the contribution of permanent roads to ERA does not change. Given the broad assumptions built in the ERA

method, TOCs are not absolute determinations of adverse impacts, but a point at which it is reasonable to expect measurable effects. Given the degree that many of the project watersheds exceed their TOC, it is especially appropriate to use the value as a yardstick of detrimental change.

The largest effect to hydrologic function to hill slopes in the project area is from the wildfire itself. Although the ERA method is not quantitatively predictive it may be used to show relative effects of different sources to watershed runoff. A total of 17 of the project area 23 watersheds are over forest designated TOC for ERA percentages. The fact that alternative C retains the ground base harvest, but drops the helicopter and skyline cable units has little effect on overall results, as ground base methods are by far the most disturbing to ground cover, which is the most important factor to hydrologic function of forested slopes. Classified project watersheds ERA percentage relative to TOC for alternative A, would be the same for alternative C.

Table 54. Summary of equivalent roaded acre (ERA) analysis for determining cumulative watershed effects.

Watersheds	ERA % Private	ERA % Alternatives		Total ERA%		
		Alt A	Alt C	Existing	Alt A	Alt C
Cold Stream	0.0	0.6	0.4	13.6	14.2	14.1
East Branch Lights C.	0.0	1.5	1.3	16.6	18.2	17.9
Freds C.	0.0	0.1	0.0	14.2	14.3	14.2
Indian C. blw Antelope-Babcock	0.0	1.2	0.6	19.7	20.8	20.3
Indian C. blw Antelope-Dam	0.0	0.3	0.2	14.6	14.9	14.8
Lonesome Canyon	1.2	0.3	0.2	28.1	28.4	28.2
L. Cooks C.	0.0	0.1	0.1	5.8	6.0	5.9
L. Indian C.	0.0	0.3	0.3	16.2	16.5	16.5
L. Lights C.	0.0	0.4	0.1	16.2	16.6	16.3
L. Lone Rock C.	0.0	0.7	0.4	15.6	16.3	16.1
Middle C.	0.0	0.5	0.3	12.2	12.7	12.5
Mid. Hungry C.	0.0	0.6	0.5	8.7	9.3	9.3
Mid. Lights C.	0.0	2.0	1.1	19.8	21.8	20.9
Moonlight C.	0.0	0.6	0.2	14.3	14.9	14.5
Moonlight Pass	0.3	0.1	0.0	21.0	21.1	21.0
Moonlight Valley	0.8	0.8	0.7	14.2	15.0	14.9
Morton C.	0.0	0.4	0.3	18.1	18.6	18.4
Pierce C.	0.0	0.1	0.1	9.9	10.0	10.0
Smith C.	1.9	0.8	0.7	20.7	21.4	21.4
Up. Hungry C.	0.0	0.1	0.1	12.0	12.1	12.1
Up. Indian C.	0.0	0.6	0.6	10.2	10.8	10.8
Up. Lights C.	0.3	0.1	0.0	16.8	16.9	16.8
West Branch Lights C.	0.5	2.3	1.7	19.4	21.6	21.0

Roads, though a steady and non-diminishing source of runoff effect are a minor one in the project area, accounting for 1 to 2 percent ERA across the watersheds. The ERA method is not spatial, so the true effect of roads may be greater or less than the value given, relative to their position on the valley slopes. Roads in steep slopes, with high cuts, tend to capture a degree of ground interflow particularly during storm events. Conveyance of this water through drainage ditches to low order draws are the primary

means by which forest roads advance the timing and/or increase runoff. Roads on the ridge lines obviously capture little except what precipitation falls directly on their running surfaces. Roads in the valley bottom may capture interflow, but at point where it was to daylight into the valley channel at any rate. Roads at mid-slope, particularly if there are multiple segments across a slope have the greatest potential for capturing storm flow and conveying to natural surface channels. It is at these crossings of roads and natural channels where the most significant resource damage occurs, typically by scour and bank erosion downstream, where accelerated velocities caused by crossing pipes and increased volume from the road conveyance degrades a channel.

Table 55. RHCA acres in high/very high ERH soils.

Logging System	RHCA Acres	Perennial RHCA	Intermittent RHCA
Helicopter or Cable	1211	603	411
Ground-Based	1163	303	178
Total	2374	907	589

All but one of the watersheds over the thresholds of concern because of the effect of fire. The exception is Moonlight Valley which has extensive logging on private ground. Lonesome Canyon, Upper Lights Creek and Smith Creek were other watersheds with very significant extent of private lands and logging on them. None of the proposed Forest treatments are other than minor proportions of ERA percentage (Table 54). Existing harvested land has actually a greater effect to runoff in most watersheds than the proposed action.

Erosion from harvest slopes, and subsequent sediment delivery to channels is expected to be elevated over normal conditions because of lack of ground cover. But in the event of precipitation that initiates erosion the overall lack of ground cover on burned slopes would be the greater source. Harvesting creates areas of compaction and displacement of soils, leading to localized incidences of overland flow, but BMPs, PNF LRMP standards and regional soil productivity guidelines would limit detrimental disturbances to soil to 15 percent or less of a treatment unit. The treatment units do not constitute the majority of slope area. Therefore actual harvest effects are a relatively minor proportion of the watershed, as shown in Table 54.

The bulk of the harvest, particularly by tractor is concentrated in the tributary headwaters of Lights Creek drainage, which confluence in a single locale at the top of the Middle Lights Creek sub-watershed. An additional and significant proportion of proposed harvest is in the Moonlight Creek drainage, which confluences with Lights Creek at the bottom end of the Middle Lights Creek sub-watershed. Further, the Middle Lights Creek is an epicenter of sorts for high burn severity. These factors in themselves would create high expectations of runoff increase downstream and within the Middle Lights Creek sub-watershed.

There have been few recorded fires that extend across more than one of the analysis watersheds. The largest fire in the Lights Creek drainage was in 1959 of 1400 acres in the Morton and Smith Creeks watersheds. The next largest was 1100 acres in 1996 in the Cooks Creek watershed, a steam that confluences with Lights Creek well downstream of

the project area. Therefore, a thoroughly unique situation exists in regards to runoff for Lights Creek, particularly within and below the Middle Lights Creek sub-watershed. Two of three important variables that could drive a very large runoff event occurred in the winter of 2007-2008. First, the fact of the fire and its most significant effect, the catastrophic loss of forest ground cover across virtually the entire landscape. Second, there was an early and heavy snowfall. The third factor would have been heavy rainfall in the mid winter months of January and February of 2008, a happenstance of 12 of 21 years during the period of record on the Indian Creek gage, which drove the 7 largest flood events recorded at the site. The occurrence of heavy rain and warm and breezy conditions in mid-winter is popularly referred to as the "pineapple express" because of the point of origin of these systems in the South Pacific Ocean near the Hawaiian Islands. These conditions can be present during El Nino episodes, but the latitude of the project area puts it between El Nino and La Nina influenced zones, and makes the correlation somewhat problematic (Barkhuff, 2008, personal communication). Most importantly is the frequent occurrence of warm and moist tropical air from the southwest moving over the Sierra Nevada Mountains in mid-winter when a thick blanket of snow may be already present. A further condition that certainly exaggerates this effect locally, and perhaps is a very significant factor, is the southwest aspect of the Lights Creek headwaters area roughly above the 5,000 foot elevation that is also the principle catchment area for the stream.

Therefore, over the next 3 to 5 years until sufficient ground cover is re-established there is a high risk of a large floods downstream of the project area, particularly within the Lights Creek drainage. Because of the effective lack of ground cover a flood could be potentially much larger than previous to the fire, with the same return interval of rainfall. And as discussed in the Hydrology section in Affected Environment it is the conclusion in this report that the Moonlight BAER Hydrology Report very probably underestimated the magnitude of potential runoff from the fire area.

3.5.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.5.2.2.1 Minor Issues

Post-fire logging would reduce large woody debris in the long-term.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

Reduced large woody debris would reduce soil productivity.

Indicator:

- Average tons/acre of large woody debris within the treatment units over the short-term and long-term

Post-fire logging would reduce recruitment of large woody debris to streams.

Indicator:

- Average number of snags (greater than 15 inches dbh) per acre available for large woody debris recruitment to streams

Post-fire logging, landing construction, road building, fireline construction, and road maintenance would cause soil disturbance and compaction.

Indicator:

- Not measured, discussed qualitatively.

Soil disturbance and compaction would increase erosion and subsequent delivery to streams.

Indicator:

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term

Increased erosion would result in reduced long-term soil productivity.

Indicator:

- Not measured, discussed qualitatively.

Soil disturbance and compaction would result in a reduction in soil productivity.

Indicator:

- Acres of ground cover enhancement

Log hauling would damage road surfaces which would increase erosion.

Indicator:

- Not measureable, discussed qualitatively.

Preliminary data gathered in fall, 2007, in mostly high severity burn tractor units shows those units are well below the recommended range (Table 53). Estimates of LWD for the current and in the short term are about 6.5 tons per acre on average across the treatment area (Tompkins 2008). In the longer term, because of recruitment from standing fire-killed, estimates range from 16 tons per acre 10 years after the fire to 27 tons per acre 30 years after the fire (Table 53).

Alternative B, the no action alternative, would have no adverse effects on soil microbes, including ectomycorrhizae. Recovery of soil microbial communities would occur gradually as vegetative communities return. Ectomycorrhizae are commonly associated with conifers and thus would follow their succession.

Seventeen of 23 project area watersheds are over thresholds set by the Forest, for management impacts that affect runoff. All but one watershed over threshold are due to the effects of the fire (Table 56). The exception, Moonlight Pass watershed is currently over threshold because of fire salvage harvest on private land. Salvage harvest in private lands most of which is above the forest managed land and in the headwaters of most analysis watersheds. Seven of the watersheds are in excess of 30 percent over TOC and it is reasonable to expect that under conditions of intense precipitation events, as discussed in preceding sections that significant increases in runoff would occur.

Table 56. Current ERA in project area watersheds.

Watershed	ERA% NFS*	ERA% PVT*	ERA% Roads	ERA% Fire	Total ERA%	ERA% TOC
Cold Stream	3.5	0.0	1.2	8.9	13.6	13
E.B. Lights	1.6	0.6	1.6	12.8	16.6	14
Freds	1.8	0.4	0.9	11.6	14.2	13
Indian blw Antelope, Babcock	1.7	0.0	1.4	16.6	19.7	13
Indian blw Antelope Dam	3.9	0.0	1.8	9.0	14.6	13
Lonesome Cyn	0.2	10.8	1.1	14.8	26.9	13
L. Cooks	0.5	0.0	0.8	4.5	5.8	12
L. Indian	2.5	0.7	1.8	11.2	16.2	12
L. Lights	0.0	2.2	0.9	13.0	16.2	14
L. Lone Rock	2.5	0.7	1.2	11.2	15.6	13
Mid. Creek	2.1	0.0	1.1	9.0	12.2	13
Mid. Hungry	1.7	0.0	1.5	5.6	8.7	13
Mid. Lights	0.2	0.7	1.3	17.6	19.8	14
Moonlight	0.4	1.1	0.8	12.0	14.3	13
Moonlight Pass	1.4	12.8	1.1	5.4	20.7	14
Moonlight Valley	0.8	1.4	1.6	9.5	13.3	13
Morton	1.0	4.0	1.3	11.8	18.1	14
Pierce	3.5	0.3	1.4	4.7	9.9	12
Smith-Fant	0.5	5.9	1.4	11.0	18.8	14
Up. Hungry	2.2	0.0	1.3	8.4	12.0	13
Up. Indian	2.4	1.1	1.0	5.8	10.2	12
Up. Lights	0.9	7.5	1.2	6.9	16.5	13
W.B. Lights	0.6	0.8	1.5	16.0	18.9	13

*--NFS = NFS lands; PVT = private land

Soil cover was removed from the wildfire and ranged from 0 to 60 percent for the surveyed units (0). Most of the units in high burn severity areas have sparse groundcover. Only one unit, unit 15, had adequate amounts of ground cover. Ground cover was provided mostly by rock fragments greater than 3 inches on the intermediate axis, with minor amounts of basal vegetation. PNF LRMP standards and guidelines direct that adequate ground cover for disturbed sites is to be determined for each Plumas NF project on a case-by-case basis. The forest plan offers guidelines for effective ground cover that vary by the soil erosion hazard rating. Effective ground cover should be maintained at 60 percent for soils with a high EHR, and 50 percent for soils with a moderate EHR (USDA 1990). Given that 65 percent of the treatment area soils have EHR of high or very high (Table 57), effective ground cover should be considered no less than 60 percent in all units. Those units with ground cover $\geq$ 20 percent were underlain by Jurassic metamorphic and Tertiary volcanic rocks, which are more resistant to mechanical weathering than the granites, had large extents of outcrops, and stony. The remainder units in question were mostly in Cretaceous granites which weather relatively quickly into sandy textured, highly erodible soils. It is reasonable to assert that effective ground overall in the project is well below the LRMP recommended guidelines virtually throughout the project area and would remain so until basal vegetation can re-establish.

Erosion risk across the project units for the treatment units using the Erosion Hazard Rating System (USDA 1990) in acres.

Erosion Hazard Rating			
Low	**Moderate**	**High**	**Very High**
210	6093	7343	1885

Table 57. Results of disturbance survey.

Unit #	Soil Cover %	Detrimental Compaction %	Down Logs per Acre	Canopy Cover %
11	28	0	<<1*	21
5a, 55b`	16	0	<1	15
15	60	5	<<1	19
16	38	0	~1	23
113c	50	0	<<1	20
113e	40	0	<1	11
22	25	5	~1	20
24	20	0	~1	6
26, 26f	12	6	~2	4
28	10	7	<1	13
26i	45	5	<1	24
31, 31c	5	5	<1	26
38a	0	0	<<1	3
76b	25	3	<1	11
52	5	0	<<1	8
54, 134	20	0	<1	28
59, 59b	0	0	<<1	9
96, 61a, 61b	5	0	<1	14
8	3	0	<1	21
79b, 92a	10	0	<<1	19
67	20	0	<<1	14
69	5	5	<<1	49

*--no downed wood within sample transects.

Typically in conditions of forest canopy and floor cover overland flow is a rare occurrence limited to areas of outcrops, or disturbance whether natural or due to activities. However, in the 30 units surveyed soil cover ranged from 0 to 60 percent with an average of 20 percent, and canopy cover ranging from 3 to 49 percent (Table 57). Given these low groundcover and overstory canopy conditions, overland flow could occur.

There would be no change in the TOC/ERA values by the implantation of alternative B (Table 56) and the greatest effect to flow would be within those seventeen of the twenty-three subwatersheds analyzed that are currently over threshold post fire and would remain over threshold. With a high water event there would be potential for a debris flow to occur within the stream courses in those subwatersheds (Table 56).

3.6 Botany

3.6.1 Affected Environment

3.6.1.1 Threatened, Endangered, Candidate, and USDA Forest Service R5 Sensitive Botanical Species

No Threatened, Endangered, or Candidate botanical species were located during past surveys. One R5 Forest Service Sensitive botanical species, *Penstemon sudans* (Susanville beardtongue), was located during 2005 surveys. Susanville beardtongue is known from 38 occurrences in California, most of which occur on land managed by the Bureau of Land Management in the vicinity of Susanville, California (CNDDB 2008 and PNF records). Two occurrences are known from the PNF. The number of plants at known occurrences varies from fewer than 50 to more than 1,000. Although often abundant where it occurs, Susanville beardtongue is restricted to a relatively small area in Lassen and Plumas counties, California, and adjacent Nevada.

3.6.1.1.1 Noxious Weeds

The California Department of Food and Agriculture's noxious weed list (California Department of Food and Agriculture 2004) divides noxious weeds into categories A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds eradication or containment is at the discretion of the County Agricultural Commissioner. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

There are 406 locations of priority weeds known within the botany analysis area. One A-rated weed, *Centaurea maculosa* (spotted knapweed), is known from seven locations. One B-rated weed, *Cirsium arvense* (Canada thistle) is known from 390 locations. Three C-rated weeds are known from the project area *Centaurea solstitialis* (yellow starthistle), *Taeniatherum caput-medusa* (medusahead), and *Cytisus scoparius* (Scotch broom). Yellow starthistle occurs at 2 locations, Medusahead at 3, and Scotch broom at 4 in the botany analysis area.

Of the 406 locations within the botany analysis area, 75 occur in alternative A proposed treatment units and 62 in alternative C proposed treatment units. There are three locations of spotted knapweed, two of medusahead, one of yellow starthistle, and 69 of Canada thistle in alternative A. There are three locations of spotted knapweed, one of medusahead, and 58 of Canada thistle in alternative C.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

The area analyzed in this document is referred to as the botany analysis area and encompasses approximately 78,615 acres and consists of all proposed treatment units, access roads to the treatment units, and the area within 1 mile of treatment unit boundaries. This area was chosen to capture all rare plants and noxious weed species that occur (a) within the proposed treatment units or (b) have suitable habitat within the

project area as well as a "source" (potential for seed dispersal) population located within close proximity to the proposed activities.

It is difficult to state with certainty when the effects of the proposed treatments would no longer be altering the life history dynamics (such as germination, growth time necessary to reach sexual maturity, quantity of viable seed produced in a lifetime) 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 method is difficult for this project because of the intensity and scale of the Moonlight and Antelope Complex fires. Natural regeneration of stands after large fires is variable and unpredictable giving factors such as pockets of unburned stands, seed trees, chance seed dispersal, and potential for future fires. The fires of 2007 have permanently changed the vegetation pattern across the botany analysis area.

3.6.2.1.1 USDA Forest Service R5 Sensitive Botanical Species

No direct effects on Susanville beardtongue (*Penstemon sudans*) are anticipated because the known locations would be flagged for avoidance. The indirect effects of the proposed action would likely be negligible to slightly beneficial. Susanville beardtongue is found in dry, naturally open areas with little or no canopy or vegetative cover. Because this species it is found in open habitats, the proposed action may increase the amount of suitable habitat for this species across the landscape. There are 4 known Canada thistle locations in unit 22 near the known locations Susanville beardtongue. These locations would be flagged for avoidance so they are not spread closer to the Susanville beardtongue by project activities. It is estimated that patches of Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species (Donald 1990). At 8 to 12 feet per year it would take many years for the existing sites of Canada thistle to impact the existing sites of Susanville beardtongue.

The direct and indirect effects on this species from alternative A would be negligible to slightly beneficial, so there would likely be a low risk of cumulative effects. There are no known specific and documented direct and indirect effects on this species from past activities because this species was discovered in the area in 2004 and added to the Sensitive species list in 2006. A query of the Forest Service Activity Tracking System (FACTS) and subsequent overlay with Susanville beardtongue locations in proposed units reveals 3 past activities. These past projects have likely had some negative effect to Susanville beardtongue. The effects of the Moonlight Fire would be assessed in the summer of 2008. It is not possible for the effects of the Indicator or Borderline III sanitation salvage projects to be assessed because no pre-project data exists.

One current project, Moonlight Roadside Safety and Hazard Tree Removal Project, also overlaps with Susanville beardtongue. This location would be flagged for avoidance before project implementation. Project effects are similar to those of this project. No other projects in appendix B are likely to contribute to the direct, indirect, or cumulative effects of *Penstemon sudans* in the botany analysis area.

3.6.2.1.1.1 Minor Issues

Soil disturbance and compaction would affect sensitive plants.

Indicator:

- Not measured, discussed qualitatively.

3.6.2.1.2 Noxious Weeds.

3.6.2.1.2.1 Minor Issues

Soil disturbance and compaction would result in an increase in noxious weeds.

Indicator:

- Risk of introduction and spread of invasive plant species

The project standard management requirements are designed to minimize risk of new weed introductions, minimize the spread of spotted knapweed, yellow starthistle, medusahead, and Scotch broom within and between units, and minimize likelihood of spread of Canada thistle from infested units to uninfested units. This project is likely to spread Canada thistle within already infested units.

Table 58. Summary of the weed risk assessment factors considered.

NON-PROPOSED ACTION DEPENDENT FACTORS		
Factors	**Variation**	**Risk**
1. Inventory	Incomplete, scheduled for spring and summer 2008.	High risk due to lack of baseline information.
2. Known Noxious Weeds	Priority species (spotted knapweed, yellow starthistle, medusahead, and Scotch broom) present, Canada thistle is abundant	High priority to prevent spread from infested units to uninfested units; prevention of weed introductions is a high priority.
3. Habitat vulnerability	Mostly, burned vegetation in an early stage of recovery. High historical disturbance, high recent disturbance	High vulnerability.
4. Non-project dependent vectors	Moderate current vectors	Moderate risk.
PROPOSED ACTION DEPENDENT FACTORS		
5. Habitat alteration expected as a result of project.	Moderate to high ground disturbance.	High risk
6. Increased vectors as a result of project	Up to 33 miles of temporary roads, road maintenance, short-term traffic	High risk

NON-PROPOSED ACTION DEPENDENT FACTORS		
Factors	**Variation**	**Risk**
implementation	increase	
7. Anticipated weed response to proposed action	All SMR and mitigation measures implemented	High risk of Canada thistle spread within infested units, low risk of new introductions, moderate risk of spotted knapweed, yellow starthistle, medusahead, and Scotch broom spread.

3.6.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.6.2.2.1 R5 Forest Service Sensitive Botanical Species.

No direct effects are anticipated because no project related activities would occur. The indirect effects of the no action would likely be negligible. Susanville beardtongue is found in dry, naturally open areas with little or no canopy or vegetative cover. There are 4 known Canada thistle locations near the known locations Susanville beardtongue. It is estimated that patches of Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species (Donald 1990). At 8 to 12 feet per year it would take many years for the existing sites of Canada thistle to impact the existing sites of Susanville beardtongue.

Because the direct and indirect effects of this project are expected to be negligible to minor, they would not substantially contribute to the effects from past, present, and future activities. The effects of other projects have been described under the proposed action above. The effects of those projects are the same for this alternative.

3.6.2.2.1.1 Minor Issues

Soil disturbance and compaction would affect sensitive plants.

Indicator:

- Not measured, discussed qualitatively.

3.6.2.2.2 Noxious Weeds

3.6.2.2.2.1 Minor Issues

Soil disturbance and compaction would result in an increase in noxious weeds.

Indicator:

- Risk of introduction and spread of invasive plant species

Because no project related activities would occur the risk of new weed introductions, spreading spotted knapweed, yellow starthistle, medusahead, and Scotch broom within and between units, and spreading Canada thistle from infested units to uninfested units is very low.

3.6.2.3 Alternative C – Direct, Indirect, and Cumulative Effects

3.6.2.3.1 R5 Forest Service Sensitive Botanical Species.

No direct effects would occur because Unit 21 is not a harvest unit in this alternative. The indirect effects of the tractor harvest alternative would likely be negligible. Susanville beardtongue is found in dry, naturally open areas with little or no canopy or vegetative cover. Removal of fire-killed trees from unit 22 may slightly increase habitat availability for Susanville beardtongue. The 4 known Canada thistle locations near the known locations Susanville beardtongue would continue to expand at an estimated rate of 8 to 12 feet per year (Donald 1990). At 8 to 12 feet per year it would take many years for the existing sites of Canada thistle to impact the existing sites of Susanville beardtongue.

Because the direct and indirect effects of this project are expected to be negligible to minor, they would not substantially contribute to the effects from past, present, and future activities. The effects of other projects have been described under the proposed action above. The effects of those projects are the same for this alternative.

3.6.2.3.2 Minor Issues

Post-fire logging, landing construction, road building, fireline construction and road maintenance would cause soil disturbance and compaction. Soil disturbance and compaction would increase erosion and subsequent delivery to streams. Increased erosion could result in reduced long-term soil productivity. Increased sediment delivery could result in changes to stream channel morphology and water quality, which could affect downstream fish habitat. Soil disturbance and compaction could result in: an increase in noxious weeds, reduction in soil productivity, short-term production of dust, damage to heritage resources, and affects to sensitive plants.

Indicator(s):

- Equivalent roaded acre (ERA) values as a percentage of the Threshold of Concern (TOC) area over the short-term and long-term
- Risk of introduction and spread of invasive plant species
- Acres of ground cover enhancement

3.6.2.3.2.1 Noxious Weeds.

The direct, indirect, and cumulative effects described under the proposed action above are the same for this alternative.

3.7 Heritage Resources

3.7.1 Affected Environment

3.7.1.1 Pre-Historic Period

Archaeological studies on the Mt. Hough Ranger District have primarily been limited to cultural resource inventories for proposed Forest Service activities. Because intensive archaeological research in the Moonlight and Wheeler Project sufficient to define prehistoric complexes and establish a reliable cultural chronology is not available, cultural assessments and interpretations for the analysis area rely upon extrapolations from several studies that were completed for lands adjacent to the analysis area.

Archeological investigations at PNF have revealed Native American occupation spanning at least 8,000 years. Heritage resources include flaked-stone artifact scatters, which reflect resource procurement activities and seasonal campsites, and habitation sites with midden deposits and, in some instances, housepits. Flaked-stone artifact scatters documented in the analysis area consist of flaked-stone tools, debris, and occasionally groundstone artifacts that most likely resulted from one or more occupational episodes. Obsidian sources north and east of the analysis area account for the majority of the lithic material used in flaked-stone tool manufacturing, although locally available chert and igneous rock sources were also used. The distribution of Native American archeological sites in the analysis area appears to have been influenced by the occurrence of perennial or reliable intermittent water sources, with most sites found in close proximity to these features.

3.7.1.2 Ethnographic Period

The Moonlight and Wheeler Project is in the ethnographic territory of the Maidu, also known as the Mountain or Northeastern Maidu (Dixon 1905:123-125; Kroeber 1925:391-392; Riddell 1978:370-371). The Maidu are a linguistic subfamily of the Maiduan family, Penutian stock (Shipley 1978:83). There are other two languages in the Maiduan family, Konkow (Concow, Northwestern Maidu) and Nisenan (Southern Maidu). Maidu dialects were probably spoken in four major areas, known as American Valley, Indian Valley, Big Meadows, and Susanville.

Maidu territory included the drainages of the Feather and Susan Rivers, in the high mountain meadows of the Sierra Nevada generally 1,219 meters (4,000 feet) above sea level or higher. This homeland was bounded by Lassen Peak to the north, the Sierra Buttes to the south, present-day Quincy on the west, and extending into the Great Basin to the east between Honey and Eagle Lakes. By the time of contact, however, the Maidu had withdrawn from the Honey Lake area, which was taken over by neighboring Paiute. Neighboring groups included the Konkow on the lower reaches of the Feather River to the west, Yana to the northwest, Atsugewi and Achumawi to the north, Nisenan to the southwest, with Northern Paiute and Washoe to the east.

Today, approximately 2,500 Maiduan people live on seven rancherias (Auburn, Berry Creek, Chico, Enterprise, Greenville, Mooretown, and Susanville) and the Round Valley Reservation, located in Plumas and Butte Counties (Alliance of California Tribes 2005). The Konkow Maidu were forcibly marched to the Round Valley Reservation in 1863, with few provisions or water over a long, hot dry trail. The Greenville Rancheria was

originally called the Indian Mission, which was allotted several parcels of land. The Rancheria was restored to federal recognition in 1983, and three or four of the original land allotments were also restored to its members. Nearly 200 members are serviced today by this federally recognized group in Greenville, Plumas County.

3.7.1.3 Historic Period

The majority of the current analysis area is within Plumas County, with minor acreage to the north extending into Lassen County. When Plumas County was formed in 1854 from portions of Butte County and named for the river that flows through it, the Spanish name for the river, "Plumas," was employed. Around this time, "El Rio de las Plumas" was also anglicized and became known as the Feather River. Some territory was transferred from Plumas to Lassen County in 1864. Quincy was later named the county seat (Plumas 2005).

The following history of Plumas County and the analysis area is divided into three major themes: gold and copper mining, ranching and farming, and timber industry. Reference is made to a few of the previously recorded archaeological sites pertaining to the history within the Moonlight and Wheeler Project. Today, the county remains rural in character, with a population density of eight people per square mile, only one incorporated city in the entire county (Portola), and only three stoplights (two in Quincy and one in Portola) The county boasts 1,000 miles of rivers and streams, more than 100 lakes, and over a million acres of National Forest (PNF 2005).

3.7.1.3.1 Gold and Copper Mining.

The history of Plumas County is firmly entwined with the Gold Rush and the elusive search for "Gold Lake" by Thomas Stoddard and other miners. In the fall of 1849, Stoddard and his partner discovered a lake with large gold nuggets somewhere in the vicinity of Sierra Valley and Downieville. After losing his way and reaching the gold camps in the Downieville-Nevada City region, Stoddard's tale encouraged thousands of miners to search for the lake in the mountains that would become Plumas and Sierra Counties (Young 2003:20-24).

3.7.1.3.2 Ranching and Farming.

The growth of ranching and farming in the region was a direct effect of the Gold Rush and the demands for food and transport (mules and horses). Ranching in the fertile valleys of Plumas County has roots as early as 1850 when miners were rented grasslands for their mules. Adjacent to the current analysis area, hay and oats were grown in Indian Valley. The first gristmill in Indian Valley was constructed in 1856, with 8,000 tons of hay cut in 1876. The valley was also famous for its horses and the quality and quantity of its butter. By 1880, the valley had a large population approaching 2,000 individuals. Ranching in the area grew to include raising beef and dairy cattle, sheep, and hogs; farmers grew hay, oats, barley, potatoes, vegetables, and fruit orchards. The Taylorsville Creamery sold butter, cheese, and milk. A store and stage stop was established around 1880 in the Genesee Valley at the southern terminus of the current analysis area (Young 2003:52-55).

3.7.1.3.3 Timber.

The initial growth of the timber industry in the region is another result of the Gold Rush and the mining industry. The first sawmill in Plumas County was erected circa 1850 at Rich Bar on the Middle Fork of the Feather River. Other mills were erected in 1852 at Rich Bar on the East Branch of the North Fork of the Feather River. By 1855, there was a mill in Indian Valley, which was powered by diverting the water from Indian Creek. Initially hauled by oxen, mules, or horses to the mills, much of the wood was used to shore up the expanding mine tunnels and then as supports for hydraulic mining (Young 2003:79-80).

3.7.2 Environmental Consequences

3.7.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

3.7.2.1.1 Minor Issues

Soil disturbance and compaction would result in damage to heritage resources

Indicator:

- Not measured, discussed qualitatively.

The treatments proposed under the action alternatives would have no direct, indirect, or cumulative effects on heritage resources, since all archaeological sites would be protected using Standard Resource Protection Measures. However, by protecting heritage resource sites from project activities under all action alternatives, there may be a cumulative effect of creating islands of unthinned, unburned fuels. These islands may burn hotter and longer that treated areas in the event of a fire. In general, past, present and foreseeable future events have had cumulative effects of varying degrees on heritage resources. There is no substantive difference in cumulative effects predicted for heritage resources between the alternatives.

3.7.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.7.2.2.1 Minor Issues

Soil disturbance and compaction would result in damage to heritage resources

Indicator:

- Not measured, discussed qualitatively.

No project treatment activities would occur under the no-action alternative; hence, there would be no effects on heritage resources. Under the no-action alternative, the exclusion of fire and other treatments across the landscape would lead to continued natural accumulation of organic litter (duff, branches, and large branches) due to future insect, fire, or drought-related mortality. This may result in the production of more intense burning through heritage resource sites in the event of a wildfire.

3.7.2.3 Alternative C – Direct, Indirect, and Cumulative Effects

3.7.2.3.1 Minor Issues

Soil disturbance and compaction would result in damage to heritage resources Indicator: ▪ Not measured, discussed qualitatively.

The treatments proposed under the action alternatives would have no direct, indirect, or cumulative effects on heritage resources, since all archaeological sites would be protected using Standard Resource Protection Measures. However, by protecting heritage resource sites from project activities under all action alternatives, there may be a cumulative effect of creating islands of unthinned, unburned fuels. These islands may burn hotter and longer that treated areas in the event of a fire. In general, past, present and foreseeable future events have had cumulative effects of varying degrees on heritage resources. There is no substantive difference in cumulative effects predicted for heritage resources between the alternatives.

3.8 Scenery

3.8.1 Affected Environment

The landscape in the Moonlight and Antelope Complex fire areas ranges from the flat areas near North Arm and Genesee Valley, to moderately and extremely steep slopes. The forests are primarily pine-dominated mixed conifer and red fir forest types; red and white fir-dominated forests exist at higher elevations. However, a large portion of these forests burned under moderate to high vegetation burn severity drastically changing the forest vegetation type in a large portion of the area and consequently, heavily influencing the existing landscape character of the area.

Impacts of the Moonlight and Antelope Complex fires vary greatly. Visual effects of the fires were most obvious directly after the fire occurred. Changes to vegetation patterns in the area have created stark contrasts to the surrounding forest character that negatively affects the setting and recreation experience. Areas that burned under high severity are now dominated by charred, fire-killed skeletons of trees and shrubs. In these areas, the forest floor is covered by ash with little to no vegetative ground cover. Portions of the fires that burned under moderate severity include areas where trees survived, but were injured by the fire. Within these areas, post-fire mortality is expected to occur due to damage of tree crowns and cambium layers. In these areas, much of the low growing vegetation and ground cover have burned. Throughout portions of the fires areas, the fires burned with low severity where trees and islands of ground cover and brush remain intact.

Scenic resources include views of naturally appearing landscapes such as landforms, rock formations, and water features and are important to forest visitors who may enjoy views from places like Antelope Lake Recreation Area. Viewpoint opportunities are also important along forests roads such as the Janesville-Antelope-Taylorsville Road (NFS Road 172), the Lights Creek Road (County Road 213), and the Diamond Mountatin Motorway (Forest Service Road 28N02).

The Visual Quality Objectives (VQOs) contained in the PNF LRMP (1988) are used to identify and classify scenic resources in the Moonlight and Antelope Complex fires area.

The VQOs were mapped as part of the forest planning process using Agriculture Handbook 462 – Visual Management System, volume 2, chapter 1 (USDA 1974). The VQOs describe different degrees of acceptable alteration of the natural and characteristic landscape. The objectives are considered the measurable standards for the management of the "seen" aspects of the land. The following VQO definitions apply to the landscape:

Retention—activities are not to be evident to the casual forest visitor.

Partial Retention—activities may be evident but must remain subordinate to the characteristic landscape.

Modification—activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the Foreground or Middle ground.

The majority of the analysis area has a VQO of modification. However, there are areas where VQOs are classified as retention and partial retention:

3.8.2 Environmental Consequences

3.8.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

The geographic area analyzed for effects on scenic resources, the analysis Area, is the Moonlight and Antelope Complex fire perimeters. The analysis area was bounded in this manner in order to incorporate scenic views from campgrounds, lakes, and forest roads that were affected by the fires. This boundary also includes portions of the Antelope Lake Recreation Area and Janesville-Antelope-Taylorsville Road.

The timeframe considered for cumulative effects is based on past and present vegetation management activities and wildfires. As discussed in section 3.3.1, past management activities, but most importantly, the recent Moonlight and Antelope Complex fires have contributed to the existing scenic landscape. Future activities were considered (appendix B) in this analysis but only until the time that project implementation has been completed. Unanticipated future wildfires and other treatments could occur prior to completion of the Moonlight and Wheeler Project, which could affect the scenic character.

3.8.2.1.1 Minor Issues

Post-fire logging would change visual characteristics.

Indicator:

- Percent of each visual quality objective (retention, partial retention, and modification) salvaged

Salvage harvesting and reforestation activities would result in noticeable impacts to scenic integrity and landscape character under both action alternatives; however, snag retention areas and remaining snags within Riparian Habitat Conservation Areas (RHCAs), as well as untreated areas within the analysis area would contribute to breaking up the continuity of such activities. It may be reasonably expected that management activities would generally exceed the PNF LRMP VQOs in the short term (0 to 5 years) and that the treatment units would be best classified as VQO of modification 5 to 30 years post harvest. Within areas that burned with high severity, the majority of the fire-killed trees would be harvested and the area would appear barren until grasses, brush, and newly planted trees become established. Stumps would be visible along the immediate foreground of roads while such areas would appear as barren patches of various sizes in middle ground views from roads. Snag retention areas and snags within RHCAs as well as untreated areas within the analysis area would provide an important vertical element that may break up the continuity of barren patches within the middle ground views. Areas that burned with low to moderate severity would retain trees that survived the fire and would enhance views of the surrounding landscape.

Table 59. Percent of each visual quality objective proposed for salvage harvesting under alternatives.

Visual Quality Objectives			
Alternative	Modification	Partial Retention	Retention
A	19%	12%	14%
B	--	--	--
C	10%	3%	0.4%

In the long term (5 to 30 years and beyond), assigned VQOs would be achieved as reforestation occurs and the effects of management becomes less apparent. Scenery resources would be characterized by established and developing young plantations where removal of fire-killed trees and competing vegetation would enhance the establishment, growth, and development of planted tree seedlings. Variable survival in cluster plantations would contribute to the heterogeneity of these stands and should not be apparent to the forest visitor. Standing snags would remain within snag retention areas and untreated areas and would provide vertical elements to landscape views dominated by green textures of an intermixture of brush and trees. As cluster plantations develop into pole size trees, harvested and planted areas would appear as natural green textures that would blend with middle ground and background views of the surrounding forest landscape.

Past activities and wildfire events, most importantly the Moonlight and Antelope Complex fires have cumulatively shaped the scenic landscape character of the analysis area. Current and proposed projects such as the roadside hazard tree removal projects and other salvage projects listed in appendix B of the draft EIS would contribute to adverse short-term effects to foreground and middle ground views. Reforestation activities associated with the action alternatives and additional reforestation projects listed in

appendix B would result in enhancing VQOs by providing for green textures and landscapes as newly planted trees are established and develop into pole-size trees. This would contribute to tempering the longevity and duration of the short-term effects to scenic integrity and landscape character by promoting forested stand conditions that would blend in with the surrounding forest landscape. Other activities listed in appendix B would not have noticeable or measurable effects to foreground, middle ground, and background scenery, scenic integrity, or landscape character.

3.8.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

Post-fire logging would change visual characteristics.

Indicator:

- Percent of each visual quality objective (retention, partial retention, and modification) salvaged

Management activities (salvage harvesting and reforestation) would not occur and therefore no visible changes beyond natural processes would result from this alternative.

Alternative B would result in the least visible change from the natural appearance of the existing burned landscape. Human caused changes would not be evident and VQOs would be achieved. In the short term (0 to 10 years), areas that burned with high severity would continue to appear as blackened hillsides with tree skeletons. These areas would be dominated by weathering snags mixed with a variety of brush as evidenced in recent past fires such as the unmanaged areas of the Storrie fire (2000), Stream fire (2001), and Boulder fire (2006). Areas that burned with lower severity would be dominated by views of individual and groups of live trees and brush species.

In the long term (10 to 30 years and beyond), the area would still achieve the PNF LRMP VQOs, but visual quality would be reduced as snags fall to the ground. Areas that burned with high vegetation burn severity would be dominated by an intermix of jack-strawed fallen snags and brush. The vertical element of standing snags would not be apparent resulting in large continuous brushfields. Scenery resources would take longer to recover to previous forest character than with action alternatives as brush dominance of the site may slow and/or hinder the establishment and development of natural regeneration.

Past activities and wildfire events, most importantly the Moonlight and Antelope Complex fires, have cumulatively shaped the scenic landscape character of the analysis area. The no-action alternative would perpetuate adverse cumulative effects on the scenic quality of the analysis area over time because re-establishment of forested conditions may be slowed and/or hindered. This could result in a vegetative type change from a landscape dominated by forested conditions to a landscape dominated by brushfields for decades, if not a century to come.

3.9 Recreation and Mining

3.9.1 Affected Environment

Dispersed recreation use is moderate in the project area. Season of use is generally May through November, with activities including camping, hiking, hunting, horseback riding,

mountain biking, off highway vehicle riding, fishing, firewood cutting, wildflower viewing, and rock hounding by individuals and small groups. January and February may see light use of snowmobile and cross-country skiing activities in the area.

Immediately adjacent to the east of the Moonlight and north of the Antelope Complex fires perimeters is the Antelope Lake Recreation Area that encompasses 2,300 acres, includes three developed campgrounds, one picnic area, and one boat ramp. The Recreation Area receives approximately 30,000 visitor days per year.

There are approximately 17 miles of non-motorized trails within the project area. The Antelope-Taylor Trail is 10 miles long, the Cold Stream Trail is 3 miles, and the Middle Creek Trail is 4 miles long.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

Refer to section 3.3.1 for recreation and mining analysis area and time frame rationale which are identical to Forest Vegetation.

None of the Antelope-Taylor Trail overlaps with either fire perimeter or treatment units. Less than one mile of the Middle Creek Trail overlaps with the Antelope Complex fire perimeter and less than one half mile of this trail overlaps with a treatment unit and is congruent with the treatment unit boundary. Almost all of the Cold Stream Trail overlaps with the Antelope Complex fire perimeter; however in this case the trail winds through unburned areas or low vegetation burn severity and does not overlap with any treatment units.

3.9.2.1.1 Minor Issues

Post-fire logging activities would cause a short-term reduction of public access and displacement of recreational users.

Indicators:

- Miles of public access roads
- Duration of delays or closures for public access roads

Currently there are 353 miles of open existing roads within the analysis area, none of which are proposed for closure or decommissioning after project implementation. Only some of these roads overlap with treatment units and only these would be impacted by project implementation activities. Project implementation is expected to occur for 12-24 months; therefore closure of specific roads at specific times to public access would result from project implementation activities and would diminish after project completion.

Cumulatively closure to public access would increase slightly from other projects within the analysis area; however those activities would have a negligible effect on public recreation opportunities in the vicinity of those projects and project implementation activities.

3.9.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

3.9.2.2.1 Minor Issues

Post-fire logging activities would cause a short-term reduction of public access and displacement of recreational users.

Indicators:

- Miles of public access roads
- Duration of delays or closures for public access roads

No public access closures are expected to result from the no action alternative as no project activities would be proposed under this alternative.

Cumulatively closure to public access would increase slightly from other projects within the analysis area; however those activities would have a negligible effect on public recreation opportunities in the vicinity of those projects and project implementation activities.

3.10 Range

3.10.1 Affected Environment

The range analysis area occurs within the boundaries of eleven livestock grazing allotments. Acres of each allotment, season of use, and number of livestock are presented in Table 60.

Table 60. Grazing allotment information within wildlife and forest vegetation analysis area.

Allotment	Acres in analysis area	Number of Livestock	Season of Use
Fitch Canyon	32	317	June 3 to Sep 2
Bass	257	60	June 1 to Sep 30
Doyle	355	100	June 1 to Sep 15
Antelope Lake	772	150	Sep 3 to Oct 4 (no use in 2008)
Jenkins	1488	600	July 15 to Sep 1
Antelope	2190	207	June 14 to Oct 8
Hungry Creek	10556	VACANT	VACANT
Clarks Creek	12185	207	July 15 to Oct 1
Taylor Lake	13750	VACANT	VACANT
Lights Creek	17437	24	June 1 to Sep 1
Lone Rock	26815	116	June 16 to Sep 15 (no use in 2008)

The majority of the range analysis area is composed of the Hungry Creek, Clarks Creek, Taylor Lake, Lights Creek, and Lone Rock Allotments. Hungry Creek and Taylor Lake allotments have been closed to grazing for over 10 years. There are no plans to activate these vacant allotments at this time. Grazing capacity within the other allotments

is based on the primary range (meadow systems) and not on secondary or transitory range. At this time there are no plans to increase livestock stocking rates or use due to the increase in transitory range created by the fire.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A (Proposed Action) and C – Direct, Indirect, and Cumulative Effects

The range analysis area is identical to that of the Wildlife, Forest Vegetation, and Fire, Fuels and Air Quality analysis areas. Refer to section 3.3.1.1for a complete discussion of the analysis area, time frames, and justifications for the analysis area and use of time frames.

Two allotments, Lone Rock and Antelope Lake, will receive no livestock use in 2008 (Scott Lusk, pers. comm.). For the remaining seven active allotments within the fire perimeter there are no plans to adjust livestock numbers, season of use or livestock distribution in the short term (2008 or 2009 grazing season). This means that there would be no rest period, or allowance for a non-grazed growing season, to occur to allow for vegetation recovery without livestock. It is expected that first year flush of grasses/forbs and riparian species would occur along wetter sights (stream courses, meadows) and this would attract livestock, leading to concentrated use along these sensitive areas. This would probably have a short term effect on recovery of riparian vegetation, including willow, aspen, and wet meadow. Concentrated livestock use in these areas would delay and possibly impede stream bank recovery and increase compaction around wet sites. Thus it is anticipated that some short term delay in recovery of riparian habitat would occur.

Project activities require coordination between the Forest Service Range specialist and the range permittee to ensure that livestock are kept away from active timber falling operations and truck haul routes. Direct effects on permittees and their cattle would be minimized through annual operating instructions, where the permittee schedules livestock to move to grazing area not affected by treatments. Vehicle collisions with cattle that may be along roads would be avoided by ensuring that contracts contain safety specifications for vehicle speeds and by alerting contractors on where cattle may be present.

The minor indirect effect on livestock form project activities would be in the form of increased stress cause by altering grazing rotations. Increased stress levels in livestock could result in a reduction in weight gain in calves, and a reduced conception rate in cows. Disturbance could also make cows more nervous, high strung, and harder to gather in the fall.

It is anticipated that some short term delay in recovery of riparian habitat would occur, which indirectly affects species in section 3.4 in terms of prey population recovery and availability. Prey species that traditionally use riparian vegetation as an essential component of habitat include passerine birds, microtine rodents, and insects. On the other hand, the increase in transitory (upland) range, may take some late season grazing pressure off of the riparian areas with a flush of dryland grass/forbs that livestock may find palatable. Grazing in these uplands reduces the amount of shrub and herbaceous cover available for prey species such as voles, squirrels, woodrats, and lagomorphs.

Based on the impacts of livestock grazing on the suitable habitat of species listed in section 3.4, this indirect effect would add short term cumulative impacts to individuals and habitat trends for these species.

3.10.2.2 Alternative B (No Action) – Direct, Indirect, and Cumulative Effects

There would be no direct, indirect, or cumulative effects to cattle, cattle grazing, or associated allotments as no project activities would occur.

It is anticipated that some short term delay in recovery of riparian habitat would occur, which indirectly affects species in section 3.4 in terms of prey population recovery and availability. Prey species that traditionally use riparian vegetation as an essential component of habitat include passerine birds, microtine rodents, and insects. On the other hand, the increase in transitory (upland) range, may take some late season grazing pressure off of the riparian areas with a flush of dryland grass/forbs that livestock may find palatable. Grazing in these uplands reduces the amount of shrub and herbaceous cover available for prey species such as voles, squirrels, woodrats, and lagomorphs.

Based on the impacts of livestock grazing on the suitable habitat of species listed in section 3.4, this indirect effect would add short term cumulative impacts to individuals and habitat trends for these species.

3.11 Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Alternative A and C, with the harvesting of fire-killed trees, would provide a short-term economic return for local and regional areas.

Alternative A and C, with reforestation, would provide a long-term future opportunity for income and employment for local and regional areas.

Refer to the environmental consequences section for each resource area for a discussion of short- and long-term effects to those resources for each alternative.

3.12 Unavoidable Adverse Effects

Smoke from pile burning, dust, and exhaust from heavy equipment, helicopters, and trucks would be created alternative A or C. Emissions would comply with State and local air quality rules and regulations. See the Fire, Fuels, and Air Quality section for a discussion of the significance of these effects among alternatives.

Some soil compaction could occur in ground-based harvesting units, although the benefits of increased ground cover and disruption of the hydrophobic layer would improve overall soil quality. Refer to the Soils and Hydrology section for a discussion of the significance of these effects among alternatives.

3.13 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Under all alternatives, there would be an irreversible loss of timber volume and value in fire-killed trees that remain on site. The magnitude of this effect varies by alternative. See the Economics Section for a discussion of the significance of these effects among alternatives. No other irreversible commitments of resources are anticipated.

Temporary road construction under alternative A or C represents irretrievable commitments for the period of time the roads are used. Temporary roads and landings would be closed and subsoiled after use, restoring the productivity of the site. Compaction associated with ground based harvesting activities is an irretrievable commitment of soil resources that would ameliorate over time. Anticipated levels of compaction are within the Forest Service, Region 5 soil quality standards. Refer to the Soils and Hydrology section for a discussion of the significance of these effects among alternatives.

3.14 Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The following laws contain requirements for protection of the environment that apply to the proposed action and alternatives:

Endangered Species Act. There are no threatened or endangered species within the project area.

Clean Water Act. There are no 303(d) listed water bodies within the project area. The nearest 303(d) listed water body is the North fork Feather River. Project activities are located about 30 miles upstream of the confluence of Indian Creek and the North fork Feather River. Application of project design features, mitigation measures, and BMP's is expected to maintain designated beneficial uses within and downstream of the project area.

Clean Air Act. All burning would be completed under approved burn and smoke management plans. Burning permits would be acquired from the Northern Sierra Air Quality Management District. They would determine when burning is allowed. The California Air Resources Board provides daily information on "burn" or "no burn" conditions. Burn plans would be designed and implemented in a way to minimize particulate emissions.

National Historic Preservation Act. Protection of historic sites would comply with the Programmatic Agreement among the USDA Forest Service, Pacific Southwest Region, California State Historic Preservation Officer, and Advisory Council on Historic

Preservation Office Regarding the Identification, Evaluation and Treatment of Historic Properties Managed by the National Forest of the Sierra Nevada, California dated 1996.

National Forest Management Act. The Forest Service is complying with the provisions of this law.

Executive Orders

Environmental Justice, Executive Order 12898 of February 1, 1994. Although low-income and minority populations live in the vicinity, activities proposed for the Moonlight and Wheeler Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects to human health and safety or environmental effects to minorities, low income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996. In accordance with this order existing tribal involvement processes with the Tribes listed in Section 4.1.1.3 of this document were followed.

Invasive Species, Executive Order 13112 of February 3, 1999. This Moonlight and Wheeler Project draft EIS covers botanical resources and noxious weeds. The project standard management requirements are designed to minimize risk of new weed introductions, minimize the spread of spotted knapweed, yellow starthistle, medusahead, and Scotch broom within and between units, and minimize likelihood of spread of Canada thistle from infested units to uninfested units. This project is likely to spread Canada thistle within already infested units.

Recreational Fisheries, Executive Order 12962 of June 6, 1995. The effects to fish habitat from the project are expected to be so small that direct effects on fish productivity and the quality of the recreational fishery would be negligible.

Migratory Birds, Executive Order 13186 of January 10, 2001. The environmental analyses of deferral actions are to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. There are no interagency determination calls to be made for migratory birds with federally listed species. Proposed activities and alternatives are not expected to effect migratory birds.

Floodplain Management, Executive Order 11988 of May 24, 1977 and 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 the project riparian management objectives; adhering to the SAT guidelines, as set forth in the HFQLG FEIS and ROD; and implementation BMP's, Standard management Practices, and project design criteria.

Use of Off-road Vehicles, Executive Order 11644, February 8, 1972. The Off-Highway Vehicle process currently ongoing on the PNF would not be affected by the alternatives proposed in the Moonlight and Wheeler Project, allowing for route designation, timeframes, and guidelines to be followed.

Special Area Designations

Research Natural Areas (RNA). The Mud Lake Modoc Cypress RNA is located within the fire perimeter, about 1 ½ miles from the nearest proposed treatment area, and would not be affected.

Inventoried Roadless Areas. No Inventoried Roadless Areas exist in the project area and would, therefore, not be affected.

Wilderness Areas. No wilderness Areas exist in the project area and would, therefore, not be affected.

Wild and Scenic Rivers. There are no wild and scenic rivers within the project area. The PNF has identified river segments that are eligible, but not yet designated, for wild and scenic river status. There are no eligible segments within the project area.

Municipal Watersheds. There are no municipal watersheds located within the project area.

4 Consultation and Coordination

4.1 Preparers and Contributors

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:

4.1.1.1 ID TEAM MEMBERS:

Rich Bednarski, Team Leader, Writer/Editor, 30 years

Katherine Carpenter, Planner, Writer/Editor, 1.5 years

Chris Collins, Wildlife Biologist, 15 years

Ryan Tompkins, Silviculturist, 7 years

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Cristina Weinberg, Archaeologist, 21 years

Kristina Van Stone Hopkins, Fisheries Biologist, 12 years

Jason Moghaddas, Fire Ecologist,

Eric Moser, Hydrologist, 20 years

Vincent Archer, Soil Scientist, 10 years

Pete Hochrein, 30 years

Elaine Vercruysse, Logging Systems, 6 years

Bill Overland, GIS Specialist, 3 years

Kyle Felker, GIS Specialist, 20 years

Gary Rotta, Wildlife Biologist, 30 years

4.1.1.2 FEDERAL, STATE, AND LOCAL AGENCIES:

U.S. Fish and Wildlife Service

California Department of Fish and Game

Environmental Protection Agency

Northern Sierra Air Quality Management district

4.1.1.3 TRIBES:

Washoe Tribe of California and Nevada

Mechoopda Indian Tribe of Chico Rancheria

Concow Maidu Tribe of Mooretown

Estom Yumeka Tribe of Enterprise Rancheria

Greenville Rancheria

Susanville Indian Rancheria

Tyme Maidu Tribe of Berry Creek Rancheria

4.2 Distribution of the Environmental Impact Statement

This EIS has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, Sate and local governments, and organizations representing a wide range of views regarding contributions to the stability and economic health of rural communities.

- Advisory Council of Historic Preservation, Planning and Review
- USDA Animal and Plant Health Inspection Service
- Natural Resources Conservation Service
- USDA National Agricultural Library, Acquisitions and Serials Branch
- National Marine Fisheries Service, Southwest Region
- US Army Engineer Division, South Pacific
- US Environmental Protection Agency, Office of Federal Activities
- Environmental Protection Agency, Region 9
- US Department of Interior, Office of Environmental Policy and Compliance
- Federal Aviation Administration, Western-Pacific Region
- Federal Highway Administration, California HDA-CA
- US Department of Energy, Office of NEPA Policy and Compliance
- All individuals listed in section 1.6 of this EIS.

In addition to this list numerous interested parties will receive notification of the EIS's availability and location on the World Wide Web through written correspondence.

5 Index

6 Glossary

90th percentile weather conditions — high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically that are met or exceeded on 10 percent of days during the fire season. It defines potential fire behavior as a result of these conditions: a 90th percentile weather day has the potential for severe wildfire behavior.

Basal area — the total cross-sectional area of all stems, including the bark, in a given area, measured at breast height (4.5 feet above the ground). Usually given in units of square feet per acre.

Biomass —trees less than 10 inches dbh not used as sawlogs. This material is usually chipped and/or removed from the project area and hauled to the mill to be used for cogeneration of energy or as fiber for wood products.

Board feet — a unit of measure of sawlog volume, equivalent to 12 inches by 12 inches by 1 inch. One million board feet is denoted as mmbf.

California Wildlife Habitat Relationships (CWHR) — a system developed jointly by Region 5 of the Forest Service and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities, and which rates the resulting classes in regard to habitat value for various wildlife species or guilds. The CWHR system has three elements: (1) major tree dominated vegetation associations, (2) tree size, and (3) canopy cover. The major tree dominated CWHR habitats in the Empire Project include red fir, Sierra mixed conifer, ponderosa pine, white fir, montane hardwood, and montane riparian.

Tree size and canopy cover classes are as follows:

Tree Size Classes in CWHR:

1 = Seedling (less than 1 inch dbh)
2 = Sapling (1-6 inches dbh)
3 = Pole (6-11 inches dbh)
4 = Small (11-24 inches dbh)
5 = Medium/Large (greater than 24 inches dbh)
6 = Multilayered (size class 5 over a distinct layer of size class 3 or 4, total canopy greater than 60- percent closure). In this EIS, class 6 is included in class 5.

Canopy Cover Classes in CWHR:

S = Sparse Cover (10-24 percent canopy closure)
P = Poor Cover (25-39 percent canopy closure)
M = Moderate Cover (40-59 percent canopy closure)
D = Dense Cover (greater than 60 percent canopy cover)

Canopy cover — the degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. Same as crown closure.

Crown closure — see canopy cover.

Cumulative effects — According the Council on Environmental Quality (CEQ) 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).

Desired conditions — desirable resource conditions for various land allocations or resources, as prescribed in forest plans.

Diameter at breast height (dbh) — the diameter of a tree trunk 4.5 feet above the ground.

Ephemeral — a watercourse that contains sporadic running water only sporadically, such as during or following storm events. Ephemeral streams have a definable channel and evidence that scour and deposition occur with less-than-annual frequency. Activity buffers are measured from edges of stream channels.

Fireline — a corridor, which has been cleared of organic material to expose mineral soil. Firelines may be constructed by hand or by mechanical equipment (e.g., dozers).

Flame length — the length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

Handpiling — piling by hand branches and limbs from tree harvests or thinnings byhand, for burning at a later time.

Home Range Core Areas — these areas are designed to encompass the best available spotted owl habitat habitat, where the most concentrated owl foraging activity is likely to occur, and is in the closest proximity to owl protected activity centers where the most concentrated owl foraging activity is likely to occur. On the Plumas National Forest, each protected activity center is 300 acres and the home range core area is an additional 700 acres, totaling 1,000 acres.

Intermittent — a watercourse with non-permanent flow but having a definable channel and evidence of annual scour and deposition. Activity buffers are measured from edge of stream channel.

Landings — forested openings, cleared of vegetation, leveled and graded, and used to stockpile sawlogs for eventual loading of load log trucks for haul to a sawmill.

Operability — the ability to conduct vegetation management operations, which include construction of access roads and log landings, use of cable logging systems, clearing of central skid trails for tractor logging, and removal of trees that pose hazards to forest workers. Trees to be removed for operability would be designated by a Forest Service representative.

Perennial streams — streams that flows continuously. The groundwater table lies above the bed of the stream at all times. Activity buffers are measured from edge of stream channel.

Protected Activity Centers (PAC) — areas delineated around nesting sites of nesting pairs of particular wildlife species. Habitat disturbance is minimized or excluded within the delineated area.

Reconstructed (roads) — reconstruction of an existing road in or adjacent to its current location to improve capacity and/or correct drainage problems. Reconstruction consists of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed.

Regeneration — tree seedlings and saplings that have the potential to develop into mature forest trees.

Riparian Habitat Conservation Area (RHCA) — activity buffers of specified widths along streams and watercourses and around lakes and wetlands which vary according to stream or feature type, as described by the Scientific Analysis Team (SAT) guidelines.

Skidding — dragging a log with a tractor to a landing for loading onto a logging truck.

Slash — tree tops and branches left on the ground after logging or accumulating as a result of natural processes.

Snags — a fire-killed standing tree; for wildlife purposes, one that is at least 15 inches in diameter at breast height (dbh) and 20 feet high.

Spotted Owl Habitat Area (SOHA) — areas delineated in land and resource management plans for the purpose of providing nesting and foraging habitat for spotted owls. No treatments would occur in SOHAs.

Stocking levels — the number of trees per acre in a regeneration site.

Threshold of Concern — the level of watershed disturbance which, if exceeded, could create adverse watershed or water quality effects, in spite of application of best management practices and other routine mitigation measures. Activities near the threshold of concern create increased risks for adverse water quality effects and a possible need for additional analysis or extraordinary mitigation, including rescheduling of projects.

Yarding — bringing sawlogs or biomass to a central location for removal from a treatment area.

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