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Empire Vegetation Management Project

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Draft Supplemental Environmental Impact Statement

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

EMPIRE VEGETATION MANAGEMENT PROJECT
Draft Supplemental Environmental Impact Statement

Lead Agency: **USDA Forest Service**

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Abstract: This *Empire Vegetation Management Project Draft Supplemental Environmental Impact Statement* (DSEIS) documents the supplemental analysis of the no-action alternative, the proposed action and four action alternatives for reducing fire hazards, harvesting trees using group selection and individual tree selection silvicultural methods, removing biomass, and implementing changes to National Forest System roads. Alternative A (proposed action) proposes fuel treatments that would retain all trees with a diameter at breast height (dbh) of 30 inches and maintain a 30 to 45 percent canopy cover. The fuel treatments would include construction of defensible fuel profile zones (DFPZ) and treatments within the Wildland Urban Interface (WUI). Alternative A also proposes group selection and individual tree selection harvests and road system improvements. Alternative B proposes no action. Alternative C proposes fuel treatments identical to alternative A; and it proposes a more economical approach for group selection and individual tree selection and road system improvements. Alternative D (preferred alternative) proposes fewer acres of fuel treatments and modifies prescribed burning treatments on six units. In addition, alternative D addresses watershed concerns and wildlife habitat concerns by reducing acres of group selection and individual tree selection in certain subwatersheds. Alternative E proposes the same amount of fuel treatment acres as alternative D, but retains all trees greater than 20 inches dbh and maintains a 50 percent canopy cover. Alternative E proposes group selection and individual tree selection identical to D. Alternative F proposes fuel treatments identical to E however it proposes no group selection or individual tree selection.

Reviewers should provide the Forest Service with their comments during the 45-day review period of the DSEIS. This will enable the Forest Service to analyze and respond to comments at one time and use information acquired in the preparation of the final SEIS, 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 SEIS (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 SEIS should be specific and address the adequacy of the analysis and merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: James M. Peña, Plumas National Forest Supervisor, at P.O. Box 11500, 157 Lawrence St., Quincy, CA 95971 (telephone: 530-283-7810). 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) 283-7746; or (4) electronically mailed to comments-pacificsouthwest-plumas@fs.fed.us. Please indicate the name "Empire Project" on the subject line of your email. Comments submitted electronically must be in "Rich Text Format" (.rtf).

Date Comments Must Be Received: The 45-day comment period starts the day after the U.S. Environmental Protection Agency publishes the draft SEIS Notice of Availability in the Federal Register. The expected publication date is March 2, 2007.

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Summary

The Forest Service proposes to improve overall forest health conditions and vegetative diversity and reduce the threat of large-scale, high-intensity wildfires by reducing hazardous fuels within the Empire Vegetation Management Project area (Empire Project area). The Forest Service also proposes to provide access for the project and reduce water quality impacts by improving the National Forest transportation system in the area.

The fuel treatment units and planning areas are predominantly located on southwest-facing slopes of Grizzly Ridge and Indian Falls Ridge northeast and east of the communities of Keddie, Butterfly Valley, Quincy, and Greenhorn. The dominant vegetation type is Sierra mixed conifer. Other vegetation types include ponderosa pine, hardwood, chaparral (found on slopes burned by previous wildfires), and white fir/red fir at higher elevations. It includes variable, but extensive, large, even-aged stands resulting from wildfire, timber harvest and plantation establishment. Meadows and corridors of riparian vegetation exist along numerous perennial and intermittent streams. Wildlife habitat in the area supports most species common in the Sierra Nevada. The area has abundant surface and ladder fuels and shade-tolerant species in the understory. The area is extensively roaded with National Forest System roads, as well as numerous nonsystem roads.

This supplement can be used in conjunction with the 2005 FEIS. However, this document is designed to improve readability by including much of the language from the 2005 FEIS as well as strengthening and clarifying the analysis.

Purpose and Need

The purpose and need for the proposed action is to reduce fire potential in the wildland urban interface, reduce the potential size and intensity of wildfires, and provide fire-suppression personnel with safe locations for taking action against wildfires. The current fuel conditions do not allow for safe fire suppression efforts nor do they provide sufficient protection from wildfire. Group selection and individual tree selection are also proposed. These intermediary thinning treatments are aimed at achieving an uneven-aged, multistory, fire-resilient forest and are designed to provide an adequate timber supply that contributes to the economic stability of rural communities. The stands proposed for treatment have moderate and dense canopy cover, where tree density has increased over decades of growth and development. In some cases, high stand densities have led to disease and insect infestations. These stand conditions, over the landscape considered in this proposal, have generated a need for treatment. Transportation system treatments are also planned to reduce impacts on forest resources and provide the necessary access for fuel treatments and group selection and individual tree selection harvests. The proposal is designed to achieve the following desired conditions:

- An uneven-aged, multistory, fire-resilient forest.
- A reduced threat of large-scale high-intensity wildfire and corresponding effects in the Empire Project area.
- Safe locations for fire personnel to take action against wildfires.
- Improved watershed conditions and reduced sedimentation caused by existing roads.
- Reduced risk of insect/pathogen drought-related mortality by managing stand density levels.
- Economically viable removal of commercial timber while accomplishing vegetation and watershed management activities.
- Contributes to the local economy, forest products industry, and social environment.

Proposed Action

The proposed action (alternative A) is comprised of three primary actions.

Action 1: Implement Fuel Treatment Strategies

- Would meet the need for changing fire behavior and providing safe locations for firefighters to suppress wildland fire.

The Empire Project proposes two categories of fuel treatments: Defensible Fuel Profile Zones (DFPZs) and Wildland Urban Interface (WUIs). DFPZs are strategically located fuel treatments designed to improve fire suppression efficiency. These fuel treatments would be located and designed specifically so that wildfires burning inside the zones would burn at lower intensities. A WUI is an area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Some fuel reduction units were specifically designed to complement similar treatments occurring on adjacent private land. The DFPZs would be part of a larger strategic system of DFPZs called for by the HFQLG Act. The proposed fuel treatments would be consistent with the goals of the *National Fire Plan*. Fuel treatments would consist of hazardous fuels reduction on approximately 6,636 acres. Of these, approximately 2,492 acres are in WUIs.

Treatments would include reduction of surface fuels, ladder fuels, and canopy fuels through a variety of methods such as mechanical harvest, hand thinning, mastication of brush and small trees, piling and burning, and prescribed underburning. Trees having a diameter greater than 30 inches dbh would not be cut except as needed for operability.

Action 2: Implement Group Selection and Individual Tree Selection Harvests

- Would meet the need for testing the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; providing an adequate timber supply that contributes to the economic stability of rural communities; and improving and maintaining ecological health of the forest.

Group selection would be conducted on approximately 1,347 acres. This would involve removal of conifers less than 30 inches dbh in areas 0.5 acre to 2 acres in size. No trees larger than 30 inches dbh would be cut except as needed for operability as designated by a Forest Service representative. Harvest slash treatments and natural regeneration or reforestation would occur in the group selection openings. Harvest slash treatments would include whole-tree yarding, piling and burning, slash chipping, and lopping/scattering limbs and treetops.

Individual tree selection would occur on approximately 4,000 acres, with a focus on thinning to promote improved health and vigor. No trees larger than 30 inches dbh would be cut except as needed for operability as designated by a Forest Service representative. Biomass harvest is proposed on 350 acres within individual tree selection harvest areas. Harvest slash treatments would occur with individual tree selection.

Action 3: Implement Transportation System Treatments

- Would meet the need for reducing impacts of the transportation system on forest resources and providing the necessary access for fuel treatments and group selection and individual tree selection harvests.

The proposed National Forest System road changes under alternative A are listed below.

- Approximately 3 miles of new National Forest System roads would be constructed but then closed upon completion of the project.
- Approximately 6 miles of new temporary roads would be constructed but then *decommissioned* upon completion of the project.
- Approximately 113 miles of existing system roads would be *reconstructed.*
- Approximately 17 miles of existing system roads would be *closed* upon completion of the project using earth and log barriers.
- Approximately 15 miles of existing system roads would be decommissioned.
- Existing harvest *landings* would be reconstructed, and new landings would be constructed where existing landings are not present or are inadequate.
- Three culverts would be replaced as part of the road reconstruction to improve fish passage.

Consultations

Federal, State, and Local Agencies

Environmental Protection Agency

Northern Sierra Air Quality Management District

U.S. Fish and Wildlife Service

California Department of Fish and Game

Federally Recognized Tribes

Formal consultation was initiated with 10 federally recognized tribes: Auburn Rancheria, Greenville Rancheria, Susanville Rancheria, Mooretown Rancheria, Redding Rancheria, Berry Creek Rancheria, Chico Rancheria, Pit River Tribe, and Washoe Tribe of California and Nevada, including the Woodfords Band Community Council.

Native American Communities, Nonprofits, and Groups

A letter containing information on the *Mount Hough Landscape Assessment* and soliciting input for the Empire Project was mailed to the following Native American Communities, nonprofits, and Tribal Groups: Strawberry Valley Maidu, Honey Lake Maidu, T'si-akim Maidu, Concow Valley Band, United Maidu Nation, Helym Nessem Maidu Cultural Center, Stiver Indian Cemetery Association, Roundhouse Council, and Maidu Cultural and Development Group.

Public Involvement

On February 2, 2002, a Notice of Intent (NOI) was published to prepare this supplement. The Forest Service began public involvement in June 2004. A second scoping period took place between February and March 2005. The following alternative development supplements the 2005 Final Environmental Impact Statement (FEIS).

Scoping is not required for supplements to environmental impact statements (40 CFR 1502.9(c)4(4)).

Alternative Development

The Forest Service developed four action alternatives (C, D, E, and F) to the proposed action based on issues identified by the Empire Project Interdisciplinary (ID) Team during the scoping process in 2004 and 2005. The Forest Service is also required to analyze a no-action alternative, which is alternative B (40 CFR 1502.14(d)).

Action Alternatives

The Empire Project ID Team developed and recommended four action alternatives to the proposed action in response to the following issues:

- Economic feasibility and enhanced volume/net value (alternative C).
- Reduced effects on the subwatersheds; reduced impacts on habitat for the California spotted owl, Northern goshawk, and mesocarnivore habitat and forest interior habitat for old-forest-dependent species (alternative D). For purposes of this analysis, forest interior habitat refers to large patches of relatively homogenous, dense, forested habitat types, classified as California Wildlife Habitat Relationship classes 4M, 4D, 5M, and 5D.
- Compliance with the Plumas National Forest off-highway vehicle (OHV) route designation process (action alternatives C, D, E, and F).
- Two additional alternatives were developed to address public concerns that harvesting trees greater than 20 inches dbh is detrimental to old-forest conditions and not necessary to achieve fire objectives, and that commercial harvest contributes to increased fire effects (alternatives E and F).

The following is a summary of the action alternatives to the proposed action. Tables S-1, S-2, and S-3 summarize the differences between the alternatives.

Table S.1. Comparison of proposed vegetation treatments and volumes between alternatives.

Alternative	Number of Planning Areas	Total Fuel Treatment Acres	Group Selection Harvest Acres	Individual Tree Selection Harvest Acres	Biomass Harvest Acres	Sawlog Volume (mmbf)[a]	Biomass Volume (tons)
A (Proposed Action)	24	6,636	1,347	4,000	350	26.3	82,000
B (No Action)	0	0	0	0	0	0	0
C	19	6,636	1,600	4,000	350	29.6	87,000
D (Preferred Alternative)	16	5,555	1,226	2,370	350	23.1	83,000
E	16	5,555	1,226	2,370	350	19.8	83,000
F	0	5,555	0	0	0	1.7	60,000

Note:

a. mmbf = million board feet.

Table S.2. Comparison of proposed system transportation treatments between the alternatives.

Alternative	Road Construction / Closure (miles)	Temporary Road Construction / Decommission (miles)	Road Reconstruction (miles)	Road Closure (miles)	Road Decommission (miles)
A (Proposed Action)	3	6.2	113	17.1	15.6
B (No Action)	0	0	0	0	0
C	3	6.2	107.1	11.1	12
D (Preferred Alternative)	3	6.2	101.8	11.1	12
E	3	6.2	101.8	11.1	12
F	0	1.9	48.3	11.1	12

Table S-3. Comparison of employment-related effects between the alternatives.

Alternative	Total Full-time Jobs	Total Employee-Related Income
A	394	$16,957,187
B	0	0
C	441	$18,954,852
D	356	$15,309,797
E	313	$13,457,271
F	49	$2,092,996

Summary of Environmental Consequences

- Chapter 3 contains the description of the affected environment for the Empire Project and effects that would occur from implementation of any of the six alternatives.

The summary of effects provided below is based on the following seven indicators:

- Fire Behavior
- Landscape Structure
- Watershed Concerns
- Wildlife Concerns
- Cost Effectiveness
- Community Stability
- Compliance with the Plumas National Forest Off-Highway Vehicle Route Designation

Alternative A (Proposed Action)

There would be an improvement in predicted fire behavior in the fuel treatment areas. The retention of 30 to 45 percent canopy cover would result in a lower probability of crown-fire events compared to existing conditions. The rate of line construction and penetration of retardant through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires burning into or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would be improved in fuel treatments.

This alternative would make a large contribution to an uneven-aged, multistoried landscape structure by retention of large trees and species that tend to be fire-resistant. This alternative would also reduce stand densities, and improve structural diversity because group selection and individual tree selection would be implemented.

Watershed concerns were measured by a percent of threshold: the lower the percent the lower the concern. Four subwatersheds, Taylor, Massack, Greenhorn, and Lee Summit, would result in a high average percent threshold presenting concerns for sedimentation and erosion.

Wildlife concerns were measured by the number of acres of habitat that would remain after harvest. Also, the acres of forest interior habitat, important to old-forest-dependent species, were measured in terms of how much would be rendered as potentially noncontiguous forest cover. Finally, the risk of losing nesting and roosting sites of the California spotted owl to wildfire was analyzed. This alternative would retain approximately 90 percent of the existing suitable foraging habitat for the California spotted owl and 88 percent of the existing suitable nesting habitat. There would be a moderate risk associated with the amount of forest interior habitat that could be rendered as noncontiguous forest cover. Lastly, there would be a decreased risk of losing owl nesting and roosting sites to wildfire.

Alternative A proposes to close (with barriers such as gates) 17.1 miles of roads and decommission 15.6 miles of roads. This alternative would not comply with the OHV route designation process, in that it closes and decommissions roads that are currently designated for consideration as an OHV route.

This alternative would be moderately cost effective in terms of having an estimated net value of $473,995 and producing 26.3 million board feet of sawlogs. It would have a moderate contribution to the economic stability of the communities by supporting approximately 394 full-time jobs and $16,957,187 in employee-related income.

Alternative B (No Action)

The predicted fire behavior in the fuel treatment areas in terms of the probability of crown fire would not be changed in this alternative compared to existing conditions. The rate of line construction and penetration of retardant through the canopy to surface fuels would not be increased. This alternative would not enhance the ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would not be improved.

This alternative would make a negligible contribution to an uneven-aged, multistoried landscape structure in terms of fire-resistant trees, low stand densities, and structural diversity because group selection and individual tree selection would not be implemented.

This alternative would have a moderate average percent threshold of 55 for the four subwatersheds of concern (Taylor, Massack, Greenhorn, and Lee Summit). This alternative would retain approximately 100 percent of the existing suitable foraging habitat for the California spotted owl and 100 percent of the existing suitable nesting habitat. No forest interior habitat would be rendered as noncontiguous forest cover. Lastly, the risk of losing owl nesting and roosting sites to wildfire would not change from existing conditions.

No roads would be closed or decommissioned under alternative B. This alternative would comply with the OHV route designation process.

This alternative would not contribute to the economic stability of the communities because it would not generate any full-time jobs or employee-related income.

Alternative C

Alternative C would result in similar effects as Alternative A within fuel treatments. Alternative C would make the largest contribution to an uneven-aged, multistoried landscape structure in terms of fire-resistant trees, low stand densities, and structural diversity because group selection and individual tree selection would be implemented on 1600 acres.

This alternative would result in similar watershed effects to Alternative A, where subwatersheds would approach, but not exceed thresholds for sedimentation and erosion. This alternative would retain approximately 89 percent of the existing suitable foraging habitat for the California spotted owl and 87 percent of the existing suitable nesting habitat. There would be a high risk associated with the amount of forest interior habitat that could be rendered as noncontiguous forest cover. Lastly, there would be a decreased risk of losing owl nesting and roosting sites to wildfire (same as alternative A).

This alternative proposes to close (with barriers such as gates) 11.1 miles of roads and decommission 12 miles of roads. This alternative would comply with the OHV route designation process. No designated routes would be impacted by alternative C.

This alternative would be highly cost effective in terms of having an estimated net value of $1,858,574 and producing 29.6 million board feet of sawlogs. This alternative would have the highest contribution to the economic stability of the communities by supporting 441 full-time jobs and $18,954,852 in employee-related income.

Alternative D (Preferred Alternative)

There would be an improvement in predicted fire behavior in the fuel treatment areas. The retention of 30 to 45 percent canopy cover result in a lower probability of crown-fire events compared to existing conditions. The rate of line construction and penetration of retardant through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would be improved in fuel treatments.

This alternative would make a moderate contribution to an uneven-aged, multistoried landscape structure in terms of fire-resistant trees, low stand densities, and structural diversity because group selection and individual tree selection would be implemented, but to a lesser degree than alternative A and C.

This alternative would have a lower threshold and fewer effects of sedimentation and erosion for the four subwatersheds of concern (Taylor, Massack, Greenhorn, and Lee Summit). This alternative would retain approximately 90 percent of the existing suitable foraging habitat for the California spotted owl and 88 percent of the existing suitable nesting habit (same as alternative A). There would be a lower risk associated with the amount of forest interior habitat that could be rendered as noncontiguous forest cover compared to alternatives A and C. Lastly, there would be a decreased risk of losing owl nesting and roosting sites to wildfire (same as alternative A).

This alternative proposes to close (with barriers such as gates) 11.1 miles of roads and decommission 12 miles of roads. This alternative would comply with the OHV route designation process. No designated routes would be impacted by alternative D.

This alternative would be moderately cost effective in terms of having an estimated net value of $294,069 and producing 23.1 million board feet of sawlogs. It would have a moderate contribution to the economic stability of the communities by supporting 356 full-time jobs and $15,309,797 in employee-related income.

Alternative E

There would be an improvement in predicted fire behavior in the fuel treatment areas. The retention of 50 percent canopy cover would result in a moderate probability of crown-fire events compared to existing conditions. The rate of line construction and penetration of retardant drops through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would be improved in fuel treatments.

This alternative would make a moderate contribution to an uneven-aged, multistoried landscape structure in terms of fire-resistant trees, low stand densities, and structural diversity because group selection and individual tree selection would be implemented.

This alternative would have similar effects as alternative D four subwatersheds of concern (Taylor, Massack, Greenhorn, and Lee Summit). This alternative would retain approximately 97 percent of the existing suitable foraging habitat for the California spotted owl and 96 percent of the existing suitable nesting habit. There would be a lower risk associated with the amount of forest interior habitat that could be rendered as noncontiguous forest cover compared to alternatives A and C. Lastly, there would be a decreased risk of losing owl nesting and roosting sites to wildfire (but a greater risk than alternatives A, C, and D).

This alternative proposes to close (with barriers such as gates) 11.1 miles of roads and decommission 12 miles of roads. This alternative would comply with the OHV route designation process. No designated routes would be impacted by alternative E.

This alternative would not be cost effective in terms of having an estimated net loss of $101,280 and producing 19.8 million board feet of sawlogs. It would make a moderate contribution to the economic stability of the communities by supporting 313 full-time jobs and $13,457,271 in employee-related income.

Alternative F

There would be an improvement in predicted fire behavior in the fuel treatment areas. The retention of a 50 percent canopy cover would result in a moderate probability of crown-fire events compared to existing conditions. The rate of line construction and penetration of retardant through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would be improved in fuel treatments.

This alternative would make a very small contribution to an uneven-aged, multistoried landscape structure in terms of fire-resistant trees, low stand densities, and structural diversity because there would be no group selection or individual tree selection treatments.

This alternative would have the lowest percent threshold for the four subwatersheds of concern (Taylor, Massack, Greenhorn, and Lee Summit). This alternative would retain approximately 100 percent of the existing suitable foraging habitat for the California spotted owl and 100 percent of the existing suitable nesting habit. No amount of forest interior habitat would be rendered as noncontiguous forest cover. Lastly, there would be a reduced risk of losing owl nesting and roosting sites to wildfire (but a greater risk than under alternatives A, C, D, and E).

This alternative proposes to close (with barriers such as gates) 11.1 miles of roads and decommission 12 miles of roads. This alternative would comply with the OHV route designation process. No designated routes would be impacted by alternative F.

This alternative would not be cost effective because the estimated net value would be a negative $1,222,001, and it would produce 1.7 million board feet of sawlogs. It would make a small contribution to the economic stability of the communities by supporting 49 full-time jobs and $2,092,996 in employee-related income.

Decision Framework

Based on the outcome of the environmental analysis of the alternatives, the Responsible Official for this project, Forest Supervisor James M. Peña, will decide whether to implement the Empire Vegetation Management Project as proposed (alternative A), implement the project based on one of the alternatives designed to best respond to issues, or not implement the Empire Project at this time. The Responsible Official has identified alternative D as the preferred alternative.

Project Implementation

The Empire Project would be implemented in 2007 and completed by 2015

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Chapter 1. Purpose and Need for Action

Scope of the Draft Supplemental Environmental Impact Statement (DSEIS)

Forest Supervisor Jim Peña signed the Record of Decision for the Empire Project Final Environmental Impact Statement (FEIS) on August 9, 2005. He decided to implement alternative D.

On November 18, 2005, Regional Forester Bernard Weingardt reversed Forest Supervisor Jim Pena's decision to implement alternative D for the Empire Project. The Regional Forester determined that the Forest Supervisor did not adequately address all of the appeal issues in the Final Environmental Impact Statement, the Record of Decision, or in the project record. He specifically mentioned there was insufficient disclosure of cumulative effects in the Final Environmental Impact Statement. Appeals were submitted by Chad Hanson (John Muir Project of Earth Island Institute, Center for Biological Diversity), John Preschutti (Plumas Forest Project), and Michael Graf (Sierra Nevada Forest Protection Campaign, Sierra Club, and Plumas Forest Project).

The Forest Supervisor, with the help of an interdisciplinary team and other Forest staff reviewed the appeal decision, the Empire EIS, project record, and Forest Service direction to determine what additional analysis was necessary to ensure a sound and compliant environmental impact statement. Based on this review, the Forest Supervisor decided to prepare a Supplemental Draft Environmental Impact Statement (SDEIS). The Forest Supervisor directed the interdisciplinary team to focus the SDEIS on cumulative effects analysis. The 2006 supplement consisted of Chapter 3 only. Although the 2006 supplement did clarify the cumulative effects analysis that was deemed insufficient, it also created difficulty for readers. The appeal review team had to weave the supplement back and forth into the 2005 FEIS, making it difficult to come to conclusions in support of the decision. The 2006 Empire Final Supplemental Environmental Impact Statement was withdrawn by the Forest Supervisor in order that we create one document, that the reader can follow, as well as continue to clarify weakness and strengthen analysis, particularly associated with Management Indicator Species and soil and watershed effects identified during the appeal process.

This document repeats much of the information in the 2005 FEIS and presents supplemental information to update and improve the analysis. This draft supplemental EIS is not intended to substitute the 2005 FEIS. Some information from the 2005 FEIS is incorporated by reference in this document and the reader is referred to the FEIS for additional information where applicable for a more complete understanding of the environmental effects.

A supplemental document (40 CFR 1502.9 (b) (3), FSH 1909.15 § 18) can provide additional clarification of the previous analysis. This document is designed to address the deficiencies outlined by the Regional Forester resulting from public appeals. Background information, detailed descriptions of alternatives and issues, along with public comment and responses to those comments can be found in the 2005 FEIS and project record.

To reduce bulk without impeding the review of this EIS, material has been incorporated by reference, cited in this document, and its content briefly described. The materials incorporated by reference are reasonably available for inspection (40 CFR 1502.21) by contacting: Gary Rotta, Empire Vegetation Management Project Leader, 39696 Highway 70, Quincy, CA 95971, (530) 283-0555, grotta@fs.fed.us

Purpose and Need for Action

Please note that technical terms are shown in italics the first time they are used in text; the definitions can be found in the "Glossary."

Implement Fuel Treatment Strategies

Purpose — The purpose of the project is to implement fuel treatment strategies to reduce the potential size and intensity of wildfires, and provide fire-suppression personnel with safe locations for taking action against wildfires. The Empire Project Defensible Fuel Profile Zones (DFPZs) are designed to be part of a larger strategic system of DFPZs that provide fire-suppression personnel with relatively safe locations from which to take action against wildfires. The proposed DFPZs are the next link in the emerging HFQLG DFPZ network. They are intended to provide strategic areas where wildfires can be safely suppressed during *90th percentile weather conditions* (a typical July day of about 85 degrees Fahrenheit). The treatments are intended to inhibit the spread of fire that may approach adjacent communities, and protect National Forest lands from wildfire originating on private land. This is part of the larger HFQLG fuel treatment strategic network as called for by the HFQLG Act (section 401 [b][1], [d][1], and [e]) and the HFQLG amendment to the *Plumas National Forest Land and Resource Management Plan*.

The Empire Project also proposes implementation of fuel treatments adjacent to private lands within communities at risk. These fuel treatments would support some of the goals identified in the *National Fire Plan*. The fuel treatments in residential areas along Chandler Road and Massack, around Butterfly Valley and Greenhorn Ranch subdivision, and in the Keddie-Cascades trailhead areas are in the WUI. The *National Fire Plan* promotes a collaborative approach for reducing wildland fire risks to communities and the environment through a 10-year comprehensive strategy. The areas included in the proposed Empire Project contribute to the *National Fire Plan*'s hazardous fuel reduction goals, specifically by ensuring that communities most at risk in the wildland urban interface (WUI) receive priority for hazardous fuels treatment. The Mount Hough District Ranger collaborated with the Plumas County Fire Safe Council and the public to identify the highest priority areas.

The existing conditions in the proposed Empire Project include moderate to high fuel loads throughout the project area. Currently, approximately 70 percent (4,645 acres) of the 6,636 total acres of proposed fuel treatment contain *surface fuels* in the less-than-3-inch diameter size class that are greater than 10 tons per acre. This surface fuel would result in flame lengths greater than 6 feet during a fire under 90th percentile weather conditions. Desired conditions for flame lengths are an average of less than 4 feet. Existing *ladder fuels* in the project area are relatively dense and live canopy base heights average between 2 and 8 feet. The desired condition of live canopy base heights is a minimum of 15 to 25 feet, depending on stand characteristics.

With the current combination of high surface fuel conditions and low canopy base heights, wildfire during the 90th percentile weather condition would transfer easily from the surface to the forest canopy. The current fuel conditions do not allow for safe fire suppression efforts nor do they provide sufficient protection from wildfire. The proposed action is intended to achieve desired conditions on the areas treated by reducing surface fuels and removing ladder fuels, thereby raising canopy base heights and reducing *canopy fuels*. The treatments are also intended to strategically connect and maintain areas that currently meet desired conditions.

The remaining 30 percent (1,991 acres) of the 6,636 total acres of proposed fuel treatments would be treated to provide connectivity between disparate sections of the proposed DFPZs. Connectivity would enhance the strategic network of DFPZs on the landscape.

The desired conditions in the proposed fuel treatments are described below.

- Residual surface fuel (less than 3 inches in diameter) does not exceed 5 tons per acre. Where down logs exist, 10 to 15 tons per acre of the largest down logs have been retained.
- Fuel conditions allow for efficient and safe suppression of wildland fire and, when necessary, safe evacuation of forest visitors, residents, and firefighters.
- Fires are controlled through initial attack under 90th percentile weather conditions.
- Wildland fire behavior in treated areas generates flame lengths less than 4 feet.
- *Canopy base height* would be raised to between 15 and 25 feet.
- Stands have been moved from Fire Condition Classes 2 and 3 towards Fire Condition Class 1.
- Hazards to firefighters are minimized by reduced snag levels.
- The threats of crown fire and stand-replacing fire have been lessened by reducing surface fuels, ladder fuels, and canopy fuels.

Implement Group Selection and Individual Tree Selection

Purpose — The purpose of the project is also to implement group selection and individual tree selection as directed in the HFQLG Act (section 401[(b] [1] and [d] [2]) and the HFQLG amendment to the *Plumas National Forest Land and Resource Management Plan;* test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and improve and maintain the ecological health of the forest.

Through the HFQLG Act, Congress mandated the development of a pilot project to test and demonstrate the effectiveness of specific vegetative management activities in meeting certain ecologic, social, economic, and fuel-reduction objectives, consistent with applicable federal law. Accomplishing the mandates of the HFQLG Act requires group selection timber harvest on 8,700 acres each year in the pilot project area. In the 2004 Record of Decision on the *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement*, the Regional Forester directed full implementation of the HFQLG Pilot Project, subject to several specific constraints. The Empire Project, which is part of the HFQLG Pilot Project, is intended to implement both this Congressional mandate and direction in the amended Forest Plan. Accordingly, the purposes of project implementation are to:

- contribute a proportional share of the harvest of 0.57 percent of the pilot project land area each year by group selection
- promote an adequate timber supply that contributes to the economic stability of rural communities
- improve and maintain forest and ecological health
- employ treatments using the most cost-effective means available
- move the project area towards a fire-resilient forested landscape
- maintain and restore riparian plant communities by removing encroaching conifers (using individual tree selection)

The Empire Project area is divided into 24 *planning areas* that range in size from 92 acres to 5,162 acres. These planning areas are units used to determine the location and effects of group selection and individual tree selection treatments. Approximately, 1,347 acres of group selection harvest would be located within the planning areas. Factors used to delineate planning area boundaries are described in Chapter 2 in the “General Information” section of the 2005 Empire FEIS. The areas that are proposed for group selection harvest are generally comprised of Sierra mixed conifer and white fir, with small amounts of ponderosa pine and red fir stands scattered throughout the planning areas. The planning areas that have been selected for treatment are classified further into *California Wildlife Habitat Relationship* size classes (4 and 5) and *canopy cover* (M and D). The trees in these stands are generally larger than 10 inches in *diameter at breast height*. The stands have moderate and dense canopy cover, where tree density has increased over decades of growth and development as a result of past management activities. In some cases, high stand densities have led to disease and insect infestations. These stand conditions, over the landscape considered in this proposal, have generated a need for treatment. These treatments are designed to move the existing condition of high stand densities and associated insect and disease infestations to a healthy forest landscape that reflects desired conditions described above.

Stands in the vicinity of the group selection harvest units would be proposed for individual tree selection, which would provide cost-effective opportunities to create suitable conditions for growth and healthy forest development. Stands that are suitable for access by ground-based equipment would be considered for *biomass* treatments together with individual tree selection. Small material and individual trees would also be removed from the forest area, thus reducing ladder fuels. See chapter 2 for a discussion of the design elements for the various treatment methods.

Implement Transportation System Treatments

Purpose — The proposed road treatments are designed to provide the necessary access for fuel treatment, group selection, and individual tree selection harvest activities. Also, the road proposal would reduce impacts such as sedimentation and erosion on forest resources. Transportation system treatments are in compliance with the *Plumas National Forest Land and Resource Management Plan; Chapter 4, Forest Goals and Policy 17A* and HFQLG amendment to the PNF LRMP.

The transportation system for the Empire Project area was evaluated through a roads analysis, which is part of the *Mount Hough Landscape Assessment* (USFS 2004). The following access needs were identified based on the roads analysis:

- Road reconstruction and maintenance are needed to bring existing National Forest System roads into compliance with current maintenance standards and to provide access to the fuel reduction, group selection, and individual tree selection treatment areas. Reconstruction and road maintenance are also necessary to reduce erosion and sedimentation and to provide for public and firefighter safety.

- Road decommissioning is needed to reduce erosion, sedimentation, soil compaction, road density, and wildlife impacts.

- Spur road closure is needed to reduce erosion, sedimentation, soil compaction, and impacts on wildlife.

- Culvert replacement is needed to allow fish passage at three locations.

- Temporary road construction is needed to access fuel treatment units where existing access is inadequate.

- New system road construction is needed to provide access to some fuel treatment units. Rather than temporary road construction in this area, system road construction is needed to meet design criteria for location and future need.

- Harvest landing construction and reconstruction is needed to facilitate removal of wood products.

Proposed Action

A detailed description of the proposed action and alternatives to the proposed action is in chapter 2, and all maps for the proposed action and alternatives are located in appendix A. The boundary for the proposed Empire Project is the 103,000-acre area described in the March 2004 *Mount Hough Landscape Assessment* and shown on figure A-1 in appendix A.

Decision Framework

The responsible official for this project, Forest Supervisor James M. Peña, will decide whether to implement the Empire Vegetation Management Project as identified in the proposed action, implement the project based on alternatives to the proposal, or not implement the Empire Project at this time.

Forest Plan Direction

The *Plumas National Forest Land and Resource Management Plan (*also referred to as the “Forest Plan”), as amended by the 1999 HFQLG FEIS Record of Decision, and as amended by the 2004 *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* Record of Decision, guides the proposed action and alternatives. The Record of Decision on the 2004 *Sierra Nevada Forest Plan Amendment* (p. 68) displays the standards and guidelines applicable to the HFQLG Act Pilot Project area. Land allocations that apply to this proposal include Off Base and Deferred Lands, late-successional old-growth stands, California spotted owl Protected Activity Centers (PACs), California Spotted Owl Habitat Areas (SOHAs), and National Forest System lands outside these allocations that are available for vegetation and fuels management activities.

Public Involvement

Scoping Process

The Mount Hough Ranger District conducted a public scoping process for the Empire Project Environmental Assessment from June 30 to July 30, 2004. It was initiated by publishing notices in the Feather River Bulletin (Quincy); and mailing a statement of the proposed action to 635 agencies, organizations, federally recognized tribes, Native American communities, nonprofits and groups, adjacent landowners, and individuals who expressed an interest in the Empire Project. At two open houses in Quincy and Taylorsville, District Forest Service representatives gave presentations to the

Plumas County Fire Safe Council and Quincy Library Group. Four field trips were conducted to explain the proposed action. The purpose of the scoping process was to inform the public about the proposed action and to seek public views on the proposed action and issues to be addressed during the project analysis period. Written or verbal scoping comments or requests for additional information were submitted by 3 agencies, 6 organizations, and 19 individuals. Summaries of public comments and Forest Service responses to comments are contained in appendix I of the 2005 Empire FEIS.

Several field trips and office meetings took place in the summer of 2004 with members of the public and the Empire Project Interdisciplinary (ID) Team. These trips involved adjacent landowners and a member of the Greenhorn Subdivision volunteer fire department. Concerns were raised about the proposal in general; potential effects on a recreational trail, road access, tree thinning on public lands immediately adjacent to private ownership; and proposed road improvements on fire evacuation routes.

After evaluating responses to the initial scoping effort, a decision was made by the Forest Service Responsible Official (the Forest Supervisor) to proceed with preparation of an EIS.

A Notice of Intent to prepare this EIS for the Empire Project was published in the *Federal Register* on February 9, 2005, and a second public scoping period was held from February 10 to March 11, 2005. Fifty-three interested parties received a 31-page document describing the proposed action, purpose and need for action, and decision to be made. A total of 640 interested parties received a summary of the proposed action. The interested parties include organizations and persons who are adjacent landowners, interested and affected parties, and those who responded to the Schedule of Proposed Action notice and had previously asked to be notified of such actions. The distribution list also included federally recognized tribes, Native American communities, nonprofits and groups, the Plumas County Board of Supervisors, and agencies including the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Department of the Interior, California Department of Fish and Game, and the Northern Sierra Air Quality Management District. One agency, four organizations, and seven individuals submitted written or verbal scoping comments or requested additional information.

The scoping comments and responses are contained in appendix I of the 2005 Empire FEIS and in the Empire Project Record, which is located at the Mount Hough Ranger District office in Quincy, CA.

Scoping Issues

The Forest Service Responsible Official and the Empire Project ID Team reviewed the comments from the first scoping effort and examined the data collected during the 2004 and 2005 field seasons. The Responsible Official approved the issues identified by the Empire Project ID Team and the range of alternatives to be analyzed. The Empire Project ID Team developed the alternatives to the proposed action based on the following issues identified from public input, data analysis, and field reconnaissance:

Proposed Action Issues

1. Economic feasibility and volume / net value for Group Selection and Individual Tree Selection Units (alternative C).

The proposed action does not provide the highest possible amount of group selection harvest, which in turn, does not provide the greatest economic value in terms of sawlog and biomass production. Several planning areas are steep, rocky and have low volume. The cost of group selection and individual tree selection is much higher than the value of the timber. Alternative C was developed to respond to this issue by withdrawing those planning areas and increasing the total group selection harvest on better sites. As a result of withdrawing these planning areas and increasing the number of group selection harvest acres, there would be more group selection units located over a smaller land base. Thus, the density (number of groups per planning area) of group selection harvest units would be greater, and there would be a greater number of openings across the landscape.

Alternative C provides the Responsible Official with an option to improve the net value of the project. Net value and volume harvested will be used to measure how this alternative deals with the issue, as well as show comparisons with the proposed action and other alternatives.

2. Watershed effects and habitat protection for California spotted owl, Northern goshawk, American marten and Pacific fisher (alternative D).

Group selection and individual tree selection treatments within specific subwatersheds present an increased risk of cumulative watershed effects. Incremental effects of past projects when combined with the Empire project proposal and future projects were examined. The effects when combined push watershed thresholds. Concerns for sedimentation of streams and soil erosion and have prompted this issue.

In addition, the proposed action distributed the group selection harvest units with densities up to 17 percent within planning areas. Wildlife habitat issues came from the percentage of group selection within planning areas that could fragment habitat important to interior forest species. This issue presents a risk and uncertainty to wildlife habitat and generated a need to explore an alternative. This issue was remedied in the development of alternative D along with the watershed issue above. The Empire Project ID Team identified a group selection density and distribution across the planning areas to be at or below 11.4 percent.

Alternative D provides the Responsible Official with an option to maintain connected wildlife habitat, avoid watershed and soil concerns and continue to meet the purpose and need for the project. Group selection and individual tree selection planning areas were dropped in subwatersheds of concern.

Densities of group selections were lowered to stay below 11.4 percent. Wildlife habitat in terms of acres, and watershed cumulative effects in terms of percent threshold of concern, will be used as indicators to measure this issue, as well as show comparisons between the alternatives.

3. Compliance with the current Plumas National Forest off-highway vehicle (OHV) route designation process (action alternatives C, D, E, and F).

While planning the Empire project proposal, the Plumas National Forest was also planning the off-highway vehicle route designations. Off-highway vehicle routes being considered for designation were not taken into account with the proposed action, resulting in proposed closure and decommission. Coordination of these two plans needed to occur to eliminate confusion and conflicting proposals.

This issue was remedied by including the OHV route designation information into action alternatives C, D, E and F. Miles of road decommissioning and closure were used to measure this issue, as well as show comparisons with the proposed action.

Two alternatives suggested by the public were carried forward for detailed analysis in this EIS; the Empire Project ID Team identified the following issues and measures for these two alternatives:

1. Modify fuel treatments to retain all trees greater than 20 inches dbh, and maintain a 50 percent canopy in habitat for the California spotted owl, Northern goshawk, and mesocarnivores (alternative E).

The proposed fuel treatments harvest trees up to 30 inches dbh. An issue was identified that harvesting trees greater than 20 inches dbh is detrimental to old-forest conditions and not necessary to achieve fuel reduction.

- Predicted fire behavior (in terms of flame length, crowning and torching index, height to live crown, and resistance to control) is an indicator that was used to measure this issue, as well as show comparisons between the alternatives.

- Wildlife habitat (in terms of acres for the California spotted owl, Northern goshawk, American marten, Pacific fisher and forest interior habitat for old-forest-dependent species) is an indicator that was used to measure this issue, as well as show comparisons between the alternatives.

2. Implement fuel treatments, retain trees greater than 20 inches dbh, and maintain a 50 percent canopy cover in habitat for the California spotted owl, Northern goshawk, and mesocarnivores. Do not implement group selection or individual tree selection harvests (alternative F).

The proposed action presents a risk and uncertainty to old-forest wildlife species, such as spotted owls, and there should be no reduction in habitat for old-forest species.

- Wildlife habitat, in terms of acres, is an indicator that was used to measure this issue, as well as show comparisons between the alternatives.
- Predicted fire behavior (in terms of flame length, crowning and torching index, height to live crown, and resistance to control) is an indicator that was used to measure this issue, as well as show comparisons between the alternatives.
- Community stability and economic value expectations, with regard to implementing the intent of the HFQLG Act, were used to show comparisons between the alternatives

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Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter provides detailed discussions on the six alternatives considered for the Empire Vegetation Management Project (Empire Project), in addition two alternatives were considered but eliminated from detailed study. A summary of the six alternatives is provided at the end of this chapter, along with a comparison of the alternatives in text form and in tables. Please note that technical terms are shown in italics the first time they are used in text; the definitions can be found in the "Glossary."

Alternatives Considered in Detail

The proposed action is identified as alternative A. The Forest Service developed four action alternatives (C, D, E, and F) to the proposed action based on issues identified by the Empire Project Interdisciplinary (ID) Team during the scoping process. The Forest Service is also required to analyze a no-action alternative, which is alternative B (40 CFR 1502.14(d)). The six alternatives are described in detail below.

Alternative A: Proposed Action

Action 1: Implement Fuel Treatment Strategies
Fuel treatment units are planned on approximately 6,636 acres, and they would be located in four watersheds (Big Blackhawk, Estray, Indian Falls, and Sockum). Fuel treatment units are placed strategically across the Empire landscape and vary in size and shape, largely due to the vegetation type, slope and proximity to roads, drainages and major topographical features. The fuel treatments consists of 28 units that range in size from 7 acres to 871 acres. Fuel reduction consists of a combination of the following treatments:

- ground-based whole-tree *mechanical harvest*, *skidding*, *slash chipping*, and removal of sawlogs and *biomass* (biomass removal involves removing trees that are 3 feet tall to 10 inches in diameter).
- chainsaw thinning (also referred to as hand thinning)
- *mastication* of brush and small trees
- machine piling/handpiling, containment fireline construction around piles, burning piles, and burning slash
- prescribed underburning

Table 2.1 shows the acres of proposed fuel-reduction treatments in both the Wildland Urban Interface (WUIs) and Defensible Fuel Profile Zones (DFPZs) proposed in each watershed. The DFPZs locations are shown on figure A-2 in appendix A. Table 2.2 summarizes the number of acres proposed for each treatment.

Table 2.1. Alternative A — summary of fuel treatment acres in the four watersheds.

Watershed	Watershed Acres	Total Fuel Treatment Acres[a]	Fuel Treatment Acres Within WUI	DFPZ Fuel Treatment Acres (not within WUI)
Big Blackhawk	22,962	3,273	679	2,593
Estray	22,462	676	657	19
Indian Falls	34,304	316	52	264
Sockum	23,210	2,371	1,104	1,266
Total	**102,938[b]**	**6,636**	**2,492**	**4,142**

Notes:

a. The current extent of Fire Condition Classes (FCC) for all fuel treatment areas in all four watersheds are FCC 1 - 1,931 acres; FCC 2 and 3 - 4,677 acres. Full implementation of the proposed action is anticipated to maintain all FCC 1 acreage and move FCC 2 and 3 towards FCC 1.

b. For this EIS, the 102,938 watershed acres were rounded to 103,000 acres. This number represents the Empire Project area, as described in the *Mount Hough Landscape Assessment* (March 2004).

Table 2.2. Alternative A — acres of proposed fuel treatments.

Proposed Fuel Treatment	Alternative A – Proposed Action (acres)
Mechanical thinning / mastication	4,169
Hand thinning	380
Prescribed fire only	2,087
Total Fuel Treatments	**6,636**

Approximately 5.0 million *board feet* of sawlogs and 60,000 tons of *biomass* would be harvested from the 28 proposed fuel treatment units. Two of the 28 units would be treated using an aerial *yarding* system (either skyline/cable or helicopter) to remove material.

Site specific information for the proposed action is shown in “Appendix B: Fuel Reduction – Existing Condition and Proposed Treatment by Treatment Unit.” Appendix B lists the number of acres in each fuel treatment unit, the watershed where each of the fuel treatment units is located, the physical characteristics, existing conditions, treatment/logging system/access needs, and remarks for each fuel treatment unit.

The following describes the design elements for the proposed fuel treatments (DFPZs and WUIs).

- Where oak is present, retain a minimum of 25 to 35 square feet *basal area* per acre of oaks over 15 inches *diameter at breast height* (dbh).

- Where available, retain some or all of the largest *snags* as follows: 2 per acre in WUIs, 4 per acre in mixed conifer/pine forest types, and 6 per acre in the red fir forest types.

- After treatment, the amount of surface fuels less than 3 inches in diameter would be less than or equal to 5 tons per acre, to prevent average flame length during wildfire from exceeding 4 feet during *90th percentile weather conditions.* Where down logs exist, 10 to 15 tons per acre of the largest down logs would be retained.

- Mechanical harvest treatments would be conducted within designated Riparian Habitat Conservation areas Areas (RHCAs) where slopes are less than 30 percent. All mechanical equipment would be excluded from within 100 feet (horizontal) of *perennial streams*, 50 feet from *intermittent* and sensitive *ephemeral* streams, and 25 feet from other ephemeral streams having evidence of scour. Other areas that would be excluded include sensitive streams characterized by locally erosive soils, downcut or gullied channels, or vertical banks. Equipment would be allowed to cross *swales* and ephemeral and intermittent streams at right angles. All mechanical exclusion areas would be designated on a map or on the ground.

- Within RHCAs, hand thinning would be used in areas where mechanical equipment is excluded. In such areas, conifers from 3 feet in height to 6 inches in diameter would be hand thinned to a spacing of 15 feet. All hardwoods and riparian vegetation would be retained. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching when burning piles.

- *Prescribed fire* would not occur within 25 feet (horizontal) of all streams; however, *backing fire* would be allowed into these areas.

- The treatment units would be evaluated following mechanical harvest and mastication. Units that do not meet desired conditions may have follow-up surface fuel treatments that would include underburning, pile burning, associated fireline construction, and/or other appropriate surface fuel treatments.

- The objective would be to leave vigorous stands with adequate vertical and horizontal crown separation in order to reduce the likelihood of *crown fire* and potential mortality of residual trees for at least the next 10 years. After harvest, tree *canopy cover* would typically be 30 to 45 percent. In no case would the *basal area* be reduced to less than 30 percent of the existing basal area. Canopy base height would be raised to between 15 and 25 feet.

- Within CWHR 5M and 5D class stands (stands that are comprised of trees greater than 24 inches in diameter with 70 to 100% canopy); a minimum of 40 percent canopy cover would be retained. Canopy cover would not be reduced by more than 30 percent of existing canopy cover. At least 40 percent of the existing basal area, generally comprised of the largest trees, would be retained.

- Average conifer spacing in pole or sapling aggregations (that is, conifers less than 11 inches dbh) would vary from 14 to 20 feet to create conditions that would inhibit a sustained crown fire during 90th percentile weather conditions.

- All trees greater than 30 inches dbh would remain regardless of canopy closure, *crown class*, or spacing, except to allow for *operability*.

- *Sporax* would be applied to all harvested pine, white fir, and incense cedar stumps that are greater than 8 inches in diameter (diameter of the stump) to minimize the susceptibility to *annosum root rot.*

- Upon completion of the fuel treatments, the Mount Hough Ranger District would implement monitoring of fuel conditions in the treatment units to gauge the effectiveness of the treatments and in terms of surface and *ladder fuel* accumulations. The desired condition is that surface fuels (fuels 3 inches in diameter, including twig-fall from trees and brush) remain at less than or equal to 5 tons per acre. Maintenance of fuel treatment areas is not part of this proposed action.

Action 2: Implement Group Selection and Individual Tree Selection Harvests

Group selection harvest is proposed on approximately 1,347 acres. Group selection (1/2 to 2 acre units) would be located in the 24 planning areas. Planning areas were delineated to aggregate stands best suited for group selection and individual tree selection. Stand aggregations of CWHR 4M and 4D (trees between 11 and 24 inches dbh with moderate and dense canopies) and CWHR 5M and 5D (trees greater than 24 inches dbh with moderate and dense canopies) were used to delineate planning areas. The planning areas help define the general location of group selection and individual tree selection, provide for more efficient resource surveys and enhance the feasibility of implementation. Exact locations of group selections would not be determined until final layout, marking and cruising of the project.

There are several planning areas that would overlap onto fuel treatment units. Thus, group selection units would also be located within fuel treatment units. Appendices C and E contain detailed, site specific descriptions of the 24 planning areas. These appendices show the number of acres in each planning area, number of acres proposed for group selections, individual tree selections, and biomass removal, watersheds where each of the planning areas are located and physical characteristics, existing conditions, logging system/access needs, and remarks for each planning area.

The proposed harvest methods are ground-based logging systems or aerial yarding logging systems. Aerial yarding systems include helicopter logging and cable logging. Both harvest methods would employ whole-tree yarding. Use of ground-based logging systems would include biomass removal. Use of cable and helicopter logging systems would include biomass treatment (removal of biomass), except where needed to regenerate *shade-intolerant* conifers.

Table 2.3 summarizes the proposed acres of the group selection harvest units in each watershed. It also shows the relative amount of harvest by logging system. This information indicates the extent of treatments relative to the 103,000-acre Empire Project area to help frame the analysis of project effects. Figure A-3 in appendix A shows planning areas where group selection harvest is proposed.

Approximately 17.3 million board feet of sawlogs and 16,000 tons of biomass would be harvested from group selection units.

Table 2.3. Alternative A — summary of group selection acres and proposed logging system harvest method by watershed.

Watershed	Watershed (acres)	Group Selection (acres)	Logging Systems (for group selection harvest)	
			Ground-Based Equipment	Aerial Yarding Equipment
Big Blackhawk	22,962	494	85%	15%
Estray	22,462	310	70%	30%
Indian Falls	34,304	90	45%	55%
Sockum	23,210	453	85%	15%
Total	**102,938**[a]	**1,347**		

Note:

a. This number represents the Empire Project area acres, which were rounded to 103,000 acres in the EIS.

The following are the design elements for proposed group selection harvest:

- Trees would be harvested from areas that are between 0.5 acre and 2 acres in size. The groups would predominantly be located in stands containing sawlog-sized conifers that generally range between 10 and 29.9 inches dbhin diameter at breast height (dbh).
- Where oak is present, retain a minimum of 25 to 35 square feet basal area per acre of oaks over 15 inches dbh.
- All trees greater than or equal to 30 inches dbh would be retained, except where removal would be required to allow for operability. Impacts on trees greater than 30 inches dbh would be minimized to the extent practicable by routing skid trails away from these trees and avoiding skin-ups with equipment.
- Desirable conifer *regeneration* would be retained (desired conifers are undamaged, healthy, and shade-intolerant species).
- All sugar pine tagged as resistant to *blister rust* would be retained.
- Two of the largest snags per acre exceeding 15 inches dbh would be retained, unless removal is required to allow for operability.
- Slash treatment would include underburning, *piling and burning*, and/or slash chipping. Firelines would be constructed, as needed, around groups to be underburned, machine piled, or hand piled.

- Groups would be regenerated with shade-intolerant native conifers indicative of the ecological habitat type in which the group is located, using a combination of natural and planted seedlings to achieve desired *stocking levels*.

- Competing vegetation would be controlled by grubbing or mastication, as needed, to ensure survival and growth of young conifers.

- Group selection units would be located outside of Riparian Habitat Conservation Areas (RHCAs).

Individual tree selection harvest is proposed on approximately 4,000 acres adjacent to or surrounding some of the group selection in the harvest units in the planning areas. Biomass removal, in combination with individual tree selection harvest, is proposed on approximately 350 acres in planning areas 14G, 18G, 19G, and 24G (see figure A-3 in appendix A). Biomass removal involves removing trees that are 3 feet tall to 10 inches in diameter.

Individual tree selection would occur in the highest priority stands in each of the four watersheds based on forest health concerns such as stand density, insect or disease activity, and fuel conditions. Treatments would be accomplished with a combination of whole-tree ground-based logging systems, helicopter logging systems, and/or cable logging systems. Harvest slash treatment would include piling and burning, whole-tree yarding, slash chipping, and lopping/scattering limbs and treetops. The individual tree selection prescription would be designed to meet Forest Plan standards set forth in the Record of Decision on the 2004 *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* (p. 69). The Forest Plan standards, which would be applied to proposed individual tree selection treatments, are described below.

Where vegetative conditions permit, design projects to retain 50 percent canopy cover after treatment averaged within the treatment unit, except where site-specific project objectives cannot be met. Where 50 percent canopy cover retention cannot be met as described above, design projects to retain a minimum of 40 percent canopy cover averaged within the treatment unit.

- Design projects to avoid reducing canopy cover by more than 30 percent from pretreatment levels.

- Design projects to retain at least 40 percent of the existing basal area, generally comprised of the largest trees.

- Design projects to retain, where available, 5 percent of the total post-treatment canopy cover in lower layers comprised of trees between 6 and 24 inches dbh.

- Design projects to retain all live trees 30 inches dbh; exceptions would be allowed for operability. As much as practicable, minimize impacts on trees 30 inches dbh.

Approximately 4 million board feet of sawlogs and 6,000 tons of biomass would be harvested from the planning areas as a result of the individual tree selection treatments.

Table 2.4 summarizes the proposed acres of the individual tree selection harvest and biomass removal in each watershed. It also shows the relative amount of harvest by logging system. This information indicates the extent of treatments relative to the 103,000-acre Empire Project area, to help frame the analysis of project effects.

Table 2.4. Alternative A — Summary of individual tree selection and biomass acres and proposed logging system harvest method by watershed.

Watershed	Watershed	Individual Tree Selection	Biomass	Logging Systems (for individual tree selection)	
				Ground-Based	Aerial Yarding
	Acres			Equipment	
Big Blackhawk	22,962	1,209	200	85%	15%
Estray	22,462	871	0	70%	30%
Indian Falls	34,304	120	50	45%	55%
Sockum	23,210	1,800	100	85%	15%
Total	**102,938**	**4,000**	**350**		

The design elements of individual tree selection and biomass harvest are described below.

- Dead conifers (due to insects, disease, or general conifer mortality) would be harvested while retaining snags for wildlife in the quantities described in the fuel treatment design elements. High-risk, unhealthy, or poor-genetic-quality commercial trees (having excessive lean, dead tops, mistletoe infections, blister rust infections, heart and root rots, severe bole damage, forked stems, or fading or chlorotic foliage) would be harvested.

- In addition, within stands of CWHR classes 4M, 4D, 5M, and 5D where canopy cover exceeds 50 percent, other commercial conifers 10 to 29.9 inches dbh would be harvested, retaining at least a 50 percent canopy cover.

- Shade-intolerant species, such as pine and Douglas-fir would be favored for retention while shade –tolerant species, such as fir and incense cedar would be favored for harvest.

- Conifers less than 30 inches dbh that are encroaching on aspen stands would be removed. Otherwise, individual tree selection harvest would be excluded from riparian habitat conservation areas.

- In addition to the above actions, conifers that are from 3 feet in height to 10 inches dbh may be removed in ground-based logging units. This action is limited to stands adjacent to group selection harvest units that provide opportunities for the economic removal of biomass.

Table 2.5 summarizes the proposed acres of fuel treatments, group selection and individual tree selection harvest acres, and biomass removal acres in each watershed. This information helped frame the analysis of project effects by presenting the extent of treatments relative to the 103,000-acre Empire Project area.

Table 2.5. Alternative A — summary of total fuel treatments, group selection, and individual tree selection with biomass removal.

Watershed	Watershed	Total Fuel Treatment	Group Selection	Individual Tree Selection (ITS)	Biomass Acres within Individual Tree Selection
	Acres				
Big Blackhawk	22,962	3,273	494	1,209	200
Estray	22,462	676	310	871	0
Indian Falls	34,304	316	90	120	50
Sockum	23,210	2,371	453	1,800	100
Total	**102,938**	**6,636**	**1,347**	**4,000**	**350**

A total of approximately 26.3 million board feet of sawlogs and 82,000 tons of biomass would be harvested under alternative A.

Action 3: Implement Transportation System Treatments

Appendix A figures A-6, A-10, A-12, and A-14 depict the road construction, closure, decommissioning, and reconstruction actions proposed under alternative A. Appendix D lists the proposed actions for each road by watershed and also describes the system road reconstruction in terms of light, moderate, or heavy treatment. Light reconstruction treatment would include clearing the brush along the roadside and grading the road surface. Moderate reconstruction treatment would include construction of drainage structures and would require use of heavy equipment such as bulldozers and back hoes. Heavy reconstruction treatment would include road relocation as well as light and moderate treatments.

Table 2.6 summarizes the proposed changes to the road system in each watershed.

Table 2.6. Alternative A — summary of road treatments in each watershed.

Watershed	Proposed Road System Changes (miles)				
	System Road Construction / Closure	Temporary Construction/ Decommission	Closure	Reconstruction	Decommission
Sockum	0.2	0.5	9.7	38.7	8.3
Big Blackhawk	0.6	4.0	5.7	44.2	4.6
Estray	1.0	1.3	0.9	28.34	1.8
Indian Falls	1.3	0.3	0.8	1.7	0.8
Total	**3.1**	**6.1**	**17.1**	**113**	**15.5**

The proposed road system changes under alternative A are listed below. The other action alternatives (C, D, E, and F) propose different numbers of miles.

- Approximately 3 miles of new National Forest System roads would be constructed but then closed upon completion of the project.
- Approximately 6 miles of new temporary roads would be constructed but then decommissioned upon completion of the project.
- Approximately 113 miles of existing system roads would be reconstructed.
- Approximately 17 miles of existing system roads would be closed upon completion of the project using earth and log barriers.
- Approximately 15 miles of existing system roads would be decommissioned.
- Existing harvest landings would be reconstructed, and new landings would be constructed where existing landings are not present or are inadequate.
- Three culverts would be replaced as part of the road reconstruction to improve fish passage.

Alternative B: No Action

This alternative takes no action to implement provisions of the HFQLG Act or National Fire Plan on the Empire Project at this time. On-going activities such as routine road maintenance, fire suppression and recreation management would continue in the Empire area. Future actions listed in appendix G, including fuel reduction projects would continue to be planned.

Alternative B complies with 40 CFR 1502.14(d), which requires that a no-action alternative be included in the analysis.

Alternative C

Action 1: Implement Fuel Treatment Strategies
Fuel treatments proposed in alternative C are identical to those proposed in alternative A.

Action 2: Implement Group Selection and Individual Tree Selection Harvests
Alternative C was developed because the proposed action does not provide the greatest economic value in terms of sawlog and biomass production. Planning areas 1G, 2G, 9G, 20G, and 23G are withdrawn from Alternative C because they are steep, rocky and have low volume per acre. The cost of group selection and individual tree selection on these units is much higher than the value of the timber. Alternative C increases the number of group selection within the remaining planning areas to 1,600 acres (an increase from 1,347 acres in the proposed action). This increase aims to meet the economic objectives of the project to the greatest extent possible and still meet the objectives described in chapter 1. The design elements for group selection and individual tree selection treatments under this alternative are the same as the proposed action.

Action 3: Implement Transportation System Treatments
Alternative C changes the amount and distribution of the group selection and individual tree selection treatments. Transportation system treatments are adjusted to support this alternative. These changes are due the five withdrawn planning areas. The changes also respond to the OHV Route Designation process issue. The proposed action would close 6 miles and decommission 3.4 miles of road proposed as potential routes. Alternative C withdraws these roads from closure and decommission. Table 2.9 compares the transportation system treatments and reflects the proposed road work to support Alternative C.

Alternative D (Preferred Alternative)

Action 1: Implement Fuel Treatment Strategies
Based on additional analysis of air quality impacts and further field reconnaissance, six fuel treatment units identified for prescribed burning in the proposed action (units 2, 9, 10, 15, 20, and 21) would be modified under alternative D. These units are too steep and rocky to implement prescribed burns safely, or would create substantial smoke impacts to Quincy. Portions of these units meet desired conditions as described in chapter 1. Portions of these treatment units would be masticated, hand thinned, or not treated. These changes result in a reduction of 1,678 acres of prescribed burning. Of these 1,678 acres, 944 acres meet desired conditions and no further treatment would occur. These acres are found in isolated pockets scattered throughout the 6 units described and although no treatments are proposed, these areas will continue to function as an integral part of the defensible fuel profile zone. There are 709 acres found within these six units that would be masticated, and 25 acres would be hand thinned rather than prescribed burn only. Unit 20 (137 acres) is withdrawn from treatment under alternative D due to the lack of access, steepness of slopes and smoke that is predicted to impact the valley surrounding Quincy and East Quincy.

Under alternative D, Sporax treatments would be implemented according to the 2005 informal appeal disposition with Californians for Alternatives to Toxics. Sporax would be applied on pine, fir, and incense cedar stumps greater than 14 inches and would be limited to annosus root rot infection identified within fuel treatment units 13 and 17.

Alternative D would limit the mechanical harvest prescription in riparian habitat conservation areas (RHCAs) that are found within fuel treatment units. Rather than retain all trees greater than 30 inches diameter at breast height (dbh) and maintain 40 percent canopy cover, alternative D would retain all trees greater than 20 inches dbh and maintain 50 percent canopy cover. This modification to alternative D was a result of comments received on the 2005 Empire DEIS. Forest Supervisor Jim Peña determined in the 2005 Record of Decision that this modification would reduce impacts to RHCAs while meeting the fuel management desired conditions. The supplemental analysis supports this decision.

Action 2: Implement Group Selection and Individual Tree Selection Harvests
Alternative D was developed because three planning areas, 3G, 7G and 8G are located in subwatersheds where there is concern for sedimentation and erosion. Alternative D withdraws these three planning areas along with the five planning areas withdrawn in alternative C. Alternative D proposes to harvest 1,226 acres of group selection and 2,370 acres of individual tree selection in the remaining planning areas.

Alternative D was also developed to take into consideration the effects of wildlife habitat fragmentation in planning areas where group selection densities reached as high as 17 percent in the proposed action. All planning areas considered under alternative D would maintain group selection densities at or below 11.4 percent.

Alternative D aims to reduce the effects to wildlife habitat and watersheds, and still meet the objectives described in chapter 1.

Action 3: Implement Transportation System Treatments
Transportation system treatments are adjusted to support alternative D modifications to the amount and distribution of the group selection and individual tree selection treatments. These changes are due the eight withdrawn planning areas. The changes also respond to the OHV Route Designation process issue. The proposed action would close 6 miles and decommission 3.4 miles of road proposed as potential routes. Similar to alternative C, this alternative would withdraw these roads from closure and decommission. Table 2.9 compares the transportation system treatments and reflects the proposed road work to support Alternative D.

With alternative D Road 25N73B would be rerouted with approximately 1,000 feet of new road construction and approximately 1,000 feet of the existing road would be decommissioned. This would be done to provide access for chip trucks which have a wide turning radius.

Alternative E

This alternative was developed to address public concerns that harvesting trees greater than 20 inches dbh is detrimental to old-forest conditions and not necessary to achieve fuel reduction objectives as described in chapter 1.

Action 1: Implement Fuel Treatment Strategies
The fuel treatments proposed in alternative E are identical to alternative D with one exception: the prescriptions are designed to retain all trees greater than 20 inches dbh (alternative D proposes a dbh of 30 inches) and a 50 percent canopy closure, where it exists. Three design criteria are specific for alternative E:

- After harvest, tree canopy cover would typically be **50 percent.** In no case would basal area be reduced to less than 30 percent of existing basal area. Canopy base height would be raised to between 15 and 25 feet.
- Within CWHR 5M and 5D class stands, a minimum of **50 percent canopy cover** would be retained. Canopy cover would not be reduced by more than 30 percent of existing canopy cover. At least 40 percent of the existing basal area, generally comprised of the largest trees, would be retained.
- All trees greater than **20 inches dbh** would remain regardless of canopy closure, crown class, or spacing, except to allow for *operability*.

Action 2: Implement Group Selection and Individual Tree Selection Harvests

Group selection and individual tree selection treatments proposed in alternative E are identical to those proposed in alternative D.

Action 3: Implement Transportation System Treatments

The transportation system treatments that are proposed for alternative E are the same in alternative D. Table 2.9 compares the transportation system treatments and reflects the proprosed road work to support this alternative.

Alternative F

This alternative was developed to address public concerns that harvesting trees greater than 20 inches dbh is detrimental to old-forest conditions. The contention is that due to risk and uncertainty to sensitive wildlife species such as the spotted owl, no group selection and individual tree selection harvest should occur. Alternative F was also developed in order to consider the effects of fuel treatments in the absence of other silvicultural treatments prescribed by the Herger-Feinstein Quincy Library Group Forest Recovery Act.

Action 1: Implement Fuel Treatment Strategies
Fuel treatments would be designed and implemented identical to those proposed in alternative E.

Action 3: Implement Transportation System Treatments
Since there are no group selection and individual tree selection treatments, the transportation system treatments necessary to support this alternative also change. There would be no road construction proposed, 1.9 miles of road decommission proposed and 48.3 miles of reconstruction. Road closure and decommission are similar to alternatives D and E. Table 2.9 compares the transportation system treatments and reflects the proposed road work to support Alternative F.

No Group Selection and Individual Tree Selection Harvests

Standard Management Requirements and Mitigation Measures

Standard Management Requirements (SMR) and mitigation measures that apply to all action alternatives are found in appendix F.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

Alternative G – Reduced Road Construction and Road Costs

Alternative G was developed to reduce road construction as a means of reducing fragmentation of the landscape and reducing road-related costs. Alternative G was designed by the Empire Project ID Team to consider the reduction of new road construction, including the construction of temporary roads as proposed during the scoping process. This proposed alternative included the elimination of group selection harvest on planning area 15G, as well as reduction and modifications of group selection harvest on planning areas 5G, 17G, 18G, 19G, and 21G. It would modify DFPZ fuel treatments proposed in units 2 and 25.

The Empire Project ID Team found that this alternative design would create problems in logging system design, with excessively long skidding and impractical yarding operations. Ultimately, the cost of reduced road construction would be offset by increased costs in operations. It was determined that harvest in the planning areas affected by this alternative would necessitate a significant increase in aerial yarding operations.

The Empire Project ID Team developed alternative F, which reduces road construction and reconstruction considerably. Alternative G was eliminated from further study and consideration because of the impractical yarding and logging system alterations. It was also eliminated from further study because alternative F would already meet the suggested intent for reduced road construction and associated costs without impractical and potentially infeasible design elements for timber harvest operations.

Alternative H – Reduced Fuel Treatments

Alternative H — Public comments suggested looking at a series of sub-alternatives to the proposed action that would implement thinning from below at three different upper-diameter limits: 10, 12, and 15 inches. Under each sub-alternative, the DFPZ and fuel treatments would be constructed by removing material up to that diameter. For simplicity, the Empire Project ID Team eliminated group selection and individual tree selection treatments from this alternative.

Two of the most common types of forest stands were analyzed using the Fuels Management Analysis Model (a computer software), described in chapter 3 under “Fire, Fuels and Air Quality”. The Sierra mixed conifer size class 4M (trees 11 to 24 inches dbh, with a 40 to 59 percent canopy cover) characterizes the majority of the DFPZ area that would be mechanically treated (about 40 percent). Using the three upper diameter limits (10, 12, and 15 inches), modeling indicated that some of the desired conditions of a DFPZ would be met. Flame lengths would remain at or below 4 feet for about 20 years. The likelihood of torching would remain relatively low for the modeled period of 50 years. Fireline construction rates would be improved due to reduced surface fuels, allowing for a more efficient and safe suppression of wildland fire. Modeled post-treatment canopy cover would be between 36 and 51 percent for the different upper diameter limit treatments; the lowest canopy cover would be in the 15-inch upper diameter treatment limit.

In addition, a major requirement of the HFQLG Act is to conduct the pilot project using the most cost-effective means available. Alternative H was considered but eliminated from detailed study in part because an economic analysis using the upper diameter limits showed that the cost of constructing a DFPZ would not fully meet the project purpose and need and would conflict with other management constraints.

Comparison of Alternatives

Table 2.7 provides a vegetation treatment comparison of all alternatives A, B, C, D, E, and F. Table 2.8 shows a comparison of volume estimates for all alternatives A, B, C, D, E, and F.

Table 2.7 Comparison of proposed vegetation treatment acres for all alternatives A, B, C, D, E, and F.

Alternative	Number of Planning Areas	Fuel Treatment Acres	Group Selection Acres	Individual Tree Selection (ITS) Acres	Biomass Acres with ITS Acres
A (Proposed Action)	24	6,636	1,347	4,000	350
B (No Action)	0	0	0	0	0
C	19	6,636	1,600	4,000	350
D (Preferred Alternative)	16	5,555	1,226	2,370	350
E	16	5,555	1,226	2,370	350
F	0	5,555	0	0	0

Table 2.8. Comparison of proposed volume estimates for all alternatives A, B, C, D, E, and F.

Alternative	Fuel Treatment Volume (mmbf)[a]	GS Volume (mmbf)	ITS Volume (mmbf)	Total Sawlog Volume (mmbf)	Biomass Volume (tons)
A (Proposed Action)	5.0	17.3	4.0	26.3	82,000
B (No Action)	0	0	0	0	0
C	5.0	20.6	4.0	29.6	87,000
D (Preferred Alternative)	5.0	15.8	2.3	23.1	83,000
E	1.7	15.8	2.3	19.8	83,000
F	1.7	0	0	1.7	60,000

Note:

a. mmbf = million board feet.

Table 2.9 compares the transportation system treatments between all alternatives A, B, C, D, E, and F.

Table 2.9. Comparison of proposed transportation system treatments between all alternatives A, B, C, D, E, and F.

Alternative	System Road Construction / Closure (miles)	Temporary Road Construction Decommission (miles)	Road Reconstruction (miles)	Road Closure (miles)	Road Decommission (miles)
A (Proposed Action)	3.0	6.2	113.0	17.1	15.6
B (No Action)	0	0	0	0	0
C	3.0	6.2	107.1	11.1	12.0
D (Preferred Alternative)	3.0	6.2	101.8	11.1	12.0
E	3.0	6.2	101.8	11.1	12.0
F	0	1.9	48.3	11.1	12.0

Implementation of alternative B would not meet the purpose and need for fuel treatments, group selection, individual tree selection, and transportation systems. No short-term improvement to fire suppression capabilities or reduction of hazardous fuels would be achieved by this alternative. This alternative would not contribute to economic stability, direct and indirect jobs, or provide an adequate timber supply to local rural communities. No road decommissioning would occur, so associated long-term beneficial watershed effects would not be realized.

Alternatives A, C, and D would meet the purpose and need for fuel treatments by treating surface, ladder and canopy fuels and providing fire-suppression personnel with safe locations for taking action against wildfires. The retention of 30 to 45 percent canopy cover would result in a lower probability of crown-fire events compared to existing conditions. The rate of line construction and penetration of retardant drops through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions. Additionally, firefighter safety would be improved in fuel treatments. The fuel treatments proposed in alternatives A, C, and D are identical and would retain various percentages of suitable habitat for the California spotted owl.

Alternatives E and F would meet the purpose and need for fuel treatments by treating surface and ladder fuels, and some canopy fuels, and providing fire-suppression personnel with safe locations for taking action against wildfires. The retention of 50 percent canopy cover would result in a moderate probability of crown-fire events compared to alternatives A, C, and D. The rate of line construction and penetration of retardant drops through the canopy to surface fuels would be reduced, resulting in a decreased ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions compared with alternatives A, C, and D. The fuel treatments proposed in alternatives E and F would retain higher percentages of suitable habitat for the California spotted owl.

Alternatives A, C, and D would meet the purpose and need for group selection and individual tree selection. The proposed density of group selection and individual tree selection in alternatives A and C would create more edge habitat, increasing the risk and uncertainty associated with habitat use by interior forest species and potentially trending four subwatersheds toward the TOC. The proposed density of group selection in alternative D would reduce the risk and uncertainty for interior forest species compared with alternatives A and C. Alternative D would not implement group selection and individual tree selection in certain subwatersheds; this would reduce the risk of approaching the TOC. Alternatives E and F would meet the purpose and need for fuel treatments by treating surface and ladder fuels, and some canopy fuels, and providing fire-suppression personnel with safe locations for taking action against wildfires. The retention of 50 percent canopy cover would result in a moderate probability of crown-fire events compared to alternatives A, C, and D. The rate of line construction and penetration of retardant drops through the canopy to surface fuels would be reduced, resulting in a decreased ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under 90th percentile weather conditions compared with alternatives A, C, and D.

Alternative E would meet the purpose and need for group selection and individual tree selection. Alternative E would reduce the risk and uncertainty associated with habitat use by interior forest species and would not raise the TOC for certain subwatersheds. Alternative F would not meet the purpose and need for group selection and individual tree selection; however, it would maintain habitat for interior forest species.

With respect to economics, alternative C would provide the greatest net value, timber supply, and creation of direct and indirect jobs. Implementation of alternatives E and F would result in a negative net valueloss of $1 million. Alternatives A and, D, and E would provide a positive net value, timber supply, and creation of direct and indirect jobs. Implementation of alternative B would result in no positive economic effect on the local community with respect to timber supply and local job creation.

Comparison of Effects

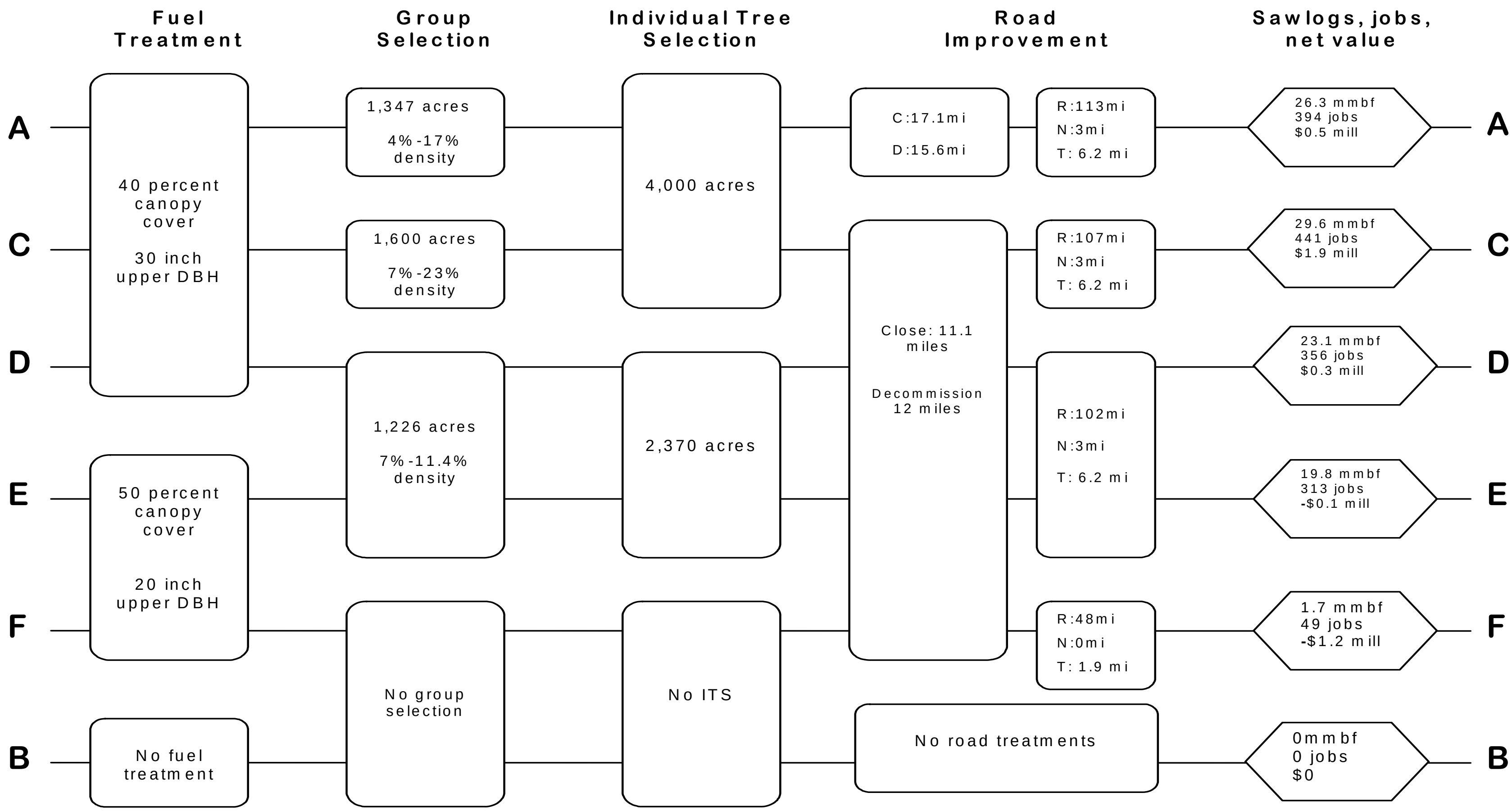
The following tables (Tables 2.10 and 2.11) and figures (Figures 2.1 and 2.2) provide comparisons of the alternatives with regard to fuel treatments, group selection, individual tree selection, transportation system improvements, and net value.

Table 2.10. Comparison of effects .

	Action 1	Action 2		Action 3
Alternative	**Implement Fuel Treatment Strategies**	**Group Selection Harvest**	**Individual Tree Selection Harvest**	**Transportation System Changes**
A	• Would meet purpose and need. • The 40 percent canopy cover would reduce suitable owl habitat.	• Would meet purpose and need. • Group selection density would fragment interior forest habitat. • Two subwatersheds would approach Threshold of Concern.	• Would meet purpose and need. • Two subwatersheds approach Threshold of Concern. • Group selection, individual tree selection, and fuel treatments combined create 394 full time jobs and return $473,995 to the Treasury.	• Would meet purpose and need. • Does not comply with Plumas National Forest OHV route designation process.
B	• Would not meet purpose and need.	• Would not meet purpose and need.	• Would not meet purpose and need. • No jobs created; no return to Treasury.	• Would not meet purpose and need.
C	• Would meet purpose and need. • The 40 percent canopy cover would reduce suitable owl habitat.	• Would meet purpose and need. • Group selection density would fragment interior forest habitat. • One subwatershed would approach Threshold of Concern.	• Would meet purpose and need. • One subwatershed would approach Threshold of Concern. • Group selection, individual tree selection, and fuel treatments combined would create 441 full time jobs and return $1,858,574 to the Treasury.	• Would meet purpose and need.
D	• Would meet purpose and need. • The 40 percent canopy cover would reduce suitable owl habitat.	• Would meet purpose and need. • Group selection density would fragment interior forest habitat but less than under alternatives A and C.	• Would meet purpose and need. • Group selection, individual tree selection, and fuel treatments combined would create 356 full time jobs and return $294,069 to the Treasury.	• Would meet purpose and need.
E	• Would reduce the	• Would meet	• Would meet purpose	• Would meet

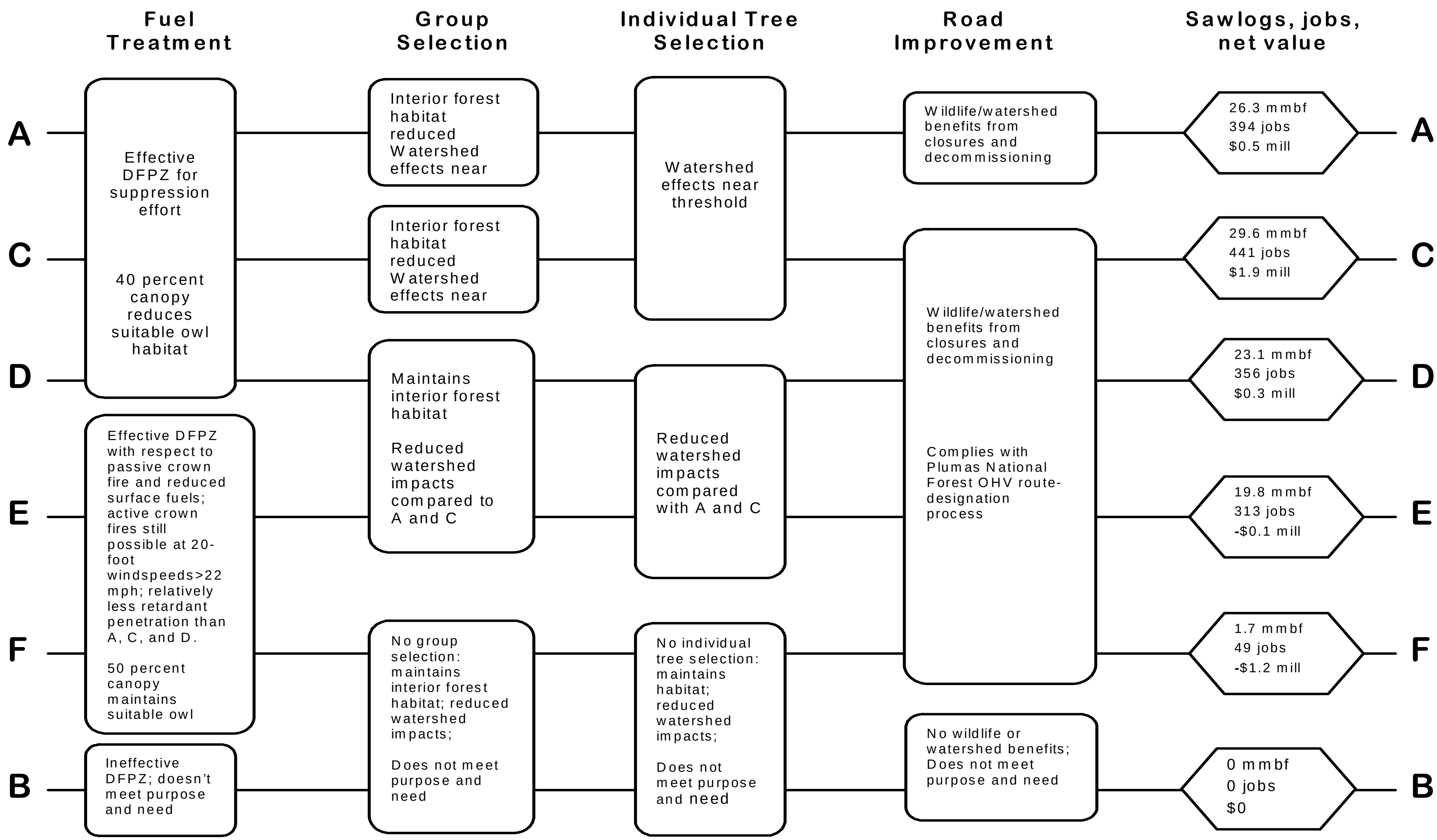
Alternative	Action 1 Implement Fuel Treatment Strategies	Action 2 Group Selection Harvest	Action 2 Individual Tree Selection Harvest	Action 3 Transportation System Changes
	likelihood of passive crown fire (torching). • The retardant penetration through the canopy to surface fuels may not be as effective as alternatives A, C, and D. • Greater likelihood of crown fire at wind speeds greater than 22 mph in fuel treatments compared with alternatives A, C, and D. • The 50 percent canopy cover would not reduce suitable owl habitat.	purpose and need. • Group selection density would fragment interior forest habitat but less than under alternatives A and C.	and need. • Group selection, individual tree selection, and fuel treatments combined would create 313 full time jobs and net loss of $101,280 to the Treasury.	purpose and need.
F	• Would reduce the likelihood of passive crown fire (torching). • The retardant penetration through the canopy to surface fuels may not be as effective as alternatives A, C, and D. • Greater likelihood of crown fire at wind speeds greater than 22 mph in fuel treatments compared with alternatives A, C, and D. • The 50 percent canopy cover would not reduce suitable owl habitat.	• Would not meet purpose and need. • Maintains interior forest habitat as continuous cover.	• Would not meet purpose and need. • Group selection, individual tree selection, and fuel treatments combined would create 49 full time jobs and net loss of $1,222,001 to the Treasury.	• Would meet purpose and need.

Figure 2.1. Comparison of treatments.



C = close; D = decommission; R = reconstruction; N = new construction; T = temporary

Figure 2.2.: Comparison of Effects.



C = close; D = decommission; R = reconstruction; N = new construction; T = temporary

Table 2.11. Comparison of Forest Characteristics by Alternative.

Indicator	Unit of Measure	Alternative A (Proposed Action)	Alternative B (No Action)	Alternative C	Alternative D (Preferred Alternative)	Alternative E	Alternative F
Fire behavior and resistance to control	Crowning index (20-foot wind speed in mph) in fuel treatments	39	17	Same as A	Same as A	21	Same as E
	Penetration of retardant drops in fuel treatments to reaching surface fuels	Increased	No change	Same as A	Same as A	Less than A	Slightly less than E
	Acres of fuel treatments where fire fighters can take safe and effective actions against wildfires	6,636	0	6,636	6,499	6,499	6,499
Fire-resistant stand structure	Post-treatment canopy cover	30%-46%	52%-79%	30%-46%	30%-46%	50%-53%	50%-53%
	Stand size class (CWHR[a]) and stand density: range in size class	CWHR size: 3-5	CWHR size: 3-4	CWHR size: 3-5	CWHR size: 3-5	CWHR size: 3-4	CWHR size: 3-4
Landscape structural diversity	Landscape Structure enhanced by percent	11.6%	0%	11.9%	9.8%	9.8%	6.5%
	Acres of fuel treatments (FT), group selection (GS), and individual tree selection (ITS)	FT: 6,636 GS: 1,347 ITS: 4,000	FT: 0 GS: 0 ITS: 0	FT: 6,636 GS: 1,600 ITS: 4,000	FT: 6,499 GS:1,226 ITS: 2,370	FT: 6,499 GS: 1,226 ITS: 2,370	FT: 6,499 GS: 0 ITS: 0
Watershed concerns (percent Threshold of Concern)	Greenhorn	91	85	89	85	85	85
	Lee Summit	94	61	93	89	84	84
Wildlife concerns	Risk of owl PAC[b] loss to wildfire	Reduced risk from existing condition	No change from existing condition	Reduced risk from existing condition	Reduced risk from existing condition	Reduce risk from existing condition but higher risk than Atl. A	Reduce risk from existing condition but higher risk than other action alts
	Suitable spotted owl foraging habitat retained (acres)	30,150	33,673	29,988	30,256	32,624	33,763

Indicator	Unit of Measure	Alternative A (Proposed Action)	Alternative B (No Action)	Alternative C	Alternative D (Preferred Alternative)	Alternative E	Alternative F
	Suitable spotted owl nesting habitat retained (acres)	10,681	12,164	10,585	10,692	11,728	12,164
	Suitable Northern goshawk nesting habitat retained (acres)	40,826	45,927	40,573	40,947	44,351	45,927
	Interior forest habitat quality: acres rendered noncontinuous forest cover	1,585 moderate risk	0	6,975 highest risk	<1,585 low risk	<1,585 low risk	0
Economics / net value	Dollars returned to Treasury	$473,995	$0	$1,858,574	$294,069	Negative $101,280	Negative $1,222,001
	Total sawlog volume (mmbf[c])	26.3	0	29.6	23.1	19.8	1.7
	Total biomass (tons)	82,000	0	87,000	83,000	83,000	60,000
Community stability	Full-time jobs	394	0	441	356	313	49
	Employee-related income	$16,957,187	0	$18,954,852	$15,309,797	$13,457,271	$2,092,996
Plumas National Forest off-highway vehicle route designation	Roads closed (miles)	17.1	0	11.1	11.1	11.1	11.1
	Roads decommissioned (miles)	15.6	0	12	12	12	12

Notes:

a. CWHR = California Wildlife Habitat Relationships.

b. PAC = Protected Activities Centers.

c. mmbf = million board feet.

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Chapter 3. Affected Environment and Environmental Consequences

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

Past, Present, and Reasonably Foreseeable Actions

The Council on Environmental Quality regulations that implement the procedural provisions of the *National Environmental Policy Act of 1969* define "cumulative impact" as 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). The past, present, and reasonably foreseeable future actions within the Empire Vegetation Management Project (Empire Project) are presented in appendix G.

Overview

This chapter is organized by the resource topics listed below. The effects of each alternative are listed under each resource topic heading.

- Forest Vegetation
- Fire, Fuels, and Air Quality
- Wildlife and Fisheries
- Hydrology and Soils
- Economics
- Transportation
- Recreation and Mining
- Botanical and Noxious Weeds
- Heritage Resources
- Scenic Resources

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FOREST VEGETATION

Summary of Effects

Alternative A (Proposed Action)

- In fuel treatments, large fire-resistant trees would be retained while smaller trees (ladder fuels) are removed. Crown separation would provide open growing space to residual trees while also serving to reduce canopy fuels. These treatments would implement a wider range of canopy cover retention (30 to 45 percent) which would enhance structural diversity and contribute to a fire-resilient landscape.

- Group selection harvest would be implemented on 4.8 percent of "available" land base as calculated in chapter 2 of the 2005 Empire FEIS. These group selection units would create openings in the forest canopy, which would promote the regeneration of an additional cohort (same age class) of shade-intolerant, fire-adapted species. In a given planning area, group selection density would range from 4 to 17 percent.

- Individual tree selection treatments would maintain large fire-resilient codominant and dominant trees, promote multistory canopy structure, and enhance the ecological health of the forest by reducing stand density.

Alternative B (No Action)

- Fuel treatments, group selection, and individual tree selection treatments would not occur. Treatments enhancing structural diversity and contributing to a fire-resilient landscape would not occur.

- The existing fuel conditions would persist and may continue to accumulate in the absence of fire or treatment. The horizontal and vertical continuity of fuels would remain intact. Stand densities would continue to increase, thereby increasing the risk for impacts of insects, disease, and fire. The probability of large wildfires occurring would remain unchanged.

- Forest conditions would continue to favor the establishment and development of shade tolerant species. Regeneration of an additional cohort of shade-intolerant species would be limited to existing gaps and those created by naturally occurring disturbance (i.e., mortality or fire).

Alternative C

- In fuel treatments, large fire-resistant trees would be retained, while smaller trees (ladder fuels) would be removed. Crown separation would provide open growing space to residual trees while also serving to reduce canopy fuels. These treatments would implement a wider range of canopy cover retention (30 to 45 percent) which would enhance structural diversity and contribute to the creation of a fire-resilient landscape.

- Group selection harvest would be implemented on 5.7 percent of "available" land base as calculated in chapter 2 of the 2005 Empire FEIS. These group selection units would create openings in the forest canopy, which would promote the regeneration of an additional cohort of shade-intolerant, fire-adapted species. In a given planning area, group selection density would range from 7 to 23 percent.

- Individual tree selection treatments would maintain large fire-resilient codominant and dominant trees, promote multistory canopy structure, and enhance the ecological health of the forest by reducing stand density.

Alternative D (Preferred Alternative)

- In fuel treatments, large fire-resistant trees would be retained, while smaller trees (ladder fuels) would be removed. Crown separation would provide open growing space to residual trees while also serving to reduce canopy fuels. These treatments would implement the widest range of canopy cover retention (30 to 50 percent) which would enhance structural diversity and contribute to the creation of a fire-resilient landscape.

- Group selection harvest would be implemented on 4.3 percent of "available" land base as calculated in chapter 2 of the 2005 Empire FEIS. These group selection units would create openings in the forest canopy, which would promote the regeneration of an additional cohort of shade-intolerant, fire-adapted species. Group selection density in the planning areas would range from 7 to 11 percent.

- Individual tree selection treatment would maintain large fire-resilient codominant and dominant trees, promote multistory canopy structure, and enhance the ecological health of the forest by reducing stand density. This desired condition would be attained on fewer acres due to the reduction in individual tree selection treatment acres.

Alternative E

- In fuel treatments, large fire-resistant trees would be retained, but fewer trees in the mid and upper story would be removed compared to alternatives A, C, and D; this is due to the retention of a 50 percent canopy cover. Consequently, crown separation would not be as great, less canopy fuels would be removed, and the reduction in stand density would not be as great.

- Group selection harvest would contribute to 4.3 percent of "available" land base as calculated in chapter 2 of the 2005 Empire FEIS. These group selection units would create openings in the forest canopy, which would promote the regeneration of an additional cohort of shade-intolerant, fire-adapted species. Group selection density in the planning areas would range from 7 to 11 percent.

- Individual tree selection treatments would maintain large fire-resilient codominant and dominant trees, promote multistory canopy structure, and enhance the ecological health of the forest by reducing stand density. This desired condition would be attained on fewer acres due to the reduction in individual tree selection treatment acres.

Alternative F

- In fuel treatments, large fire-resistant trees would be retained, but fewer trees in the mid and upper story would be removed than in alternatives A, C, and D due to the retention of

50 percent canopy cover. Consequently, crown separation would not be as great, less canopy fuels would be removed, and the reduction in stand density would not be as great.

- No group selection or individual tree selection treatments would be implemented; therefore, this alternative would not promote an uneven-aged, multistory, fire-resilient landscape and would not address ecological health concerns.

Affected Environment

Effects Analysis Boundaries. For the purpose of this analysis, the boundary of the proposed Empire Project Area, as described in the Mt. Hough Landscape Assessment (March 2004) is used to analyze the direct, indirect, and cumulative effects on forest vegetation. The 103,000-acre area was used as the geographic boundary in the analysis because it is comprised of the four watersheds (The Big Blackhawk, Estray, Indian Falls, and Sockum watersheds) in which vegetation management treatments would occur. The analysis area includes the vegetation occurring within both the treatment and non-treatment areas within the affected watersheds. The analysis considers the four watersheds because, when combined, they represent the furthest measurable extent that forest vegetation effects resulting from the proposed alternatives would occur.

The analysis area used for the vegetation analysis is different than the analysis area used for the wildlife analysis. In determining the proper cumulative effects analysis area for a given resource, it is important to ensure that the area considered will provide the appropriate context for reasonable determination of effects. The geographic boundary delineated for vegetation analysis was based on the four watersheds described in the Mt. Hough Landscape Assessment (March 2004). The wildlife analysis area was delineated based on biological criteria as defined by the presence of spotted owl protected activity centers and home range core areas, which can extend beyond watershed boundaries (appendix G, figure G-1). The vegetation data for both analysis areas is consistent because both the wildlife and vegetation analyses used the Vestra vegetation mapping, California Wildlife Habitat Relationships (CWHR) vegetation typing, and stand exam data collected within the project area.

In addition, the direct, indirect, and cumulative effects analysis is bounded in time. Past projects ranging as far back as 1966 were considered as past actions within the Empire Project area. In a broader sense, historical management regimes prior to 1966 were considered as factors acting upon successional processes which shape the landscape of today. Past wildfires occurring after 1916 were also considered as past events that have contributed to the existing condition. For the purpose of this analysis, the temporal bounds include a 50-year modeling horizon for future effects of treatment. This timeframe is appropriate because it encompasses the effects of treatment on the stand level and continuous forest vegetation on the landscape.

Habitat Types

The Empire Project area has 13 habitat types as classified by *California Wildlife Habitat Relationships* (CWHR) (Mayer and Laudenslayer 1988); 8 of the 13 habitat types are found in the areas proposed for treatment (table 3.1). These CWHR habitat types were developed for vegetation throughout California and are used to generally typify those habitat types occurring in the Empire Project area. Forestwide typing into habitat classifications was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). The following discussion crosswalks between habitat types and plant communities because vegetation is described as a community, whereas habitats are more specific to wildlife relationships in the plant communities.

Table 3-1. Acres of habitat type in the Empire Project area.[a]

California Wildlife Habitat Relationship (CWHR Type)	Empire Project Area		Fuel Treatment Units		Planning Areas[b]	
	Acres	Percent	Acres	Percent	Acres	Percent
Sierra mixed conifer	60,253	58	3,780	57	11,645	55
White fir	16,170	16	1,246	19	8,340	40
Montane hardwood	9,383	9	902	14	152	1
Montane chaparral	3,588	3	328	5	292	1
Ponderosa pine	2,653	3	372	6	196	1
Perennial grassland	6,913	7	0	0	0	0
Red fir	1,510	1	0	0	342	2
Montane riparian	822	1	0	0	37	0
Wet meadow	602	1	0	0	0	0
Lodgepole pine	11	0	0	0	11	0
Rock	719	1	9	0	64	0
Water	258	0	0	0	0	0
Urban	57	0	0	0	0	0
Total	**102,938**	**100**	**6,636**	**100**	**21,077**	**100**

Notes:

a. Acres are calculated using the 2004 HUC6 watershed boundaries.

b. Group selection and individual tree selection harvests would occur in the planning areas.

Sierra Mixed Conifer— Sierra mixed conifer stands account for 57 percent of the fuel treatments and 55 percent of the planning areas. These stands are well stocked and have a strong component of shade-tolerant species in the smaller-diameter classes, which may indicate a gradual shift in species composition. The regeneration of shade-tolerant species at high stand densities contributes to the vertical accumulation of ladder fuels and interlocking crowns, which provide continuous canopy fuel arrangements. Mechanical harvesting and/or prescribed fire would be the primary fuel treatment utilized in this habitat type to reduce the horizontal and vertical arrangement of ladder and canopy fuels.

White fir—The white fir habitat type is the next most prevalent community in the Empire Project area, and is found primarily in upper elevations (approximately 5,000 to 6,500 feet), and account for 19 percent of the fuel treatments and 40 percent of the planning areas. These stands are well stocked, in terms of having many trees per acre and relatively high stand densities. The regeneration of shade-tolerant species at high stand densities contributes to the vertical accumulation of ladder fuels and interlocking crowns, which provide continuous canopy fuel arrangements.

Red fir—The red fir habitat accounts for 2 percent of the planning areas, resulting in 342 acres that may be treated utilizing group selection and/or individual tree selection methods under the action alternatives.

Ponderosa Pine—The ponderosa pine habitat accounts for 6 percent of the fuel treatments and 1 percent of the planning areas. Although stand structure is relatively heterogeneous (comprised of a variety of vegetative types), shade-tolerant regeneration and understory shrubs persist as potential ladder fuels. Prescribed fire and/or mechanical harvesting would be the primary fuel treatment used in this habitat type to reduce the horizontal and vertical continuity of ladder fuels and retain regeneration of shade-intolerant species.

Montane Hardwood—Montane hardwood is the third most prevalent habitat type found in the Empire Project area. In this community, hardwoods dominate the upper layer of the forest canopy, with a sparse shrub and herbaceous layer underneath. Canyon live oak and black oak are the most common hardwoods, with scattered Douglas-fir and ponderosa pine in the overstory. On good sites, hardwoods establish close to one another without overlapping, while on poor sites, the spacing gets much wider. In mature stands, tree heights tend to be uniform in the hardwoods yet subordinate to the conifers. The montane hardwood habitat accounts for 14 percent of the fuel treatment units. Prescribed fire and/or handthinning would be the primary fuel treatment used in this habitat type to reduce the horizontal and vertical continuity of grass and shrub components which may act as ladder fuels into the hardwood overstory.

Montane Chaparral—The montane chaparral habitat type is dominated by chaparral species such as whitethorn ceanothus, snowbrush ceanothus, greenleaf manzanita, and huckleberry oak (Mayer and Laudenslayer 1988). The growth form varies from prostrate to tree like, and mature stands are often impermeable to large mammals. Site quality, disturbance history, and browse have major influences on structure, with the harshest sites described as low-growing edaphic communities ("edaphic" refers to plants that are influenced more by soil characteristics than climate). In the Empire Project area, these sites are better characterized as a subclimax community, where previous stand-replacing fires have occurred in the mixed conifer zone.

The montane chaparral habitat type accounts for 5 percent of the fuel treatments. Prescribed fire and/or mastication would be the primary fuel treatment used in this habitat type to alter the vertical and horizontal arrangement of shrubs and retain regeneration of healthy conifers.

Stand Structure

The predominant size class in the Empire Project area, fuel treatment units, and planning areas is the small tree size class (11 to 24 inches dbh), which occupies 61 percent of the Empire Project area (table 3.2). Approximately 12 percent of the Empire Project area has no size or canopy classification because these areas are rock, water, urban, grassland, meadow, and chaparral habitats, which are labeled as nonforest in tables 3.2 and 3.3. The second most common size in the assessment area was the medium/large tree (greater than 24 inches dbh) class. The majority of the pole size class (6 to 11 inches) is classified as montane hardwood.

Table 3.2. Size classes within the Empire Project area, fuel treatment units, and alternative A planning areas.

Size Class Code	Size Classes	Empire Project Area		Fuel Treatment Units		Alternative A Planning Areas	
		Acres	Percent	Acres	Percent	Acres	Percent
—	Nonforest	12,751	12	337	5	379	2
1, 2	Seedling, sapling (0 to 6 inches dbh)	1,694	2	98	1	310	1
3	Pole (6 to 11 inches dbh)	12,412	12	1,324	20	944	5
4	Small tree (11 to 24 inches dbh)	63,224	61	3,827	58	15,511	73
5[a]	Medium/large tree (greater than 24 inches dbh)	12,857	13	1,050	16	3,934	19

Note:

a. CWHR size class 6 was incorporated into CWHR 5D due to the small amount (less than 20 acres) present in the Empire Project area.

Table 3.3. Canopy cover in the Empire Project area, fuel treatment units, and alternative A planning areas.

Canopy Cover Code	Canopy Cover	Empire Project Area		Fuel Treatments Units		Alternative A Planning Areas	
		Acres	Percent	Acres	Percent	Acres	Percent
D	Dense (>60%)[a]	24,163	24	1,285	19	5,001	24
M	Moderate (40%–59%)	42,692	41	2,952	44	11,473	54
P	Open (25%–39%)	18,103	18	1,515	23	3,368	16
S	Sparse (10%–24%)	5,229	5	547	8	857	4
—	Nonforest	12,751	12	337	5	379	2

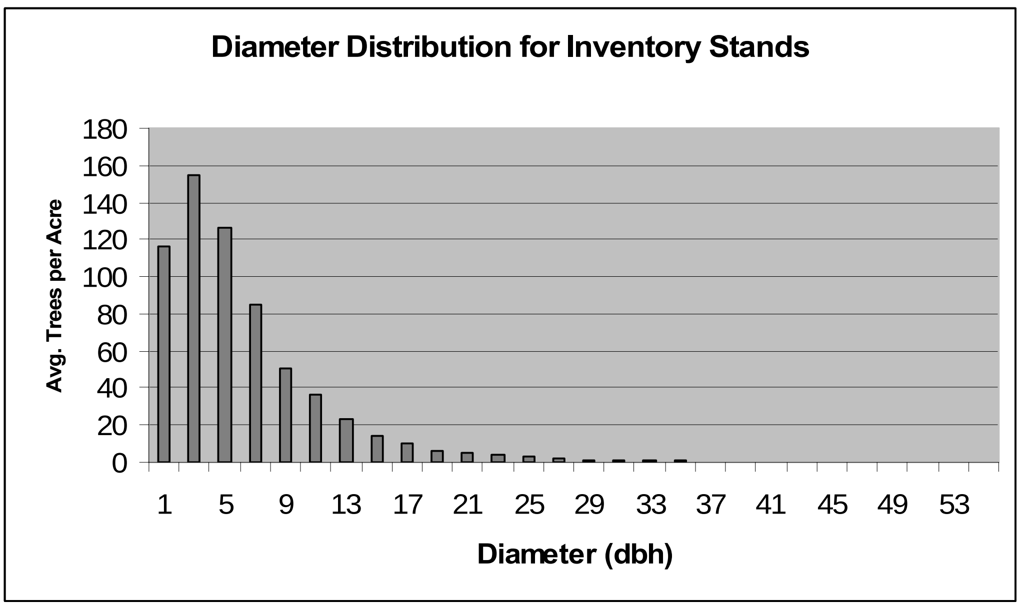
Note:

a. > = greater than

Canopy cover is another component of the CWHR system, which is measured as the percent cover in trees greater than 6 inches dbh. A large percentage (41 percent) of the Empire Project area is classified into the moderate canopy cover class (40 to 59 percent) (table 3.3). The next most prevalent is the dense canopy cover class (greater than 60 percent), occupying 24 percent of the Empire Project area. The open canopy cover class (25 to 39 percent) is the third most common, followed by the non-forest areas. The sparse canopy cover class (10 to 24 percent) is found in approximately 5 percent of the Empire Project area. Please refer to the "Vegetation Report" found in the Empire Project record for more information regarding landscape distribution of CWHR structure classes within the project area, fuel treatments, and planning areas.

Table 3.2 shows that a large majority of the project area, fuel treatment units, and planning areas are mid seral forest characterized by CWHR size class 4. Table 3.3 shows that the predominate canopy covers are closed canopies characterized by CWHR Dense (D) and Moderate (M) canopy densities which represent canopies greater than 40 percent cover. When averaged across all stands, inventory data, primarily from these mid-seral, closed-canopy stands, indicate that the tree diameter distribution follows a reverse J-shaped curve; characteristic of an uneven-aged structure in which the greatest number of trees per acre is in the smallest size classes, with a sharp decrease into the subsequent diameter class (figure 3.1).

Figure 3.1. Average diameter distribution for inventory stands.



In the Empire Project area, it is likely that all stands do not follow this reverse J-shape, and it is important to recognize that diameter class or size does not necessarily correlate with age (O'Hara 1998). Both even-aged and uneven-aged stands are found in the Empire Project area, and stand exam data indicate that, although diameter class follows the reverse J-shaped diameter distribution on the forest landscape level, diameter distribution at the stand level is variable. Uneven-aged stands may have variable size distribution, and, in many cases, even-aged stands have been shown to assume a reverse-J diameter distribution (Oliver and Larson 1996; Smith et al. 1997; O'Hara 1996, O'Hara 1998).

The stand exam data show that diameter distribution follows ecological patterns of development for uneven-aged stands on the *landscape* level (figure 3.1), but not necessarily on the individual *stand* level; However, it does underscore the excessive number of small diameter (largely suppressed and intermediate) trees which represent the prevalence of primarily ladder, but also canopy fuels in these mid seral closed canopy forest types that predominate the project area.

In many studies, un-entered mixed conifer and ponderosa pine stands have followed this distribution (Skinner and Chang 1996; Ansley and Battles 1998), and develop in areas that historically burn with frequent low to moderate severity fires, creating a mosaic of age and diameter classes (Weatherspoon 1996). However, stands within the project area have been influenced by factors such as,fire exclusion, overstory removal harvest, insects, disease, and/or shade tolerant regeneration patterns which have promoted the accumulation of ladder fuels. Please refer to the "Vegetation Report" for further quantification of stand data that supports these conditionsby CWHR type.

Stand Density

The concept of stand density index was first developed for even-aged stands by Reinecke (1933) to compare "the density of stocking of various stands." In general, the concept of stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Curtis 1970; Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Helms and Tappeiner 1996; Jack and Long 1996; Powell 1999; Woodall et al. 2002).Stand density can be described by many different parameters, such as trees/acre, basal area, crown competition factor, stand density index and relative density.

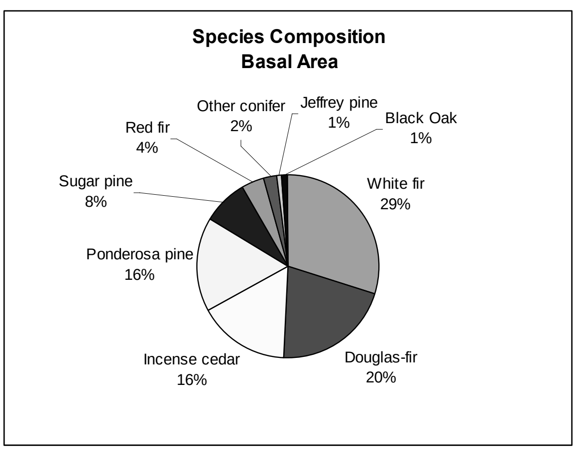
Stand density index (SDI) is an index that can be used to compare against maximum site productivity to produce a density index, which reflects the true capability of the site . SDI for the Empire Project stratified inventory data ranged from 333 to 583, and in the non-stratified it ranged from 87 to 900 with the average at 457.

The relative density concept describes a stand's density relative to the maximum possible density and may serve as a simile for a stand density relation to its carrying capacity. At the time of inventory over 90 percent of the stands sampled in the Empire project area were above 55 percent relative density. A relative density between 55 and 60 percent has been described as the lower limit of the "Zone of Imminent Competition Mortality" above which trees begin die due to competition related stress (Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Smith et al. 1997; Powell 1999; Long 2005). For the purpose of this analysis, 55 percent was used as a conservative measure of the onset of competition related mortality (also referred to as "density dependent mortality") because stress induced by competition increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health as stands managed below this threshold are less likely to incur mortality due to the agents mentioned above.

Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California. The calculation of this maximum stand density is largely dependent on the mix of species. A more site-specific maximum stand density may be calculated using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 1994). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For the purpose of this analysis, stand density and relative density was based on the predicted and maximum stand density index as calculated by FVS. Please refer to the "Vegetation Report" for further quantification of stand density indices by plant community type.

Species Composition

Data from inventory plots were used to analyze species composition in the Empire Project area. The data show that white fir is the most abundant tree species in both basal area and trees/acre. Douglas-fir is the next abundant, followed by incense cedar, ponderosa pine, sugar pine, and red fir. Minor species include Jeffrey pine, black oak, and other conifer. The data (figure 3.2) suggest a shift in regeneration from shade-intolerant species (ponderosa pine and Jeffery pine) to shade-tolerant species (white fir, and incense cedar). For example, the shade-tolerant species account for 56 percent of trees per acre, yet only account for 45 percent of the basal area per acre, which suggests that these species generally include many smaller-diameter trees that may be characteristic of established regeneration (figure 3.12). Stand data for sierra mixed conifer stands in the project area indicates that, on average, there are twice as many white fir and incense cedar trees less than 10 inches in diameter than ponderosa pine and Jeffrey pine (figures 3.2 and 3.12). Please refer to the "Vegetation Report" for further quantification of trees per acre by diameter class and species.



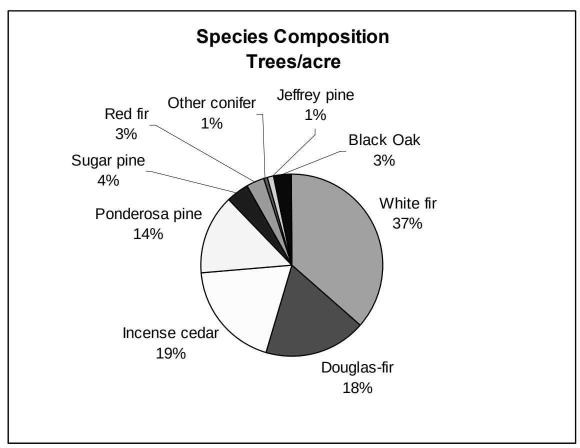


Figure 3.2. Species composition by basal area and trees per acre.

Others have suggested a compositional shift in species in the Sierra Nevada. McKelvey and Johnston (1992) report:

When compared with the current species composition in Sierran forests, the composition at the turn of the century was reasonably similar. Comparing the forest-wide estimates made by the Plumas NF in 1913 (Moore 1913) with current estimates from mixed-conifer timber strata it appears that true fir and incense-cedar have increased and that pines have decreased. This is probably an overestimate of the shift, however, because other strata, such as the ponderosa pine type, have far fewer firs and a greater percentage of yellow pine. It is reasonable, however, to infer from these data that the proportion of fir (basal area or volume) has increased by perhaps 10–20 percent, while the proportion of yellow and sugar pines has decreased by a similar amount. We are surprised that this trend has not been stronger, given the preference for logging yellow and sugar pine and the expected successional patterns of the forest. The stand structure at the turn of the century was often quite open, and became more scattered subsequent to heavy logging. These open stand conditions may have favored pine regeneration and helped to produce the species composition we see today . . . The trend toward the more shade-tolerant fir will be enhanced by selective removal of other species, by fire suppression, and by maintenance of the very dense stand conditions that exist in many areas of the Sierra Nevada today. The trend will, to a certain extent, be counteracted by infestations of the fir engraver beetle, to which these stands appear to be very susceptible.

Ansley and Battles (1998) have observed that despite relatively static species composition in the recent past (39 years), current structural conditions suggest a shift in species composition will occur in the absence of disturbance. Skinner (2005) articulates how suppression of natural fire regimes and human-caused disturbance has acted upon species regeneration that may prove to be the functional mechanism for explaining such a shift in species composition. Both structural conditions, fire suppression, and species preferences of past management activities in the above mentioned literature, is found within the Empire project area which suggests that sierra mixed conifer forests in the project area may follow similar species composition trends as noted throughout the Sierra Nevada.

Disturbance History

Humans have influenced the landscape, beginning with Native American use of fire to improve wildlife forage and acorn production. The frequent low-intensity fire used by these indigenous people created open stands of large scattered trees of varying ages and arrangements (Anderson and Morrato 1996). The American Valley, Elizabethtown, and Quincy were the supply centers used by miners arriving in the area shortly after the gold rush began in California in the early 1850s (Young 2003). Trees closest to the settlement centers were used for barns, fencing, homes, water flumes, business structures, and mine adits. Timber harvest also became a significant land use in the early 1900s, especially around Butterfly Valley, Massack, Squirrel Creek, and Quincy (Weinberg, pers. comm.).

These areas were harvested using railroad logging systems that removed large, overstory Douglas-fir and pine.

Grazing—Livestock grazing was another resource use the settlers brought with them until a drought in 1860 killed most of the cattle in California. After this, sheep were used as the dominant livestock, gaining in numbers, with the statewide peak reported in 1872. The decline from this peak was gradual, and it is noted that even as late as 1900, overgrazing was still occurring in parts of the Northern Sierra (McKelvey and Johnston 1992). In areas where overgrazing occurred, the understory vegetation was significantly reduced, producing bare mineral soil on which abundant conifer regeneration established once grazing ceased.

Timber Harvesting—In order to quantify the amount of harvest and/or tree removal on National Forest lands in the Empire Project area, the Forest Activity Tracking System (FACTS) was queried for all records from 1946 to the present. The earliest records indicate salvage of fire-burned timber was the predominate activity from 1946 to 1965. From 1966 to 1975, single-tree selection was the dominant harvest system, followed by overstory removal and salvage. In the next two decades, overstory removal became a preferred harvest prescription. Clearcutting in various forms (patch, with reserves, and total removal) also occurred from 1976 to 1995. For the last 10 years, the only activity on public lands in the Empire Project area has been a 3-acre clearing around the Mount Hough lookout, sanitation salvage, and mechanical/hand thinning.

Approximately 11.2 percent of the National Forest land in Empire Project area (11,479 acres) has been logged or hand thinned in the past 40 years. Approximately 10.1 percent of the privately owned land in the Empire Project area (10,420) has been logged since 1994. Most of the activities left some structure in place rather than removing every tree. The majority of logging prior to 1966 occurred in fire-burned areas or near towns and roads.

Fire—The discussion about logging illustrates that past harvest has removed large overstory trees, which were the most fire-resistant trees in the stand. This harvest left behind thickets of smaller trees and fuels from the limbs and tops. The natural thinning of small trees by fire ceased due to the absence of low severity, frequent fires as a natural process (Skinner and Chang 1996). These conditions are prevalent within the project area (figure 3.3). Such mechanisms/disturbances have also contributed to the trend in shifting species composition in Sierra Nevada forests (Skinner 2005). Also, high-severity fire has influenced structure by killing large trees, with subsequent development into areas dominated by chaparral or hardwood. The landscape condition resulting from these influences is a high density of small trees and a reduced abundance of large trees.

Figure 3.3. Exisiting conditions in DFPZ unit 13: Thickets of smaller trees contribute to high stand densities in the absence of fire. Note the large dominant ponderosa pine in the background with a large basal fire scar.

The current condition in the Empire Project area has also been influenced by fire occurrence, fire severity, and fire exclusion (Skinner and Chang 1996). Lightning and human-caused fire has been a frequent visitor to the Empire Project area, with an average of 11.5 ignitions per year recorded from 1970 to 2001 (see the "Fuels Report" contained in the Empire Project Record). Since 1916, 22 large fires have burned 14,725 acres in the Empire Project area, which have created hardwood and chaparral habitat. The most notable examples of this are the Bell, Oak, and Cashman fires, which were three high-severity fires that burned a total of 4,296 acres in the 1970s. These fires are typed as 44 percent mixed hardwood, 22 percent montane chaparral, and 26 percent Sierra mixed conifer, with the rest in small percentages of white fir, perennial grasslands, and ponderosa pine. Prior to the fires, the vegetation type was primarily in Sierra mixed conifer, and the structure was similar to surrounding forested areas.

Insects and Diseases

Insects—Annual aerial insect surveys were conducted on the Plumas National Forest from 1995 to 2003, with the exception of 1999. These surveys assessed mortality (greater than 1 percent of the overstory), and associated polygons were mapped and labeled with damage type, agent, and levels (severity). Approximately 68,768 acres of mortality were mapped in the Empire Project area. Most of this mortality (98 percent) occurred in 2002 and 2003 and, with the exception of approximately 200 acres, was labeled as having 1 to 5 percent mortality levels. All mortality, except in one polygon, was attributed to bark beetles, which indicates that the level of mortality may be attributed to endemic levels of these common forest insects. Another cause of damage is the fir engraver, which is known to occur in the Empire Project area.

Diseases—The primary pathogen of concern found in the Empire Project area is *annosum* root disease, caused by *Heterobasidion annosum* (Schmitt et al. 2000). The incidence of *annosum* is highest in white fir stands in the Empire Project area, with some known infections in mixed conifer and pine stands (Frank Hanson, pers. comm.). While all western conifers are susceptible to this pathogen, white fir tends to be most susceptible to adverse effects from the disease (USDA 1978). This root disease is spread via spores infecting fresh wounds or stumps and from root-to-root contact (Sinclair et al. 1987). Stands with repeated entry in the Empire Project area have a higher incidence of the disease than un-entered stands. The effects of this disease range from reduced individual tree vigor, root and bole decay, windthrow, root mortality, and in the worst-case scenario, tree mortality.

A more detailed discussion on Forest Vegetation can be found in the “Vegetation Report” filed the Empire Project Record.

Environmental Consequences — Forest Vegetation

Methodology and Assumptions. Unit-specific information (including acres, watershed, aspect, slope, elevation, soils, existing fuel and vegetation conditions, treatments, logging system, and access needs) for fuel treatments are described in "Appendix B: Fuel Reduction — Existing Condition and Proposed Treatment by Treatment Unit." The information (including acres, watershed, aspect, slope, elevation, soils, existing vegetation conditions, logging system, and access needs) specific to the planning areas for group selection and individual tree selection treatments are described in "Appendix C: Group Selection and Individual Tree Selection by Planning Area."

The acres of group selection and individual tree selection per planning area were developed for each alternative. The locations of group selection and individual tree selection treatments in the planning areas follow the design elements described in chapter 2. Analysis of environmental consequences is based on CWHR size class and density.

For analysis purposes, the Forest Vegetation Simulator (FVS 1997) was used to analyze the direct, indirect, and cumulative effects on stands in the Empire project area for a 50-year time frame. The Forest Vegetation Simulator (FVS), an individual-tree, distance-independent growth and yield model, was used extensively in this analysis to summarize current stand conditions, model future conditions and stand dynamics, and model proposed treatments and their effects. FVS can simulate growth and yield for most major forest tree species, forest types, and stand conditions. FVS can simulate a wide range of silvicultural treatments. The Western Sierra Nevada (WESSIN) variant was used in this analysis. Detailed documentation and assumptions and limitations of the model are available at http://www.fs.fed.us/fmsc/fvs/. The reader is referenced to the following documents: *Essential FVS: A User's Guide to the Forest Vegetation Simulator.*

Quantification of treatment effects on stand structure per CWHR size class and density as predicted by the FVS model are described in the "Vegetation Report" in the Empire Project Record. Stand diagrams using FVS and Stand Visualization System (SVS 2002) model output data are also displayed in the following analysis and the "Vegetation Report". Model outputs have unknown variances; however, this is normal for modeling efforts, and outputs are best evaluated in a relative rather than an absolute sense. The analysis uses stand structure characteristics such as trees per acre, basal area, quadratic mean diameter, canopy cover, and stand density index. Please refer to the "Vegetation Report" for more detailed quantification of stand characteristics.

Effects Common to All Action Alternatives

All mechanical harvest operations, including tractor and skyline-based logging systems, would adhere to standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15, including Region 5 supplements) and the Best Management Practices as delineated in the "Water Quality Management for Forest System Lands in California: Best Management Practices" (USDA 2000).

Trees greater than 30 inches dbh may be removed for operability; however, such removal would be subject to agreement by the Forest Service. Removal of trees for operability is expected to be incidental, dispersed in nature, and therefore, would have negligible effects on stand structure.

Whole-tree yarding would be used in all action alternatives to treat slash generated by harvest activity. Removal of limbs and tops by such methods would greatly reduce activity-generated surface fuels (Agee and Skinner 2005). The majority of trees would be removed using whole-tree yarding, which would effectively reduce the potential for activity-generated fuel accumulation. The slash would be lopped and scattered to minimize fuel bed depth, continuity, and arrangement if whole-tree yarding is not feasible (such as when mechanical yarding of an individual large tree would result in excessive damage to a residual stand). The net effect may result in incidental activity-generated fuel accumulations; however, underburning, pile burning, or other appropriate surface fuel treatment method would be used, as needed, to reduce activity-generated fuels (see "Appendix F: Standard Management Requirements and Monitoring Plan").

Alternative A (Proposed Action)

Fuel Treatments. The fuel treatments proposed in alternative A would employ a combination of mechanical harvest, mastication, hand thinning, and prescribed fire treatments.

The mechanical harvest treatment would use low thinning, also known as “thinning from below,” to remove ladder fuels in the suppressed and intermediate crown classes, which would reduce the vertical continuity between surface and canopy fuels (Peterson et al. 2005; Graham et al. 2004). Removal of saplings and pole-sized trees would reduce stand density, ladder fuels, and shade-tolerant species, while increasing canopy base height. This treatment would be effective in reducing torching, which would further reduce the potential for a surface fire to initiate into a crown fire (Peterson et al. 2005; Graham et al. 2004).

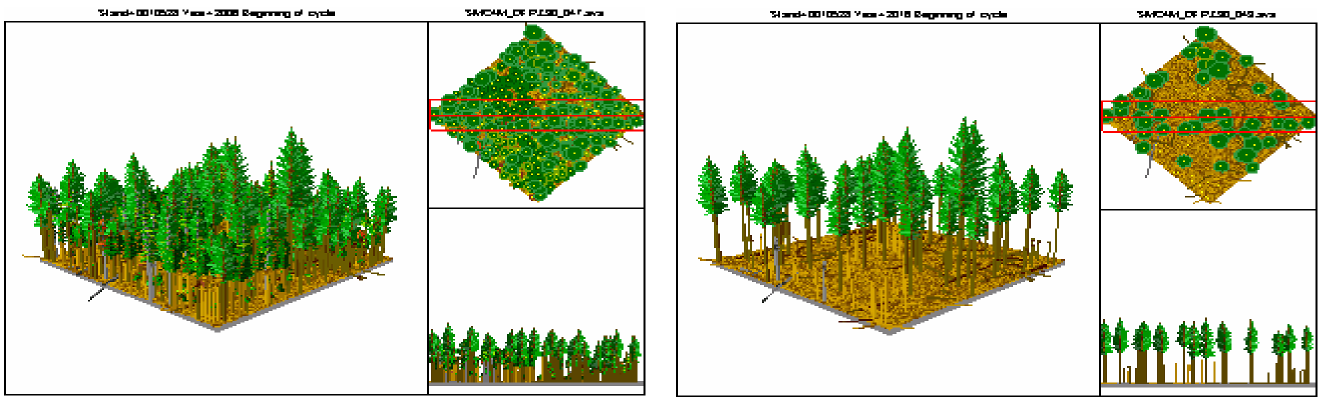
Fuel treatments also use crown thinning to remove codominant trees and, consequently, to reduce the horizontal continuity of canopy fuels (Peterson et al. 2005; Graham et al. 2004). The removal of codominant trees would reduce stand density, canopy bulk density, and interlocking crowns by increasing crown spacing between residual trees. Large fire-resilient dominant and codominant trees would be retained to maintain structural diversity and contribute to multistory canopy conditions. In addition, species preference for retention would be given to more shade-intolerant trees with fire-resistant characteristics, such as ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir (Graham et al. 2004). This treatment may reduce the spread of crown fire (Peterson et al. 2005; Graham et al. 2004), and when combined with low thinning, may reduce torching.

Direct and Indirect Effects: Mechanical Thinning

Mechanical thinning fuel treatments would implement a range of canopy cover retention between 30 and 45 percent canopy cover. Implementation of a range of canopy covers within the projects builds some variability and diversity into the treatments such that every acre would not be treated exactly the same. This allows for site specific “tailoring” of the prescription to the existing condition and would augment diversity across the units. The following discussion reports stand values for 30 percent canopy cover retention to account for the effects that could occur at the minimum canopy cover retention level.

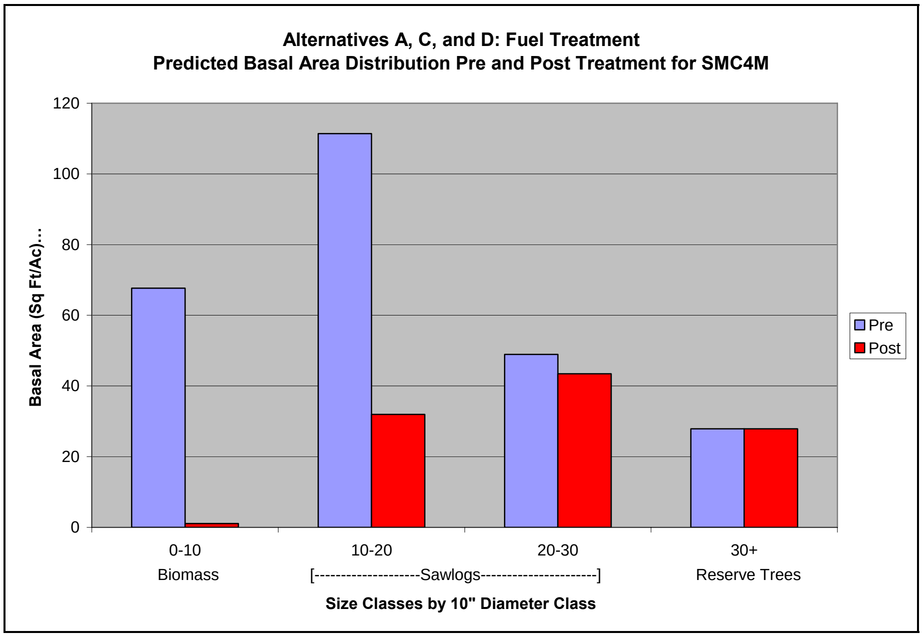
Stand Structure and Density—The low thinning that would occur during mechanical fuel treatments would reduce vertical continuity between the surface fuels and canopy fuels by removing the ladder fuels, which would reduce the potential for torching and crown fire initiation from surface fuels. However, by removing ladder fuels in the suppressed and intermediate crown classes, the treatment would effectively reduce structural diversity of the canopy on the stand level. The crown thinning would decrease horizontal continuity between canopy fuels by substantially reducing canopy bulk density. This would provide for adequate spacing between crowns, which may inhibit the spread of crown fires. Immediately after treatment, the residual stand structure would be an open, single-canopy stand comprised of large trees with relatively greater spacing between crowns (figure 3.4). The residual diameter distribution would be more normal or bell shaped and would largely be limited to codominant and dominant size classes.

Figure 3.4. Mechanical Thinning Fuel Treatment: Stand visualization of existing condition and predicted post-treatment stand structure for a representative SMC4M stand under alternative A.



The net effect would be a reduction in conifer stocking and density, which would correspond with an increase in average tree spacing to 25 feet and a reduction in canopy cover to 30 to 45 percent. Pretreatment conifer stocking currently ranges from approximately 401 to 842 trees per acre. Mechanical fuel treatments would reduce residual stocking to approximately 43 to 139 trees per acre comprised of the largest dominant and codominant trees.

Figure 3.5. Mechanical Thinning Fuel Treatment (Alternative A): Existing pre-treatment basal area and predicted post- treatment basal area distribution for SMC4M stands.



The reduction of stocking would correspond with an approximate 35 to 62 percent reduction in *basal area* (111 to 196 square feet per acre). The reduction in basal area would occur primarily the understory (trees less than 10 inches in diameter) and the midstory (trees between 10 and 20 inches in diameter); Retained trees would have an average diameter ranging between approximately 19.4 to 25.3 inches dbh in CWHR size classes 4 and 5. The reduction in basal area (figure 3.5) would correspond with a reduction in stand density which would be below the threshold for density dependent mortality. The longevity of the reductiton in stand density would be maximized relative to alternatives E and F because alternative A would implement lower canopy cover retention within fuel treatments..

A reduction in stocking and density to enhance individual tree growth would contribute to the development of stands into subsequent CWHR size classes. CWHR class 3 stands would develop into CWHR class 4, and CWHR classes 4M and 4D stands would develop into CWHR class 5M. CWHR classes 5M and 5D would be maintained in the same size class with a moderate canopy cover. Size class and canopy cover alone may not reflect attributes of suitable habitat associated with CWHR class because the reduction in structural diversity on the stand level due to the removal of suppressed and intermediate crown classes would persist. Group selection located within fuel treatments may create isolated areas where fuel ladders exist; however, such structure would contribute to structural diversity and promote regeneration of shade-intolerant species.

Table 3.4. Mechanical harvest fuel treatment: Existing stocking and predicted post fuel treatment retention of trees per acre (TPA) between 20 and 29.9 inches dbh under alternative A.

Exisiting Stocking and Predicted Retention of Trees 20-29.9 inches dbh			
CWHR Type	**Total TPA Pre-treatment**	**Residual TPA Post-Treatment**	**Percent Retained**
SMC3P	0.0	0.0	0%
SMC4P	11.2	7.7	69%
SMC4M	17.0	15.0	88%
SMC4D	22.1	20.9	95%
SMC5P	26.2	16.5	63%
SMC5M	14.5	10.0	69%
SMC5D	12.3	12.3	100%
WFR4P	19.4	17.9	92%
WFR4M	24.0	17.6	73%
WFR4D	23.2	22.6	98%
WFR5M	20.3	20.3	100%
WFR5D	17.7	17.7	100%

Alternative A would implement a 30-inch upper diameter limit in the fuel treatments. Retention of trees between 20 and 29.9 inches dbh would range from approximately 63 to 100 percent where currently present (table 3.4). In CWHR 5M and 5D, retention of these trees would range from approximately 69 to 100 percent. Overall, this would equate to approximately 14.9 trees per acre retained on average. In addition, all trees greater than 30 inches dbh would be retained. On average, approximately 79 percent of trees per acre between 20 and 30 inches in diameter would be retained and all trees 30 inches in diameter would be retained thereby maintaining large dominant and codominant fire-resistant trees. Stocking of trees greater than 30 inches dbh would range from approximately 0 to 11 trees per acre. This would equate to approximately 5.4 trees per acre retained on average. Although reduction in trees per acre would be rather substantial, the majority of large-diameter overstory trees would be retained, providing for the upper strata of the canopy.

Over time, the residual stand structure would range from an open to moderately dense canopy stand comprised of large trees (average diameter ranging from approximately 23.5 to 32.2 inches dbh in CWHR size classes 4 and 5); however, canopy cover is expected to increase with residual stand growth., ranging from approximately 37 to 53 percent. The larger range in canopy cover may provide more versatility in reaching diverse site-specific desired conditions, and the lower limits of the range would improve the long-term effectiveness of treatment in maintaining lower canopy cover.

Species Composition— Within fuel treatments, species preferences would determine post-treatment species composition. A mixture of dominant and codominant trees of species indicative of ecological habitat type would be retained with an emphasis on more shade-intolerant trees with fire-resistant characteristics, such as ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir. Additional factors that may affect the establishment, growth, and development of residual trees and understory vegetation include pre-treatment or adjacent stand characteristics such as existing structure and species composition, seedbed conditions, available seed source, and light environment.

The light environment created by fuel treatments may have a major influence on the diversity of understory vegetation, which may include brush, grass, and forb species, as well as hardwood and conifer regeneration (Kimmins 2004). The reduction in canopy cover to 30 percent would create a more open light environment, which would promote the growth of residual trees and the establishment and development of shade-intolerant trees and understory vegetation. Creation of openings and bare mineral soil by skid trails or landings may promote the establishment of early seral species.

The reduction in canopy cover to 45 percent would create a light environment best characterized by partial shade. This may tend to promote the establishment of species that are adapted to development under lower light conditions. Consequently, regeneration of shade-intolerant species may be limited to openings that provide sufficient light levels, while shade-tolerant species may develop throughout the stand given their greater ability to maintain growth at lower light levels (Kimmins 2004).

Development of understory vegetation and tree regeneration is largely dependent on light environment and the existing or adjacent stand characteristics mentioned above. Although canopy cover increases with growth after treatment, cover is expected to be less than that of pre-treatment conditions by 13 to 40 percent at 50 years following treatment. This indicates that a higher light environment would persist in stands where canopy is reduced to 30 percent. This would maintain the growth of shade-intolerant trees and understory vegetation. In stands where canopy would be reduced to 45 percent, a lower light environment would persist, which would promote the development of shade-tolerant understory vegetation. The stands where canopy cover would be reduced to 30 percent could sustain a continuous cover of understory vegetation relative to stands retaining 45 percent canopy cover, which may exhibit patchy or discontinuous cover of understory vegetation. This range would contribute to spatial heterogeneity (diversity of species) of understory structure and development.

Sporax Treatment. The proposed action alternatives propose to apply Sporax to all harvested pine, white fir, and incense cedar stumps greater than 8 inches in diameter to minimize residual tree susceptibility to *annosum* root rot in mechanically harvested fuel treatment units. Mechanical harvesting would be used in approximately 3,947 acres of the fuel treatment units. Aspect, slope, soils, vegetation types, and treatments for all fuel treatment units are described in "Appendix B: Fuel Reduction — Existing Condition and Proposed Treatment by Treatment Unit.

The recommended application level is one pound of Sporax to 50 square feet of stump surface (Wilbur-Ellis 2001). The 8-inch lower- stump diameter limit proposed in the draft EIS was according to Forest Service Handbook direction (FSH 3409.11-Forest Pest Management Handbook, Region 5 Supplement No.3409.11-94-1). Kliejunas and Woodruff (2004) recommended raising the lower stump diameter limit to 14 inches and argued that this would result in "few, if any, subsequent *annosum* root disease centers." Raising the lower stump diameter limit would result in substantially less stump treatment (in terms of stump area) and correspondingly less Sporax used per acre because only sawlog-sized tree stumps would be treated.

Other methods for controlling *annosum* have been suggested. Many of these alternative methods have been developed for forests in the southeastern United States. Several treatment strategies (prescribed burning, manipulation of season of cutting to avoid dispersion of spores, and treatment with a competitive nontoxic fungus [*Phlebiopsis gigantea*]) have been recommended in the southeastern region by Mississippi State University Extension and others (Ammon and Patel 2000; Annesi et al. 2005). Intensive prescribed burning before and after treatment, as suggested by Ammons and Patel, may not be a viable option due to prohibitive cost and inherent risk associated with pre-treatment burning. Cutting when *annosum* spores are at their lowest levels has been suggested, however, there are no data or studies to support the effectiveness of such a treatment. The competitive fungus, *Phlebiopsis gigantean,* is not available or registered for use in California and may not be a viable treatment due to the dry summer and fall seasons. The treatment strategies discussed above were developed for forests in the southeastern United States, and there is no literature that suggests that such methods would be effective in California.

Direct and Indirect Effects: Sporax treatment

The basal area requiring Sporax treatment when using an 8-inch lower-stump-diameter limit would range from approximately 63 to 176 square feet per acre, with an average of 119.3 square feet per acre (table 3.5). Given the recommended application level, the amount of Sporax application per acre would be approximately 1.3 to 3.5 pounds, with an average of 2.4 pounds per acre. The basal area requiring Sporax treatment when using a 14-inch lower-stump diameter limit would range from approximately 0 to 99 square feet per acre, with an average of 44.9 square feet per acre. Given the recommended application level, the amount of Sporax application per acre would be approximately 0 to 2 pounds, with an average of 0.9 pound per acre. The discrepancy between basal area at dbh versus stump basal area at 1 foot is expected to be negligible (Johns, pers. comm.). The proposed levels of Sporax application (in pounds per acre) is consistent and well within those analyzed in the Human

Health and Ecological Risk Assessment for Borax (Sporax) Final Report (USDA 2006) and would therefore have a negligible effect on non-target forest vegetation.

Table 3.5. Mechanical Thinning Fuel Treatments: Predicted harvested basal area per acre requiring sporax application

	Alternatives A, C, & D	
CWHR	**8" Lower Diameter Limit**	**14" Lower Diameter Limit**
SMC3P	160	0
SMC4P	85	39
SMC4M	133	69
SMC4D	176	99
SMC5P	156	87
SMC5M	90	30
SMC5D	102	7
WFR4P	92	46
WFR4M	137	76
WFR4D	137	52
WFR5M	63	19
WFR5D	101	15
Average	**119.3**	**44.9**

Infection by *annosum* root disease may become more wide spread if stumps are not treated. This would make the long-term control of the disease more difficult and may impact previously unaffected stands, as well as adjacent landowners. In group selection and individual tree selection areas where Sporax would not be used, infection rates of stumps would be variable depending upon microclimate and spore loading at the time of cutting. In areas where stumps were left untreated, up to 50 percent of the stumps were infected (Kliejunas 1986). *Annosum* is present in the Empire Project area, and there is the potential for new infection in any harvest area because spores can travel up to 100 miles. Once *annosum* occupies a site, it resides in the soil for up to 50 years as a saprophytic (an organism that obtains food from dead or decaying organic matter) agent. The disease would create infection centers where trees of like species would begin to display effects ranging from reduced individual tree vigor, root and bole decay, windthrow, root mortality, and in the worst case scenario, tree mortality. The infection centers would create localized pockets of dead and down trees which would contribute to higher surface fuel accumulation in the future. There are no proven methods for eradicating this disease on a site.

The amount of Sporax applied in the 3,947 acres of mechanical treatment could be reduced by limiting Sporax use to areas that have been identified as having *annosum* root rot and the immediate proximity. Such target areas may be identified during field preparation activities (such as layout, marking, and cruising) prior to implementing the Empire Project. As previously mentioned, Sporax would not reduce root-to-root spread of *annosum,* but it would effectively reduce potential for infection and spread through stumps. This would prevent exacerbation of infection centers due to logging activities. However, limiting Sporax use to just the infection centers could result in stump infection beyond the localized treatment sites. In the Sierra mixed conifer, the effects would be tempered due to the mixed species composition, whereas the effects of stump infection would be far greater in single-species stands (true fir or pure pine stands). The "Vegetation Report" in the Empire Project Record contains additional information.

Direct and Indirect Effects: Mastication

The mastication treatments would occur primarily in the montane chaparral community and in conifer stands where mechanical treatment is not viable. Proposed mastication would primarily target reducing brush species within the portions of the units occupied by montane chaparral, but would also treat thickets of small trees (under approximately 8 inches in diameter) in conifer forest types where mechanical treatments or prescribed fire treatments are either too expensive or relatively less effective in meeting desired conditions. This is the case in units 1, 2, 12, and 15.

The mastication treatments would alter the vertical arrangement of brush fuels converting live aerial fuels into dead surface fuels. Vigorous conifer saplings and larger trees would be avoided during treatment to encourage the establishment of forest cover where site quality permits. The treatment would contribute to a deeper duff layer, which may inhibit the growth of grass and forb species. However, basal sprouting and seedling establishment is expected to contribute to the regeneration of immature stands of brush species. Concurrently, the duff layer would decline due to decomposition, eventually allowing establishment of understory vegetation.

In mastication treatments, brush species are expected to regenerate and develop into mature stands. Conifers would not be subjected to mastication treatments and would increase forest cover where site quality permits. Mastication treatments would not modify CWHR size class or density and are not expected to enhance development of stands into subsequent CWHR size classes.

Direct and Indirect Effects: Hand Thinning

Hand thinning would occur in stands where mechanical harvest may be limited by steep slopes and/or resource concerns. Hand thinning would primarily occur in Riparian Habitat Conservation Areas to treat ladder fuels where mechanical treatment is not feasible. Such instances occur within units 4, 6, 11, 13, 24, and 28.

Hand thinning and piling activities would treat trees 6 inches in diameter and less and, therefore, would not affect canopy cover as classified by the California Wildlife Habitat Relationship system (CWHR). The treatment would minimally affect structural diversity because trees greater than 6 inches in diameter would be retained. Fuel ladders would be reduced while canopy fuels would remain the same.

After hand thinning treatments, canopy cover according to CWHR classification would not be affected, and changes in structural diversity would be minimal. Handpile burning may induce crown and cambium (living tissue underneath the bark) scorch on nearby residual trees, and may cause incidental mortality dependent on such damage; however, incurred mortality as a result of handpile burning would be negligible. Understory vegetation would not be affected, with the exception of localized areas where duff and litter would be consumed during handpile burning. Even in these localized areas, the understory vegetation would regenerate, and the effects would be short term.

Direct and Indirect Effects: Prescribed Fire

Prescribed fire treatments would be used in stands that are not available for mechanical treatment and as a follow-up to surface fuel treatment in stands where mechanical harvest would occur. The stands not available for mechanical treatment units are 2, 5, 7, 8, 9, 10, 12, 15, 20, 22 26, and 27. These units are occupied by a mixture of montane chaparral, montane hardwood, and open forest types, primarily sierra mixed conifer and ponderosa pine, where prescribed fire treatments, in combination with handthinning and mastication treatments are suitable to meet desired conditions.

The prescribed fire treatment would reduce surface fuel loading by consuming duff, litter, and down woody debris. This treatment is likely to induce scorch on lower canopy residual trees and may cause incidental mortality in trees. However, on the stand level, prescribed fire would have a minimal effect on existing forest vegetation and structure. Prescribed fire would create a mosaic of conditions through ignition and microclimate variability, creating bare mineral soil in some areas and leaving vegetation intact in other areas. Where bare mineral soil is created and vegetation is killed, sprouting and regeneration would reinvigorate the understory plant community (Kauffman and Martin 1990).

Prescribed fire treatments may result in mortality of individual or isolated pockets of trees; however, this effect is expected to be incidental on the stand level. Establishment of understory vegetation may be dependent on consumption of the surface fuels (primarily the duff and litter layers), canopy cover, and stand characteristics mentioned above. However, low-intensity prescribed fire would not substantially modify CWHR size class or density and is not expected to create large shifts in forest species composition and structure .

Individual Tree Selection. The individual tree selection treatment may be described as a combination of low (“thinning from below”) and crown thinning (Smith et al. 1997) where individual trees are selected for removal in order to meet forest health objectives while maintaining forest composition and structure. The forest health objectives are designed to improve vigor of residual trees by reducing stand density and competition and reducing the potential for insect and disease infestations. The largest, most vigorous dominant and codominant trees would be retained to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be given to trees with more fire-resistant characteristics, such as ponderosa pine and Douglas-fir (Graham et al. 2004). Crown thinning is expected to have minimal to moderate effectiveness in reducing canopy bulk density and continuity because the ladder fuels and vertical continuity between surface and canopy fuels would remain intact (Peterson et al. 2003, 2005). Low thinning would reduce continuity of ladder fuels and canopy fuels by removing suppressed and intermediate trees; however, the effectiveness of such treatment may be limited by the lower diameter limit of 10 inches in units where biomass would not be removed. Consequently, stands with a minimal biomass component would receive priority for individual tree selection treatment without biomass removal.

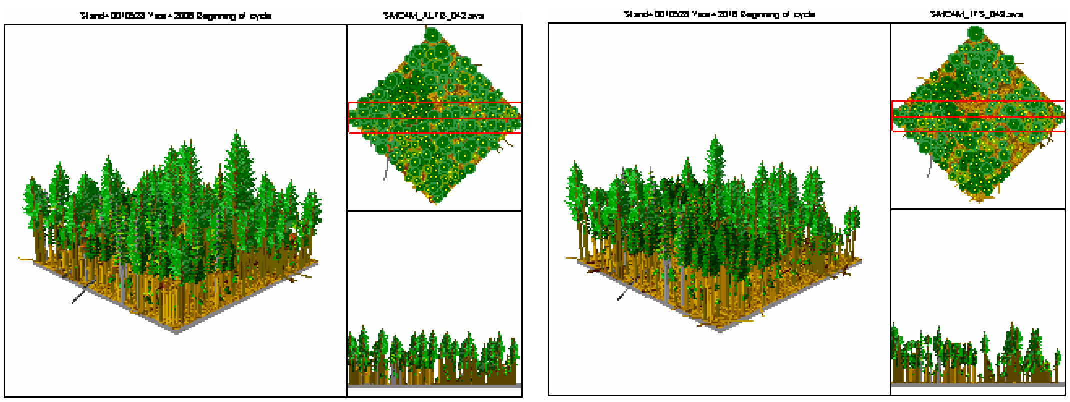
Helms (1998) describes individual tree selection as a method in which “individual trees of all sizes are removed more or less uniformly throughout the stand to promote growth of remaining trees and to provide space for regeneration.” However, in the Empire Project area, individual tree selection would be used as an intermediary thinning of the area around group selections to reduce stand density and improve forest growth and health. The dominant and codominant trees would receive preference for retention. This would shift the focus to suppressed and intermediate trees for removal, resulting in a combination of low and crown thinning. However, in the Empire Project, individual tree selection would not be used as a regeneration method. Group selection would be used for meeting regeneration objectives because individual tree selection may favor shade-tolerant species when used as a regeneration method. The combination of individual tree selection and group selection harvest methods would strive to emulate gap dynamics of an uneven-age forest system. This system focuses on maintaining forest structure while providing openings that encourage regeneration of shade-intolerant species, and it may be effective in enhancing structural and compositional diversity, which contributes to the ecological health of the forest.

The spatial coordination of group selection and individual tree selection harvest may be a very appropriate tool when emulating uneven-aged forest development. The combination of the treatments would maintain forest structure, composition, and canopy cover while providing for openings, which would promote the establishment and development of desirable shade-intolerant tree species. The reverse J-shaped diameter distribution would be maintained where individual tree selection would be used in conjunction with group selection.

Direct and Indirect Effects: Individual Tree Selection without Biomass Removal

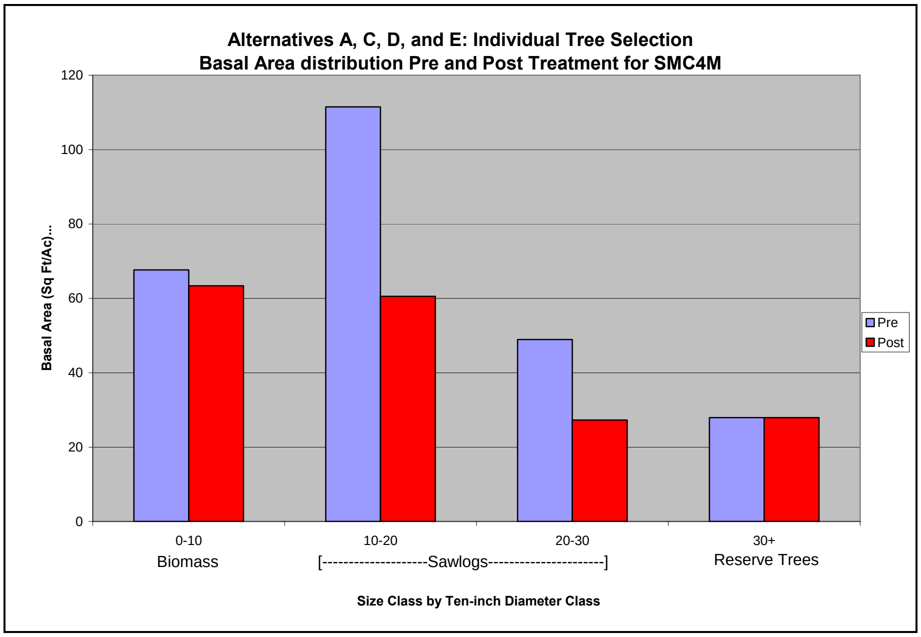
Stand Structure and Density—The individual tree selection method would have minimal effects on tree stocking and canopy cover, which would be maintained above 50 percent. Crown overlap would be maintained due to greater retention of canopy cover in the suppressed and intermediate crown classes, which would provide for structural diversity on the stand level. However, ladder fuels less than 10 inches dbh would not be removed. Low (“thinning from below”) and crown thinning of trees greater than 10 inches dbh would create conditions that encourage the development of a vertically stratified stand (multiple-layered canopy, figure 3.6). This stand structure would likely result in a diameter distribution that would be approximately reverse J-shaped or reverse J-shaped with a “hump” representing the retained dominant and codominant trees.

Figure 3.6. Stand visualization of individual tree selection: Exisiting condition and predicted post-treatment stand structure for a representative SMC4M stand.



Density would be slightly reduced to the lower limit of density dependent mortality, which may release individual trees but not contribute to a notable increase in growth. Trees per acre would be reduced by approximately 2 to 13 percent, whereas basal area would be reduced by as much as 40 percent. This effect would occur as a result of retaining all trees under 10 inches dbh. Most of the basal area per acre removed would be in trees between 10 and 20 inches in diameter which represent the intermediate and shorter codominant trees (figure 3.7). On average, more than 55 percent of basal area per acre between 20 and 30 inches in diameter would be retained and all trees 30 inches in diameter and greater would be retained thereby maintaining large dominant and codominant trees.

Figure 3.7. Individual Tree Selection: Exisiting pre-treatment basal area and the predicted post-treatment basal area distribution for SMC4M stands by 10 inch diameter class.



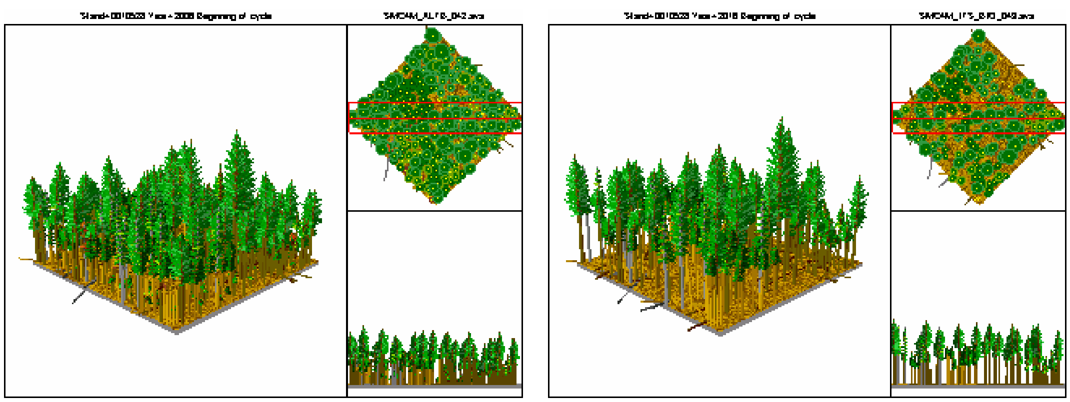
The overstory canopy would be dominated by these largest dominant and codominant trees, while the more subordinate intermediate trees would be removed. Trees that are under 10 inches dbh would be retained, creating a two- to three-storied stand dependent on degree of height differentiation between dominant, codominant, and understory trees. This would result in a multi-canopy stand of a relatively large range of diameter classes.

Species Composition— A mixture of dominant and codominant trees of species indicative of ecological habitat type would be retained with an emphasis on shade-intolerant trees with fire-resistant characteristics, such as ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir, where appropriate. A minimal reduction in canopy cover would maintain the light environment in the understory at moderate- to low-level conditions, and no notable change above current levels is expected. This diffuse light environment would be characterized by partial to substantial shade, and consequently, the current trend towards the establishment and development of shade-tolerant vegetation and conifer regeneration would continue. Regeneration of shade-intolerant species would be limited to openings in the canopy, which may provide a higher light environment in comparison to the remainder of the stand. Skid trails and landings may create such openings where light conditions and bare mineral soil provide for the establishment and development of shade-intolerant or early seral species. However, since canopy cover on the stand level would remain relatively high, the effect of treatment on understory vegetation is expected to be negligible.

Direct and Indirect Effects: Individual Tree Selection with Biomass Removal

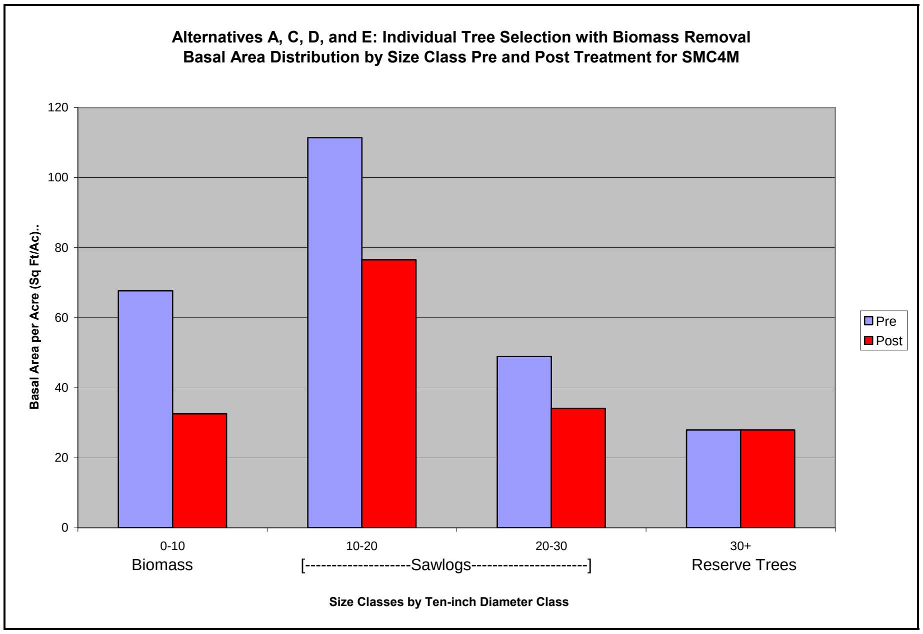
Stand Structure and Density— Individual tree selection with removal of biomass would incorporate the concept of low thinning, where the vertical continuity between surface fuels and canopy fuels would be reduced by the removal of smaller diameter ladder fuels in the form of biomass products. The removal of ladder fuels in the suppressed and intermediate crown classes would result in a greater reduction in structural diversity on the stand level where crown overlap is less likely to occur (figure 3.8).

Figure 3.8. Individual Tree Selection with Biomass Removal: Stand visualization of existing condition and predicted post-treatment stand structure for a representative SMC4M stand.



Since maintaining 50 percent canopy cover is the main constraint, the integration of biomass removal with individual tree selection would reduce the number of larger trees to be removed as the relative proportion of smaller tree removal increases. This would result in a larger reduction in stocking and density, particularly in the smaller diameter classes. The result would be a reduction in stand density which would be below the threshold for density dependent mortality; however the longevity of this effect would be limited by retaining higher canopy covers of 50 percent. In CWHR size classes 4 and 5, pre-treatment stocking ranges from approximately 534 to 736 trees per acre. The treatment would reduce stocking to approximately 161 to 193 trees per acre. Basal area would be reduced by approximately 30 percent, primarily in the smaller size classes represented by trees under 20 inches in diameter (figure 3.9). On average, approximately 68 percent of the trees per acre between 20 and 30 inches would be retained and all trees 30 inches and greater would be retained thereby maintaining large dominant and codominant trees.

Figure 3.9. Individual Tree Selection with Biomass Removal: Exisiting pre-treatment basal area and the predicted post-treatment basal area distribution for SMC4M stands by 10 inch diameter class.



Because this treatment would fully incorporate the concept of low thinning (thinning from below the canopy), the resulting stand structure would range from a single- to two-storied stand comprised of the largest dominant and codominant trees. Residual intermediate trees would be retained for structural diversity, and the most suppressed and intermediate trees would be removed. Diameter distribution would be more normal or bell shaped due to the removal of small trees. The overlap of tree crowns would be reduced, but tree crowns would provide more continuous cover.

Individual tree selection harvests would be designed to retain forest structure, composition, and canopy cover. The treatments are expected to maintain CWHR classification with a temporal reduction in canopy cover to the moderate classification. Both treatments would reduce inter-tree competition, thus providing for individual tree growth; however treatments with biomass removal would provide for a further reduction in stand density. The removal of biomass would alter the structural diversity of the canopy by reducing smaller diameter ladder fuels and crown overlap, yet still provide for canopy cover retention. The retention of 50 percent canopy cover would maintain a moderate to low light environment where understory development would largely be limited to shade-tolerant species.

Species Composition—Individual tree selection with biomass removal would result in 50 percent canopy cover, which would maintain a moderate to low light environment best characterized by partial to substantial shade. Post-treatment, a mixture of dominant and codominant trees of species indicative of ecological habitat type would be retained with an emphasis on shade-intolerant species. Establishment and development of understory vegetation would primarily consist of shade-tolerant species, while shade-intolerant species would be limited to openings in the canopy where sufficient light levels exist. Skid trails and landings may create such openings where light conditions and bare mineral soil would provide for the establishment and development of shade-intolerant or early seral species. The effect of treatment on understory vegetation is expected to be negligible because canopy cover would remain relatively high.

Group Selection. The proposed action would implement group selection harvest as directed in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) to "test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and improve and maintain ecological health of the forest."

The group selection method would create openings in the canopy to mimic gaps caused by natural agents, thereby emulating regeneration of a multicohort (multiple age classes) system across the landscape (York et al. 2003; Helms and Tappeiner 1996). Bonnicksen and Stone (1981, 1982) describe the southern mixed conifer forest of the Sierra Nevada as consisting of "mosaic aggregations in a space-time system." The aggregations (collections) of cohorts (groups of individuals commonly consisting of trees of similar age [Helms 1998]) created using the group selection system may be used to increase diversity in forest structure on the landscape scale (McDonald and Abbot 1994), as well as promote the establishment and development of intermediate and shade-intolerant regeneration (Leak and Filip 1977).

The ability of group selection to promote establishment and development of shade-intolerant conifer regeneration is largely dependent on the size of the opening (York et al. 2004; McDonald and Reynolds 1999). "Seedlings of very shade intolerant species such as Ponderosa pine require a minimum of 30 percent full sunlight to survive in the understory" (Oliver and Larson 1996). The amount reaching the group is a function of group size relative to the surrounding codominant and dominant tree height on the edge of the group. Consequently, those trees in the center of the group selection receive the most amount of light and water while those trees near the edge receive partial shade and must compete with surrounding codominant trees for water resources (York et al. 2003). Throughout all alternatives, a range of group selection sizes would be utilized to most appropriately "fit" the site requirements to encourage the regeneration of shade-intolerant species. Group selection openings would range in size from 0.5 acre to 2 acres, averaging 1.5 acres in size. Exact field placement of group selection units would be determined by field crews. Placement of group selection units would consider stand characteristics such as site quality and regenerative capacity, CWHR size class, number of leave trees, access, logging systems, volume, and resource protection.

Direct and Indirect Effects: Group Selection

Stand Structure and Density—In group selection units, conifers under 30 inches dbh would be removed; however, healthy, undamaged, shade-intolerant conifer regeneration and a minimum of 25 to 35 square feet of basal area per acre of black oaks over 15 inches dbh would be retained, if present. Canopy cover and tree density would be dramatically reduced in order to create a high light environment, which would promote the establishment and development of shade-intolerant conifer regeneration and understory vegetation. Consequently, the treatment is expected to shift groups into CWHR size class 1 and 2 structures. Residual stand structure would be comprised of no more than approximately 10 trees per acre, all of which would be greater than 30 inches dbh. This would result in a very open stand structure with a canopy cover ranging from approximately 0 to 17 percent. Consequently, group selection would create openings of early seral forest structure best characterized by CWHR size classes 1 and 2. Currently, this structure only accounts for 2 percent of the Empire Project area.

Group selection harvest units would be regenerated using a combination of naturally established and planted shade-intolerant species to achieve desired stocking levels. Group selection harvest units would be regenerated with approximately 257 to 435 trees per acre of desirable shade-intolerant species indicative of the ecological habitat type in which the group is located. Diameter distribution would be representative of a one- to two-aged stand depending on the presence of overstory trees greater than 30 inches dbh (Smith et al. 1997).

Development into subsequent CWHR size and cover classes would be largely dependent on seedling survival and competition with brush, grass, and forb species. Competing vegetation components are expected to persist until conifer canopy closure is sufficient to limit the understory light environment. Mortality of competing vegetation may begin to occur at the CWHR class 3M stage, as it is expected that pole-size trees would develop crowns above competing vegetation. Timber stand improvement activities in the form of mechanical maintenance (brush reduction and pre-commercial thinning) would have a positive effect on development of stand structure in group selections.

As conifer regeneration in group selection units grows, these groups are expected to develop into subsequent CWHR size and cover classes. Within 50 years of treatment, groups would be expected to develop into a pole structure with moderate canopy (CWHR 3M). Stand structure in group selection harvest units would develop into primarily single canopy, pole sized stands ranging in diameter from approximately 9.5 to 10.6 inches dbh. Groups with residual overstory trees greater than 30 inches dbh would be two storied and two aged. Crowns would generally be codominant, but may begin to differentiate into dominant and intermediate crown classes. Consequently, diameter distributions within such aggregations would be relatively normal (approximating the bell shaped curve) and the canopy would be relatively contiguous, accounting for approximately 60 to 67 percent canopy cover.

Species Composition— The openings in the forest canopy created by group selection units would promote the regeneration of an additional cohort of shade-intolerant, fire-adapted species. A mixture of trees of species indicative of ecological habitat type would be planted with an emphasis on shade-intolerant trees with fire-resistant characteristics, such as ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir, where appropriate. In addition, natural regeneration would be utilized particularly for shade tolerant species such as incense cedar and red and white fir. The net result across the landscape would be a mosaic of cohort aggregations, which would contribute to diversity in forest composition and structure.

Establishment and development of competing shrubs, grasses, and forbs is expected, but it should be noted that group selection may also be used as a silvicultural technique to reduce the occurrence of competing brush species (McDonald and Fiddler 1993). McDonald and Reynolds (1999) observed that in smaller group selection openings, "normally aggressive shrub species were never really competitive," but also observed less successful development of shade-intolerant species such as ponderosa pine in smaller group selections. However, group selections as proposed in all action alternatives would be 3.5 to 14 times the size of those groups in the McDonald and Reynolds study. It is expected that the larger size of the group selection would contribute to a higher light environment where shade-intolerant conifer regeneration would successfully develop.

Cumulative Effects: Past, Present, and reasonably foreseeable actions within the analysis area (Common to all alternatives)

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects, and these past actions are not discretely separable from natural events and the natural environment. The incremental effects from past actions cannot be easily separated or isolated from natural changes to the environment that have occurred over time including changes resulting from past natural events.

Past Actions. The cumulative effects across the vegetation analysis area may be examined through landscape distribution of CWHR size class and density as a proxy for successional (seral) stage. The aggregate cumulative effect of past actions is quantified through existing distribution of CWHR size class and density and the incremental cumulative effects of treatments proposed under the alternatives are shown within the following tables for the corresponding alternatives (tables 3.6, 3.7, 3.8, 3.10, and 3.11).

Timber harvest on public lands—Since 1966 timber harvest activities on federal lands within the project area were focused on selection harvests: single-tree selection (2,453 acres), overstory removal

(4,363 acres), sanitation (926 acres), and salvage (604 acres). Selection harvests on federal lands account for approximately 8.1 percent of the project area. These harvests typically removed large senescent overstory trees while retaining denser stands of small to medium size trees characteristic of CWHR size class 4. The resultant structure of affected stands across the landscape is mid-seral in development. The effect is a reduction in larger overstory trees and a reduction in snag and large down woody debris recruitment. This is reflective of the abundance of CWHR size class 4 within the project area (Table 3.2). These stands have moderate to dense canopies of interlocking crowns and a strong component of shade tolerant regeneration due to the canopy and light conditions. Both factors contribute to ladder fuel and canopy fuel conditions identified as undesirable for potential fire hazard.

Since the 1980's even-age silvicultural systems were also implemented within the project area. These systems include patch clearcutting (533 acres), stand clearcutting with reserves (752 acres), and stand clearcutting with total removal (591 acres). These regeneration harvests have created existing plantations of sapling to pole-sized (4-10inches dbh) stands characteristic of CWHR size classes 2 (sapling-sized trees) and 3 (pole-sized trees). These activities have converted later seral stands (CWHR size class 5) to early seral stands (CWHR size classes 1, 2, and 3), however, these harvests only account for 1.8 percent of the project area.

Past activity data also indicates that commercial thinning, mechanical thinning, and hand thinning have occurred on 910 acres of federal land within the project area. Thinning activities focused on reducing stand densities primarily in the suppressed, intermediate, and codominant crown classes. The effect of these activities generally has been to create more open canopy conditions (CWHR "P") and has been beneficial for forest health and fire hazard by reducing competition and mortality in forest stands, however, only 1 percent was treated by these methods.

Timber harvest on private lands—Timber harvest on private lands within the project area is also largely focused on selection harvests (selection, sanitation/salvage). A total of 5,806 have been treated since 1994. These selection harvest activities display effects similar to those described above on federal land account for approximately 5.6 percent of the project area. Even-age harvest systems (clearcutting, shelterwood, shelterwood seed) total 3,021 acres and account for approximately 2.9 percent of the project area. These even-age harvest activities display effects similar to those described above on federal land. Commercial thinning on private lands totals 4, 055 acres of treatment and accounts for approximately 3.9 percent of the project area. These areas have had beneficial effects as mentioned above. Group selection, rehabilitation, and seed tree removal harvests account for less than a percent of the project area and are dispersed in location and time; therefore the effects are negligible at the project area scale.

Fire—Since 1916, twenty-two large fires (exceeding 100 acres in size) have burned 14,725 acres within the project area. These large fires account for approximately 14.3% of the project area. These large fires have created large areas of monotypic vegetation types characterized by hardwood and chaparral. Since 1970, 355 fires ranging in size from less than 1 acre to over 1,600 acres have occurred within the project area. The vast majority of these fires were less than an acre in size and the effect on forest vegetation is limited to infrequent gaps in forest cover. In contrast, the history of suppressing fire within the project area has had perhaps the most profound effect on the forest vegetation in the project area. In concert with past timber harvesting practices, the suppression of fire has contributed to the development of dense stands comprised of small to medium sized trees and shade tolerant regeneration.

The cumulative effect of past harvest activities, wildfires, and fire management in the project area has created an abundance of stands characteristic of CWHR size class 4 (Table 3.2) with moderate to dense canopy cover (Table 3.3). The existing condition of forest vegetation is generally characterized by dense stands comprised of small to medium sized trees (Figure 3.1) comprised primarily of shade-tolerant species (Figure 3.2).

Present Actions. Firewood cutting and Christmas tree cutting activities are present as well as future actions within the project area; however these activities are largely limited to within 100 feet of system roads. Therefore, these activities do not have a measurable effect in areas that do not have vehicular access. In areas where woodcutting is permitted, these activities are dispersed in nature and limited in impact,therefore, these actions are considered in the cumulative effects, however are negligible..

Firewood cutting—Since 2001, 66 commercial and 3,513 personal-use woodcutting permits have been issued on the Mt. Hough Ranger district. In the recent past, personal-use woodcutting appears to have dropped (appendix G). While the amounts of woodcutting within the project area are not quantifiable, commercial and personal-use firewood cutting would display the largest effect on quantity and size of snags. Because snag removal is limited to a specified distance from system roads, the effect would be limited to localized areas. Stand exam data and forest vegetation simulation indicate that snags of sufficient size for wildlife habitat would range from approximately 0 to 6 snags per acre. Commercial and personal-use woodcutting would have the greatest effect in the fuel treatment areas located near roads. The effect of woodcutting would be reduced snag levels in localized treatment areas. However, across the landscape, the effect of firewood cutting would be negligible given the relatively higher snag levels in areas where roads do not exist and those snags would remain untreated. Although new snags would be recruited in untreated areas of the project as stands approach maximum stand densities where mortality would increase.

Christmas Tree Permits—Christmas tree removal has had and would continue to have the largest effect on the quantity of small fir (white fir and red fir) because these are the favored Christmas tree species. Since 2001, the Mt. Hough Ranger District has issued 8,716 Christmas tree permits, although the amount of Christmas tree removal is not quantifiable within the project area. Stand exam data indicate there are approximately 409 to 741 trees less than 10 inches dbh per acre in true fir communities found in the Empire Project area. In the recent past, the number of Christmas tree permits sold has been relatively constant, ranging from 2,062 to 2,348 trees per year on the Mount Hough Ranger District. Given the large number of trees less than 10 inches dbh per acre, the number of acres left untreated through past, present, and future projects, the shade tolerant nature of fir regeneration, and the seasonal and dispersed frequency of this activity, Christmas tree removal would have negligible effects on forest structure and composition.

Recreation—Most of the recreational use consists of dispersed activities and is largely restricted to areas outside the treatment units. These activities include use by individuals and small groups hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATV's, hunting, fishing, camping, rock hounding, and mining. There are two developed campgrounds where concentrations of campers occur during the summer months; in these locations effects to forest vegetation may include trampling and a decline in tree regeneration due to concentrated use. However, these effects are limited to the two campground locations and are not expected to affect surrounding forest vegetation in the project area. Dispersed recreation consists of activities that would generally result in negligible effects on forest vegetation structure, composition, and development due to the dispersed nature of activities and infrequent occurrence. For example, hunting within the project area (zone X6A) has a quota of approximately 380 tags and is limited to three weeks in October. Hunting activities have a negligible cumulative effect on forest vegetation as these activities are seasonal and limited to in their effects on vegetation to infrequently dispersed camping.

OHV—As described in Appendix G, there is a developed OHV track at Four Corners and six designated OHV routes within the project boundaries. During the winter months, snowmobile use is dispersed across the analysis area. Effects on forest vegetation would be highly localized and limited to the route on which vehicles travel. This effect is tempered due to the relative amount of surrounding vegetation that would remain unaffected by vehicle travel. Dispersion, frequency, and seasonality of use would also contribute to tempering any effects on forest vegetation in the project area. Therefore, the incremental contribution to cumulative effects would be negligible.

Mining—Over 70 mining claimants and 45 placer claims are located within the project area, primarily along creeks. These mining claims may affect riparian vegetation and surrounding forest vegetation; however this effect would be tempered by the limited area in which these activities occur and the relative amount of unaffected surrounding forest vegetation. Dispersion and seasonality of operations also limits the localized effects of mining activities on forest vegetation in the project area. Therefore, the incremental contribution to cumulative effects would be negligible.

Grazing—Livestock using grazing allotments may affect tree establishment and regeneration due to physical trampling of vegetation; however, this would be expected to have negligible effects on forest structure and composition due to spatial discontinuity between forested areas and areas of high use and palatable forage production. In addition, of the two allotments in the project area, the Long Valley allotment is currently vacant, and cattle from the Bear Creek allotment do not enter the project area due to topography that limits access. No active grazing is currently occurring within the project area. Therefore, the incremental contribution to cumulative effects would be negligible.

Special Uses—There are 43 Special use permits within the project area (see appendix G) that include road use, TV and microwave antennas, a cemetery, power and telephone lines, reflectors, livestock areas, organizational camps, residences, irrigation and domestic water lines, and horse trails. These would have a negligible impact on the establishment and development of forest vegetation because of the localized and dedicated areas for such uses. Therefore, the incremental contribution to cumulative effects would be negligible.

Reasonably Foreseeable Actions. Future HFQLG and non-HFQLG project planned within the analysis area boundary of Empire project would contribute to cumulative effects. Fuel treatments listed under future activities in Appendix G include the Mt. Hough Lookout Sale, the Dancehouse Fuel Treatment Project, and the Old Sloat Fuels Reduction Project.

Fuel Treatment Projects—The Mt. Hough Lookout sale consists of burning three acres of handpiles. Effects on forest vegetation would be limited to the extent of the burn pile and therefore would be highly localized in these three acres and negligible across the project area due to size and scale.

The Dancehouse-Chandler Fuel Treatment Project is a Resource Advisory Council (RAC) project which consists of mechanical and hand thinning and underburning treatments designed to reduce accumulations of hazardous fuels. For analysis purposes the mechanical thinning is considered a past project as it has been accomplished; however the prescribed fire treatments are considered a future project as it has not yet been completed. The Chandler project consists of 62 acres of mechanical thinning, 10 acres of hand thinning, and 19.5 acres of a mechanical and hand thinning within the RHCA. The Dancehouse project consists of 33 acres of mechanical thinning and 278 acres of handthinning.

A portion (~100 acres) of the Corridor Fuel Reduction Project falls within the vegetation analysis area. The thinning component of the Corridor and Dancehouse-Chandler projects was designed to reduce stand density by thinning from below; thereby reducing ladder fuels and canopy fuels. The effect is the removal of small diameter trees and a reduction in canopy cover while retaining the largest dominant, fire resistant trees. These treatments have had beneficial cumulative effects for maintaining forest health by reducing stand density and increasing fire protection in the wildland urban interface by reducing hazardous fuel accumulations. The prescribed fire treatments are expected to enhance the effectiveness of the thinning treatments by reducing hazardous surface fuels thereby contributing to the overall fire resistant structure of the stands in the project area. These projects would not change CWHR size class, but would be expected to modify canopy cover to more open conditions. Cumulatively, these projects would increase area treated within the project area that may beneficially modify fire behavior on the landscape level.

Hazard Tree Removal—In 2005, approximately five acres of roadside hazard tree removal was planned within the project area along Grizzly Ridge. This would affect dead, dying, and unstable green trees within falling distance of the road. The effect would be a reduction in snags within proximity of the road, but given the size, and dispersed intensity of the treatment, the effects on overall snag levels would be negligible. This project is expected to have a beneficial effect for public safety and road access.

Meadow Restoration—Other future projects located within the project area would have a negliglible cumulative effect on forest vegetation within the project area. The Rhinehart Meadow OHV restoration planned in 2006 consists of installing barriers to prohibit vehicle access and promote meadow and stream restoration. It is anticipated that this would have a beneficial effect on forest vegetation by providing further protection for meadow vegetation; however due to the project scale this would be a negligible effect.

Noxious Weed Treatments—The Medusahead Noxious weed treatment would occur between 2005 and 2010. Medusahead has been treated using a heat treatment that kills the plant, but does not ignite them. Treatment of noxious weeds would contribute to a positive cumulative effect by preventing the spread of non-native vegetation that competes with native understory forest vegetation. Due to the dispersion, small scale, and relatively minimal magnitude of the weed treatments, this project would have an negligible effect on forest vegetation.

Wildlife Habitat Improvements—Proposed wildlife habitat improvements planned for 2005 to 2010 include the installation of 12 guzzlers and the development of two waterholes. This would not have a measurable effect on forest vegetation within the project area due to the dispersion, small size, and relatively minimal magnitude of these treatments.

DFPZ Maintenance—Future DFPZ maintenance is not proposed in the project area at this time, but is included in the cumulative effects analysis as a possible future action. The 2003 HFQLG Final Supplemental EIS and ROD in combination with the original HFQLG Act FEIS and ROD provide programmatic guidance for DFPZ construction and maintenance in the HFQLG pilot project area. The predicted maintenance treatments are listed in Appendix G. These maintenance activities could occur at least 10 years after implementation.

The effect of such maintenance activities would maintain an open understory with reduced amounts of brush, tree regeneration, and naturally accumulating slash. These activities may reduce incidental numbers of snags, but may also induce snag recruitment through incidental tree mortality, particularly in prescribed fire treatments.

Another effect of DFPZ maintenance would be a reduction in tree regeneration and decreased recruitment of another age class of trees at the stand level. However, DFPZ maintenance treatments would maintain forest canopy and residual tree size. This, in turn, would retain stand structure and composition and would enhance the long-term effectiveness of fuel treatments in terms of reducing understory establishment and development.

HFQLG Pilot Project - The cumulative effect of HFQLG pilot project actions, such as the proposed action, and other vegetation management actions in the Sierra Nevada was assessed in the SNFPA FSEIS (2004). The cumulative effect of the HFQLG pilot project actions, such as the proposed action and proposed HFQLG projects was assessed in the HFQLG FEIS (1999). The fuel treatments constructed in the proposed Empire Vegetation Management Project would constitute approximately 2.2 percent of the total acreage of fuel treatments to be constructed under the pilot project (up to 300,000 acres). The group selection as proposed in the Empire Vegetation Management Project alternatives accounts for less than 19 percent of the annual group selection planned for the pilot project (8,700 acres/yr) and analyzed under the HFQLG FEIS (1999).

As covered earlier, the effect of past harvest activities, wildfires, and fire management in the project area has created an abundance of stands characteristic of CWHR size class 4 (Table 3.2) with moderate to dense canopy cover (Table 3.3). When considering the existing condition (past actions) in combination with the proposed treatments, the present activities, and the future activities, the stand structure would continue to perpetuate the abundance of CWHR size class 4.

Cumulative Effects (Alternative A).

To summarize, the proposed fuel treatments would create a relatively open forest structure where fuel amounts and arrangements have been altered to encourage low-intensity surface fires, which may be effectively suppressed by fire management personnel. Individual tree selection removal would maintain continuous forest cover, where horizontal and vertical structure would be retained on the stand level thus contributing to landscape level structural diversity. Group selection would create aggregations of an additional cohort of shade-intolerant species characterized by single canopies and more normal (bell-shaped) diameter distributions. These treatments, when applied together with the the present and future fuel treatments, would reduce accumulations of hazardous fuels, improve forest health by reducing stand density, and promote the regeneration of shade-intolerant species while maintaining forest cover and structure across the landscape. The proposed treatments in combination with the present and future projects would also contribute to landscape-level diversity by creating different stand structures with regard to stand densities, canopy structure, distribution of size classes, and age classes.

The acres proposed for individual tree selection represent 3.9 percent of the Empire Project area. The acres proposed for group selection only represent 1.3 percent of the Empire Project area; however, this equates to 4.8 percent of the land base "available" for group selection as calculated in chapter 2. Group selection density in the planning areas would range from 4 to 17 percent. The net cumulative effect would be an increase in structural and compositional diversity; however, this effect would vary for any given stand. Therefore, the cutting cycle would vary but would be limited by the upper range of group density. On the landscape level, the number of acres cut annually would average 0.57 percent over the 175-year regeneration cycle but would vary on an annual basis due to variation in group selection harvest density. This effect would contribute to temporal variation in forest and stand structure over the 175 year regeneration cycle.

Table 3.6. Alternative A: Cumulative effects on landscape distribution of CWHR size class and density within the forest vegetation analysis area.

CWHR Size Class	CWHR Tree Sizes (average)	CWHR Density Class	CWHR Canopy Cover (%)	Alternative B		Alternative A			
				Existing Acres	Existing Percent	Proposed Acres	Change in acres	Proposed Percent	Change in Percent
1	**<1" dbh**	**Total**		**0**	**0.0%**	**1347**	1347	**1.3%**	**1.3%**
2	**1-6" dbh**	**Total**		**1694**	**1.6%**	**1694**	**0**	**1.6%**	**0.0%**
3	**6-11" dbh**	D	>60	2103	**2.0%**	**2103**	0	**2.0%**	0.0%
		M	40-59	3695	**3.6%**	**3695**	0	**3.6%**	0.0%
		P	25-39	4536	**4.4%**	**4536**	0	**4.4%**	0.0%
		S	10-24	2078	**2.0%**	**2078**	0	**2.0%**	0.0%
		Total		**12412**	**12.1%**	**12412**	**0**	**12.1%**	**0.0%**
4	**11-24" dbh**	D	>60	14983	**14.6%**	**13430**	-1553	**13.0%**	-1.5%
		M	40-59	33405	**32.5%**	**31340**	-2065	**30.4%**	-2.0%
		P	25-39	12352	**12.0%**	**14935**	2583	**14.5%**	2.5%
		S	10-24	2484	**2.4%**	**2484**	0	**2.4%**	0.0%
		Total		**63224**	**61.4%**	**62189**	**-1035**	**60.4%**	**-1.0%**
5	**>24" dbh**	D	>60	6444	**6.3%**	**5370**	-1074	**5.2%**	-1.0%
		M	40-59	5590	**5.4%**	**5181**	-409	**5.0%**	-0.4%
		P	25-39	751	**0.7%**	**1922**	1171	**1.9%**	1.1%
		S	10-24	72	**0.1%**	**72**	0	**0.1%**	0.0%
		Total		**12857**	**12.5%**	**12545**	**-312**	**12.2%**	**-0.3%**
Non-forest total				**12751**	**12.4%**	**12751**	**0**	**12.4%**	**0.0%**
Grand Total				**102938**	**100.0%**	**102938**	**0**	**100.0%**	**0.0%**

The cumulative effect of the proposed treatments in combination with the past, present, and reasonably foreseeable projects would be a shift in forest successional stages to relatively earlier and more open canopy stages. Table 3.6 displays the change in percent by size class and density as proposed under alternative A. Approximately 1.3 percent of the analysis area would be converted to early seral conditions as represented by CWHR size class 1. The shift to relatively earlier seral stages would be tempered by promoting the development of mid and late successional stages in thinned stands and untreated stands which would create a mosaic of successional stages across the landscape.

Approximately 3.6 percent of the analysis area would be converted to more open canopy conditions as represented by CWHR “P”. Alternative A would contribute to the shift to more open canopy conditions in mid seral stages and later seral stages represented by CWHR size classes 4 and 5, respectively. This would contribrute to structural diversity across the landscape by promoting more open canopy conditions, thus enhancing tree growth, and consequently, promoting the development of mid seral stands into later seral stands.The intensity of this effect would be limited by the number of acres treated over time and the dispersed nature of these treatments across the landscape.

Cumulative effects also include the persistence of the largest trees across the project area, particularly those greater than 30 inches dbh. The proposed, present and future thinning treatments would retain the largest trees within treated areas. In addition, thinning stands to decrease stand densities would also promote the growth of large trees over time and reduce competition thereby reducing the risk of mortality due to insects, disease, and wildfire.

Removal of snags during project activities would reduce snag levels in current, proposed, and future fuel reduction projects, therefore the cumulative effect would be the reduction of snags in treated areas. This effect would be greatest within proposed and future fuel treatments. However, across the project area, the retention of snags and snag recruitment would continue to occur particularly in untreated areas and areas away from roads, where high stand densities would continue to contribute to mortality.

The past, present, and future projects contribute to a mosaic of different stand structures and densities that would contribute to the diversity of forest vegetation throughout the project area. The diversity in forest structure and composition created by these treatments (discussed above) and their spatial arrangement across the landscape may reduce the growth of large fires (Graham et al. 2004). This diversity would contribute to the creation of an uneven-aged, multistory, fire-resilient landscape, which would enhance ecological health of the forest while providing a timber supply that contributes to the economic stability of the surrounding rural communities.

In the context of the project area, the cumulative effect of these treatments would enhance the capacity to manage fire potential and forest health. Consequently, this would promote desired conditions identified in Chapter 1 as compared to the baseline of the no-action alternative and could lead to a reduction in forest vegetation losses due to large, damaging wildfires. The relative proportion of the landscape treated would temper these effects. On the remaining 83.2 percent of public land in the Empire Project area, conditions described in the affected environment would continue as presented in the no-action alternative.

Alternative B (No Action)

This alternative takes no action to implement provisions of the HFQLG Act or National Fire Plan on the Empire Project at this time. On-going activities characterized as present and reasonably foreseeable projects such as firewood cutting, recreation use and management, fuel treatments, and noxious weed treatments would continue in the Empire area. These actions listed in appendix G, would continue to take place and be planned.

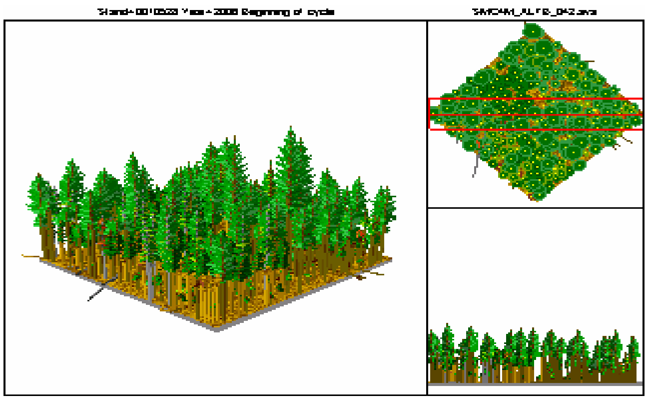
The no-action alternative would not employ treatments to address areas of concern identified in the *Mount Hough Landscape Assessment* or objectives and desired conditions identified in the purpose and need sections in Chapter 1. The no-action alternative would allow stands to continue to develop according to succession and would perpetuate the legacy of past management practices and fire suppression (Skinner 2005).

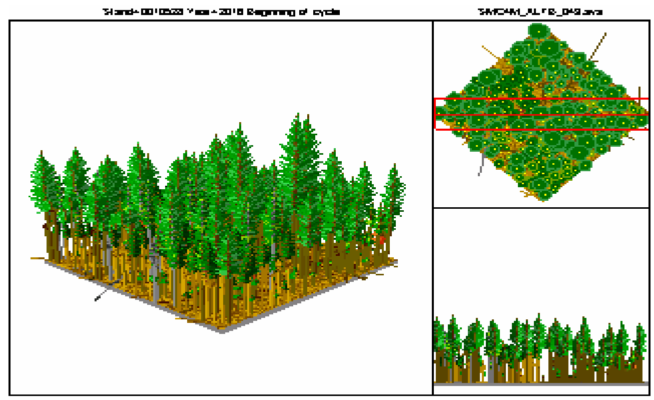
Direct and Indirect Effects: No Action

Fuel reduction, individual tree selection, and group selection treatments would not occur under the no-action alternative. Consequently, the horizontal and vertical continuity of surface, ladder, and canopy fuels would remain intact in the absence of naturally occurring disturbance (such as mortality), and accumulation would continue to increase in the absence of fire. This would not meet the purpose and need “to reduce the potential size and intensity of wildfires and provide suppression personnel safe locations for taking action against wildfires.”

Stand Structure and Density— The forest structure would be characterized by dense, closed, multi-canopy stands with overlapping and interlocking crowns ranging from approximately 52 to 70 percent canopy cover. Such stand structure would maintain vertical continuity of surface, ladder, and canopy fuels, thus creating the potential for surface fires to induce torching and crown fire. This stand structure would also maintain horizontal continuity of canopy fuels that would maintain the potential for active crown fire spread (figure 3.10).

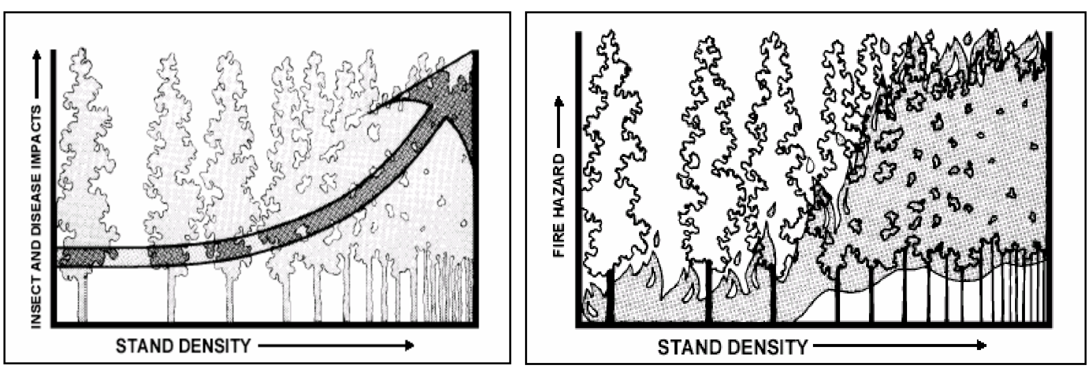
Figure 3.10. No Action: Stand visualization of existing condition and predicted future (10 years) stand structure for a representative SMC4M stand.





The no-action alternative would rely on disturbance such as density-dependent mortality and fire occurrence (or the lack thereof) to shape forest structure. Early seral structures best characterized by CWHR size class 1 and 2 account for only 2 percent of the Empire Project area. Relying on “natural” processes would perpetuate current conditions until such events occur and would delay restoration of desired conditions. This would result in maintaining a relatively homogenous forest structure dominated by CWHR size class 4, which currently accounts for approximately 61 percent of the Empire Project area. Alternative B would not provide for spatially variable, diverse forest structures across the landscape as described by Skinner (2005), Skinner and Chang (1996), and Weatherspoon (1996). Relying on these natural processes would likely not meet the desired conditions identified in the *Mount Hough Landscape Assessment* or those identified in the purpose and need sections in chapter 1.

Figure 3.11. General effects of increasing stand density on (a) insect and disease impacts, and (b) fire hazard as described by Powell (1994, 1999).



Existing stand conditions would persist and develop unaltered by active management. Current stocking levels range from approximately 401 to 842 trees per acre. Most of these trees are less than 10 inches in diameter and represent ladder fuels in the suppressed and intermediate crown classes. These high stand densities would be expected to persist. These high stand densities create increased tree competition that predispose weakened trees to attack by insects and infection by diseases (figure

3.11). These dense stands would be at greater risk for density-dependent insect and disease mortality above endemic levels due to a heightened level of tree competition.

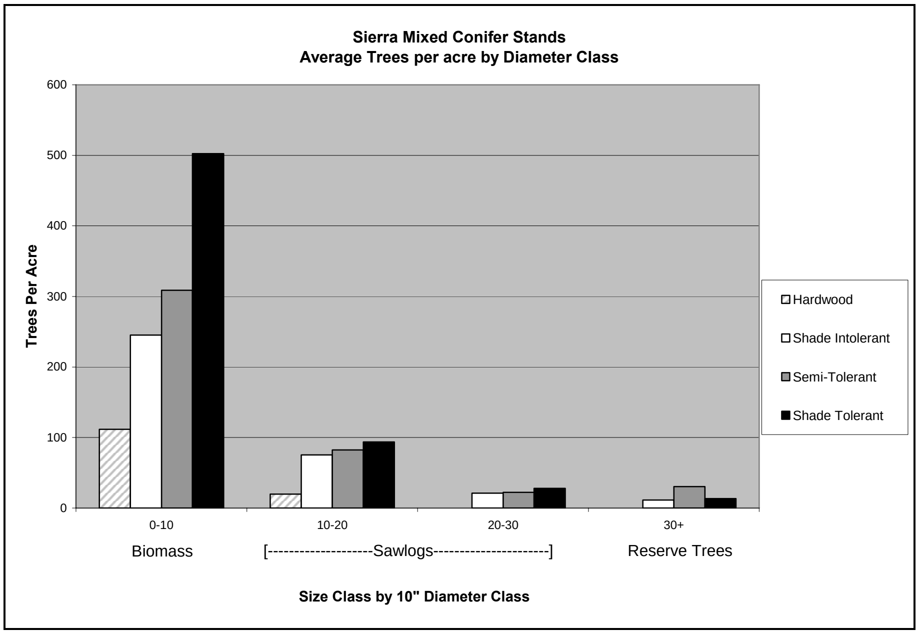
Annual insect surveys on the Plumas National Forest indicate a recent increase in insect activity. As these populations build, the potential for insects to move into additional areas increases. Maintaining stands in high densities would allow an increase in insect and disease abundance. If insect populations are allowed to build up on National Forest lands, the potential for spread to adjacent lands would increase. During endemic periods of insect infestation, trees of low vigor are typically attacked, but once epidemic population levels are reached, even healthy trees are subject to attack. Mortality as a result of high stand densities and increased populations of insects and diseases would contribute to the accumulation of surface fuels.

Mortality due to high stand densities, insects, and disease (density-dependent mortality) is expected to contribute to an increase of surface fuels, and shade-tolerant conifer regeneration is expected to contribute to the perpetuation of the fuel ladder. Consequently, the vertical and horizontal continuity of surface fuels, ladder fuels, and canopy fuels would remain intact. Surface fuels would continue to accumulate because the accumulation rate is typically greater than decomposition in many temperate ecosystems characterized by dry forests of the West (Graham et al. 2004).

The high fuel loadings and ladder fuels created by the exclusion of fire and other past management activities have created prime conditions for a wildfire start on National Forest lands to spread to adjacent private lands. In the absence of strategically located fuel treatments, fire management must rely on naturally occurring areas where fire personnel can be located for suppression activities. Given current fuel conditions and forest structure, the probability of reducing the effect of catastrophic wildfire may be limited. Catastrophic fire in the watershed would reduce structural complexity, create early-seral conditions, and increase brush abundance.

Species Composition—The existing stand structure promotes a low, diffuse light environment where understory conditions may be characterized by partial to complete shade. This is largely due to high stand densities (approximately 210 to 309 square feet of basal area per acre) that have high canopy cover. Such conditions have favored and would continue to favor the regeneration of shade-tolerant species such as white fir and incense cedar (figure 3.12). Individual tree selection and group selection would not be implemented, and the opportunity to test such uneven-aged silvicultural systems would not occur in this project. Regeneration of an additional cohort of shade-intolerant species would be limited to existing gaps and those created by naturally occurring disturbance (i.e., larger mortality or fire events). In the absence of area thinning, many stands would begin or continue to incur mortality due to high stand densities, insects, and disease, which may create openings sufficient for shade-intolerant regeneration, but such mortality would also likely contribute to an increase in surface fuels.

Figure 3.12. Exisiting conditions in Sierra Mixed Conifer Stands: Average trees per acre by 10 inch diameter class by species tolerance for shade. The Hardwood Category is primarily Black Oak, the shade intolerant species include Jeffrey and ponderosa pine, the semi-tolerant species include Douglas-fir and sugar pine, and the shade tolerant species include white fir and incense cedar.



Stands in the Empire Project area would continue to develop under succession. Canopy cover, size class, and structure would largely be maintained, thus perpetuating a moderate to low level light environment that would promote the establishment and development of shade-tolerant conifer regeneration. In the absence of fire and naturally occurring disturbance, shade-tolerant conifer regeneration currently existing in the understory would develop into codominant canopy trees. Over a longer temporal scale, this may result in a shift in species composition giving preference to regeneration of shade-tolerant species over shade-intolerant species (Minnich et al. 1995; Ansley and Battles 1998).

Cumulative Effects. Past, present, and reasonably foreseeable future projects common to all alternatives are found under the Cumulative Effects discussion in Alternative A. Since no roads would be closed or decommissioned under this alternative access for firewood cutting would remain unchanged.

The no action alternative would not address the existing conditions of forest vegetation which depart from the desired conditions as described in Chapter 1: among these conditions are hazardous fuel accumulations, dense stands of young trees, and shade tolerant regeneration. No actions would be employed to reduce the risk of high intensity wildfire. No thinning activities would occur to enhance the growth of dominant and co-dominant trees into larger size classes. No group selection harvests would occur to promote the development of early seral forest structure; consequently, mid-seral stand conditions would persist promoting the regeneration of shade tolerant species.

When considered cumulatively with past, present, and future projects, the no-action alternative would retain large trees and retain and recruit snags. Stand densities would continue to increase, as would the risk of tree mortality due to insects, disease, and wildfire. These effects would occur throughout the entire project area. Snag recruitment and risk of tree mortality is expected to be greatest in stands that display the highest densities.

This alternative would not improve and maintain forest and ecological health by reducing high stand densities and would not implement group selection as identified in chapter 1. The cumulative effects include the retention of mid-seral forest structure and the regeneration of shade tolerant species throughout the project area. This alternative would perpetuate the prevalence mid seral forest represented by CWHR size class 4, particularly in the closed canopy conditions represented by CWHR canopy density classes “D” and “M”. Early seral structure contributing to landscape diversity would not be created through silvicultural treatments and consequently, regeneration of shade intolerant species would not be enhanced nor expected to increase.

In the context of the project area, occurrences of large wildfires in the future may display the same effects as those wildfires that burned in the project area in the past: the creation of large areas of monotypic vegetation types characterized by hardwood and chaparral. When considered cumulatively with past fires and harvest activity, as well as present and future actions, the cumulative effect of large wildfires in the future could lead to a decrease in conifer forest types throughout the project area. This would not address the desired conditions as described in Chapter 1 and could exacerbate existing conditions.

Alternative C

Direct, Indirect, and Cumulative Effects. The fuel treatments, individual tree selection, and group selection effects on stand levels would be similar to alternative A because the proposed treatment prescriptions do not vary in prescription or in acres (for fuel treatments or individual tree selection). The difference therein lies at the landscape level due to the differing magnitude of acres planned for group selection. The relative percentage of group selection harvest in the Empire Project area would increase to 1.6 percent; however, this is 5.7 percent of the “available” land base as calculated in chapter 2 of the 2005 Empire FEIS. The acres and treatments proposed for individual tree selection are identical to those proposed in alternative A.

Table 3.7. Alternative C: Cumulative effects on landscape distribution of CWHR size class and density within the forest vegetation analysis area.

CWHR Size Class	CWHR Tree Sizes (average)	CWHR Density Class	CWHR Canopy Cover (%)	Alternative B		Alternative C			
				Existing Acres	Existing Percent	Proposed Acres	Change in acres	Proposed Percent	Change in Percent
1	**<1" dbh**	**Total**		**0**	**0.0%**	**1600**	1600	**1.6%**	**1.6%**
2	**1-6" dbh**	**Total**		**1694**	**1.6%**	**1694**	**0**	**1.6%**	**0.0%**
3	**6-11" dbh**	D	>60	2103	**2.0%**	**2103**	0	**2.0%**	**0.0%**
		M	40-59	3695	**3.6%**	**3695**	0	**3.6%**	**0.0%**
		P	25-39	4536	**4.4%**	**4536**	0	**4.4%**	**0.0%**
		S	10-24	2078	**2.0%**	**2078**	0	**2.0%**	**0.0%**
		Total		**12412**	**12.1%**	**12412**	**0**	**12.1%**	**0.0%**
4	**11-24" dbh**	D	>60	14983	**14.6%**	**13416**	-1567	**13.0%**	**-1.5%**
		M	40-59	33405	**32.5%**	**31197**	-2208	**30.3%**	**-2.1%**
		P	25-39	12352	**12.0%**	**14935**	2583	**14.5%**	**2.5%**
		S	10-24	2484	**2.4%**	**2484**	0	**2.4%**	**0.0%**
		Total		**63224**	**61.4%**	**62032**	**-1192**	**60.3%**	**-1.2%**
5	**>24" dbh**	D	>60	6444	**6.3%**	**5293**	-1151	**5.1%**	**-1.1%**
		M	40-59	5590	**5.4%**	**5162**	-428	**5.0%**	**-0.4%**
		P	25-39	751	**0.7%**	**1922**	1171	**1.9%**	**1.1%**
		S	10-24	72	**0.1%**	**72**	0	**0.1%**	**0.0%**
		Total		**12857**	**12.5%**	**12449**	**-408**	**12.1%**	**-0.4%**
			Non-forest total	**12751**	**12.4%**	**12751**	**0**	**12.4%**	**0.0%**
			Grand Total	**102938**	**100.0%**	**102938**	**0**	**100.0%**	**0.0%**

Past, present, and reasonably foreseeable future projects common to all alternatives are found under the Cumulative Effects discussion in Alternative A. The past, present, and reasonably foreseeable activities and their associated direct, indirect, and cumulative effects on forest structure and composition would be similar to those described in alternative A; however 253 additional acres of group selection would occur creating more early seral forest structure; this represents a 19 percent increase in group selection relative to Alternative A. However, the difference in group selection acres proposed accounts for less than one percent of the project area. The 253 additional acres of group selection under alternative C would enhance the regeneration of shade intolerant species provide for more early seral structures that would develop into aggregations of pole-sized stands. Approximately 1.6 percent of the analysis area would be converted to early seral conditions as represented by CWHR size class 1. Table 3.7 displays the change in percent by size class and density as proposed under alternative C.

The structural changes at the landscape level are similar to those described in alternative A; alternative C would also create more open canopy conditions as represented by CWHR “P” and it would contribute to the shift to more open canopy conditions in mid seral stages and later seral stages represented by CWHR size classes 4 and 5, respectively. However, alternative C would create an increase in relative percentage of group selection in the planning areas and, consequently, in the Empire Project area. This would effectively increase the density of group selection in each planning area to between 7 and 23 percent. Therefore, the cutting cycle would vary among stands but would be limited by the upper range of group density. On the landscape level, the number of acres cut annually would average 0.57 percent over the 175-year regeneration cycle but would vary on an annual basis due to variation in group selection harvest density. This effect would contribute to temporal variation in forest and stand structure over the 175-year regeneration cycle. However, on the landscape scale, the relative percentage of group selection units would still be within the allowable density prescribed for implementation of the HFQLG Act. Under this alternative, 82.9 percent of public lands in the Empire Project area would be left untreated, and conditions in untreated areas would continue as presented in the no-action alternative.

Alternative D (Preferred Alternative)

Direct, Indirect, and Cumulative Effects. The stand level effects of fuel treatments would be similar to alternatives A and C with the exception of the prescription modifications and acre changes listed in Chapter 2 under alternative D for units 2, 9, 10, 15, 20, and 21. Prescribed burning prescriptions would be modified to mastication and handthinning treatments because some portions of these units either already meet desired conditions, the terrain is too steep to implement burns safely or burning would create substantial smoke impacts. The proposed prescriptions under alternative D are designed to accomplish the vegetation and fuels management objectives and reduce negative impacts to resources. The effects of the prescription modifications would be identical to those described for mastication and hand thinning fuel treatments under alternative A.

In addition, the mechanical harvest prescription in riparian habitat conservation areas (RHCAs) within fuel treatments would be modified . Under alternative D, all trees greater than 20 inches dbh would be retained and a minimum of 50 percent canopy cover would be retained. The effects of this prescription modification would be identical to those described for mechanical thinning fuel treatments under alternative E; however, these effects would be localized and restricted to the RHCAs. The effects of mechanical thinning fuel treatments outside the RHCAs would be identical to those as described under alternative A. This modification would allow for higher densities within riparian areas to best meet riparian management objectives and would contribute to a wider range of canopy covers established through treatments. Implementing a range of canopy covers (30 to 45 percent outside RHCAs and 50 percent within RHCAs) would enhance treatment diversity on the landscape.

Under alternative D, sporax treatments would be applied on pine, fir, and incense cedar stumps greater than 14 inches and would be limited to annosus root rot infection. An estimated 21 acres or less would be treated within fuel treatments 13 and/or 17. This would greatly reduced the amount of sporax applied in the project area; however, limiting Sporax use to just the infection centers could result in stump infection beyond the localized treatment sites. In the Sierra mixed conifer, the effects would be tempered due to the mixed species composition, whereas the effects of stump infection would be far greater in single-species stands (true fir or pure pine stands). The risk for infection would be present in all untreated mechanical harvest units and the effects would be identical to those descrbed under sporax treatments in alternative A.

With alternative D, Road 25N73B would be rerouted with approximately 1,000 feet of new road construction and approximately 1,000 feet of existing road would be decommissioned. This modification would provide access for chip trucks for biomass removal. This road reroute would facilitate vegetation treatments. Effects of the reroute would include removal of localized forest vegetation, however, due to the size and scale of the action in context of the project, these effects are negligible.

Individual tree selection, and group selection would be identical to alternatives A and C because the proposed treatment prescriptions do not vary. However, alternative D decreases the magnitude of acres proposed for both individual tree selection and group selection. Consequently, less structural diversity would be introduced to the landscape.

Under this alternative, 2.3 percent of the Empire Project area has been proposed for individual tree selection. The group selection acres would account for 1.2 percent of the Empire Project area (table 3.8), which equates to 4.3 percent of the land base "available" for group selection as calculated in Chapter 2 of the 2005 Empire FEIS. Alternative D would also reduce the group selection density to less than 11.4 percent of each planning area. This effect would vary for any given stand. Therefore, the cutting cycle would vary but would be limited by the upper range of group density. On the landscape level, the number of acres cut annually would average 0.57 percent over the 175-year regeneration cycle but would vary on an annual basis due to variation in group selection harvest density. This effect would contribute to temporal variation in forest and stand structure over the 175-year regeneration cycle.

Table 3.8. Alternative D: Cumulative effects on landscape distribution of CWHR size class and density within the forest vegetation analysis area.

CWHR Size Class	CWHR Tree Sizes (average)	CWHR Density Class	CWHR Canopy Cover (%)	Alternative B		Alternative D			
				Existing Acres	Existing Percent	Proposed Acres	Change in acres	Proposed Percent	Change in Percent
1	<1" dbh	Total		0	0.0%	1226	1226	1.2%	1.2%
2	1-6" dbh	Total		1694	1.6%	1694	0	1.6%	0.0%
3	6-11" dbh	D	>60	2103	2.0%	2103	0	2.0%	0.0%
		M	40-59	3695	3.6%	3695	0	3.6%	0.0%
		P	25-39	4536	4.4%	4536	0	4.4%	0.0%
		S	10-24	2078	2.0%	2078	0	2.0%	0.0%
		Total		12412	12.1%	12412	0	12.1%	0.0%
4	11-24" dbh	D	>60	14983	14.6%	13517	-1466	13.1%	-1.4%
		M	40-59	33405	32.5%	31363	-2042	30.5%	-2.0%
		P	25-39	12352	12.0%	14935	2583	14.5%	2.5%
		S	10-24	2484	2.4%	2484	0	2.4%	0.0%
		Total		63224	61.4%	62299	-925	60.5%	-0.9%
5	>24" dbh	D	>60	6444	6.3%	5334	-1110	5.2%	-1.1%
		M	40-59	5590	5.4%	5228	-362	5.1%	-0.4%
		P	25-39	751	0.7%	1922	1171	1.9%	1.1%
		S	10-24	72	0.1%	72	0	0.1%	0.0%
		Total		12857	12.5%	12556	-301	12.2%	-0.3%
Non-forest total				12751	12.4%	12751	0	12.4%	0.0%
Grand Total				102938	100.0%	102938	0	100.0%	0.0%

Past, present, and reasonably foreseeable future projects common to all alternatives are found under the Cumulative Effects discussion in Alternative A. The past, present, and reasonably foreseeable activities and their associated direct, indirect, and cumulative effects on forest structure and composition would be similar to those described in Alternatives A and C; however, alternative D proposes only 1,226 acres of group selection. This would be 121 acres fewer than proposed in Alternative A; this represents a 9 percent reduction in group selection acres from Alternative A. Therefore, less early seral structure would be created under this alternative. The difference in group selection acres proposed accounts for less than one percent of the project area.

The structural changes at the landscape level are similar to those described in alternative A; alternative C would also create more open canopy conditions as represented by CWHR "P" and it would contribute to the shift to more open canopy conditions in mid seral stages and later seral stages represented by CWHR size classes 4 and 5, respectively. The largest difference proposed under alternative D would be a reduced amount of individual tree selection treatment. Alternative D only proposes 2,370 acres of individual tree selection treatment; this represents a 40 percent reduction in individual tree selection acres from Alternatives A and C. Short-term reduction of stand densities within the project area would not be as prevalent as under Alternatives A and C. The cumulative effect would be reduction of acreage thinned under the individual tree selection treatment; however, since these treatments maintain mid-seral forest structure, the effect on landscape structure would be limited to reducing CWHR dense canopies (D) to moderately dense (M). Retaining more untreated areas which would maintain mid-seral forest structure in dense canopy conditions, and the intensity of this effect is expected to increase as more areas are left untreated.

In stands not treated under this alternative, stand density would continue to increase as under the no action alternative and thinning would not enhance the growth of large dominant and codominant trees. In these areas, snag retention and recruitment would continue to occur due to density dependent tree mortality. The cumulative effects include the persistence of large trees, retention and recruitment of snags in untreated areas, and reduced stand densities where present and future treatments occur within the project area.

Relative to all alternatives, this alternative implements the widest range of canopy cover retention limits and would best contribute to a mosaic of different stand structures and densities that contribute to the diversity of forest vegetation throughout the project area. As mentioned above, the diversity in forest structure and composition created by these treatments and their spatial arrangement across the landscape may greatly reduce the growth of large fires (Graham et al. 2004). In the context of the project area, the cumulative effect of the diversity of treatments within this alternative would enhance the capacity to manage fire potential and forest health. Consequently, this would promote desired conditions identified in Chapter 1 as compared to the baseline of the no-action alternative and could lead to a reduction in forest vegetation losses due to large, damaging wildfires. The relative proportion of the landscape treated would temper these effects. Under this alternative, 85.7 percent of public land in the Empire Project area would be left untreated, and conditions in untreated areas would continue as presented in the no-action alternative.

Alternative E

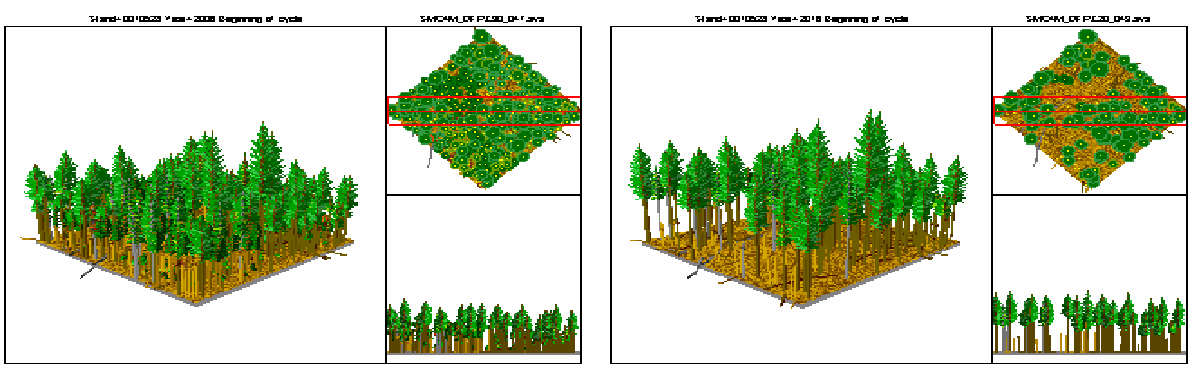
The fuel treatments proposed in alternative E would employ the same combination of stand treatments as alternative D; however, this alternative would modify fuel treatments to retain all trees greater than 20 inches dbh and maintain a 50 percent canopy cover. Stand level effects for mastication, hand thinning, and prescribed fire treatments would be similar to those described in alternative D.

Direct and Indirect Effects: Mechanical Thinning

Stand Structure and Density— The low thinning would eliminate vertical continuity between the surface fuels and canopy fuels by removing ladder fuels, which would reduce the potential for torching and crown fire initiation from surface fuels. However, by removing ladder fuels in the suppressed and intermediate crown classes, the treatment would effectively reduce structural diversity of the canopy on the stand level. The crown thinning would moderately decrease horizontal continuity between canopy fuels by reducing canopy bulk density, but not as much as alternatives that implement lower canopy cover retention limits (figure 3.13 versus figure 3.4). This would provide for some spacing between crowns, but crown separation would be substantially less due to the 50 percent canopy cover retention limit.

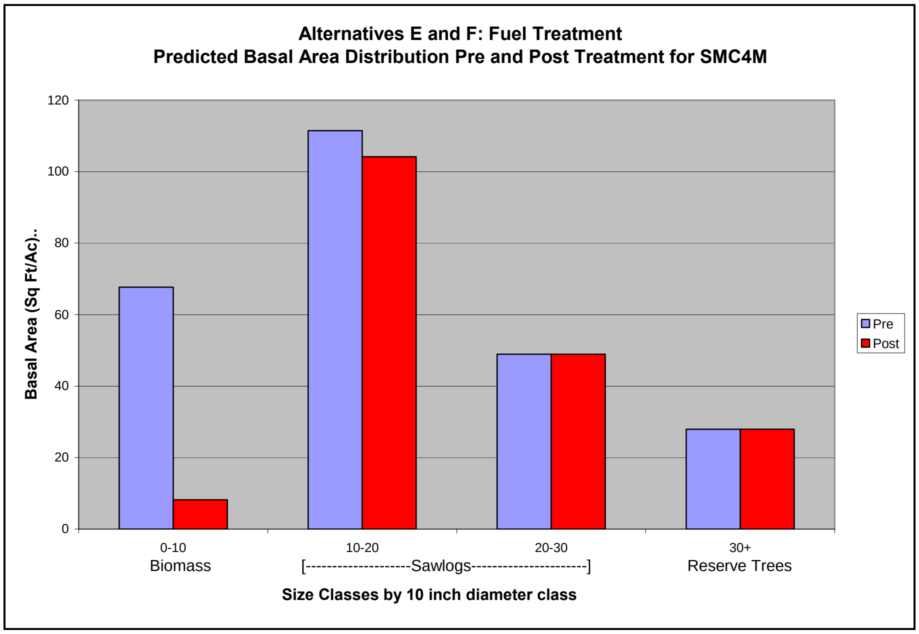
The residual stand structure would be a denser, more closed-canopy stand comprised of intermediate, codominant, and dominant trees with relatively less spacing between crowns. Immediately, post-treatment, canopy cover would range from approximately 50 to 52 percent (figure 3.13). The residual diameter distribution would be more normal or bell shaped and would largely be limited to codominant and dominant size classes. However, this residual distribution would be much wider relative to that created in alternative A because retaining trees greater than 20 inches dbh and maintaining 50 percent canopy target would limit removal of codominant trees to achieve crown spacing.

Figure 3.13. Mechanical Thinning Fuel Treatment (Alternative E): Stand visualization of existing condition and predicted post-treatment stand structure for a representative SMC4M stand.



The net effect would be a reduction in conifer stocking and density, which corresponds to an anticipated increase in average tree spacing to 18 feet and a reduction in canopy cover to 50 percent. Residual stocking in mechanical fuel treatments would range from approximately 121 to 165 trees per acre comprised of the largest intermediate, codominant, and dominant trees.

Figure 3.14. Mechanical Thinning Fuel Treatment (Alternative E): Existing pre-treatment basal area and predicted post- treatment basal area distribution for SMC4M stands.



The reduction in stocking as a result of treatment would correspond with an approximate 14 to 35 percent reduction in basal area. Retained trees would have an average diameter ranging between about 14.9 to 19.9 inches dbh in CWHR size classes 4 and 5. Reduction in basal area would occur primarily in trees less than 10 inches in dbh, and minimal basal area reduction would occur in trees greater than 10 inches dbh (figure 3.14). Consequently, stand density would be reduced to below the threshold for density dependent mortality; however, the longevity of this effect would be shorter relative to alternatives A, C, and D.

Alternative E would retain trees greater than 20 inches dbh in the fuels treatment. On average, approximately 17.3 trees per acre between 20 and 29.9 inches dbh would be retained. In addition, approximately 5.4 trees per acre over 30 inches dbh would be retained on average. Trees greater than 20 inches dbh may be removed for operability; however, such removal would be subject to agreement by the Forest Service. Removal of trees for operability is expected to be incidental and therefore, would have negligible effects on stand structure. Although reduction in trees per acre would be rather substantial, the majority of large overstory trees would be retained, providing for the upper strata of the canopy.

A reduction in stocking and density would enhance individual tree growth, thereby contributing to the development of stands into subsequent CWHR size classes. CWHR size class 3 stands would develop into CWHR size class 4, and CWHR 4M and 4D stands would develop into CWHR 5M. CWHR 5M and 5D would be maintained in the same size class with a moderate canopy cover. The canopy cover in the mechanical harvest treatment areas would increase with residual stand growth. The residual stand structure would remain as moderately dense canopy stand comprised of large trees (average diameter would range from approximately 14.8 to 21 inches dbh in CWHR size classes 4 and 5); however, the canopy cover would increase and range from approximately 55 to 58 percent canopy cover. However, size class and canopy cover alone may not reflect attributes of suitable habitat associated with CWHR class because the reduction in structural diversity on the stand level due to the removal of suppressed and intermediate crown classes would persist.

All fuel treatments under alternative E would maintain 50 percent canopy cover and would be rather uniform relative to alternatives A, C, and D. Consequently, the range and development (55 to 58 percent for alternative E) of canopy covers and structural diversity would be relatively less than alternatives A, C, and D. would begin to approach canopy densities that may not meet desired conditions.

Species Composition— The fuel treatments would maintain a canopy cover greater than 50 percent, providing for greater cover than treatments proposed under alternative A. Therefore, creation of an open light environment would be more restricted in this alternative. The establishment and growth of understory vegetation and conifer regeneration would be limited to those species that could tolerate partial to complete shade. Such environmental conditions would increase the potential for the establishment and development of an understory plant community adapted to a diffuse light environment.

Development of understory vegetation is largely dependent on canopy cover and maintenance activities. Fifty years following treatment, canopy cover is expected to recover to within pre-treatment conditions by 5 to 21 percent. This indicates that a lower light environment characterized by partial to complete shade would persist, which may promote establishment and development of shade-tolerant understory species and shade-tolerant conifer regeneration (Oliver and Larson 1996).

Direct and Indirect Effects: Mastication, Hand Thinning, and Prescribed Fire

Stand-level direct and indirect effects for mastication, hand thinning, and prescribed fire treatments would be similar to those in alternatives A, C, and D.

Direct and Indirect Effects: Sporax treatment

Sporax treatment of stumps would occur in mechanical harvest fuel treatments as described in alternative D, and the effects would be similar to those described in alternative D. However, retaining trees greater than 20 inches dbh and maintaining a 50 percent canopy cover in mechanical fuel treatments under alternative E would substantially reduce the amount of trees removed and the amount of stump area that would require Sporax treatment per acre. The basal area requiring Sporax treatment when using an 8-inch lower–stump-diameter limit would range from 22 to 146 square feet per acre with an average of 58.1 square feet per acre (table 3.9). Given the recommended application level, the amount of Sporax application per acre would be approximately 0.4 to 2.9 pounds, with an average of 1.2 pounds per acre. The basal area requiring Sporax treatment when using a 14-inch lower-stump-diameter limit would range from 0 to 18 square feet per acre with an average of 5.3 square feet per acre. Given the recommended application level, the amount of Sporax applied per acre would be approximately 0 to 0.4 pound, with an average of 0.1 pound per acre. The discrepancy between basal area at dbh versus stump basal area at 1 foot is expected to be negligible (Johns, pers. comm.).

Table 3.9. Mechanical Thinning Fuel Treatments (alternative E): Predicted harvested basal area per acre requiring sporax application

CWHR	**Alternatives E & F**	
	8" Lower Diameter Limit	**14" Lower Diameter Limit**
SMC3P	146	0
SMC4P	26	2
SMC4M	48	3
SMC4D	89	18
SMC5P	53	6
SMC5M	48	10
SMC5D	65	0
WFR4P	22	1
WFR4M	56	16
WFR4D	58	7
WFR5M	22	0
WFR5D	64	1
Average	**58.1**	**5.3**

The effects of not utilizing Sporax in individual tree selection and group selection would be identical to those described in alternative A.

Cumulative Effects. Past, present, and reasonably foreseeable future projects common to all alternatives are found under the Cumulative Effects discussion in Alternative A. The past, present, and reasonably foreseeable actions and their associated direct, indirect, and cumulative effects on forest structure and composition would be similar to those described in Alternative D. for group selection and individual tree selection treatments. However, the fuel treatments proposed in alternative E would use low thinning and crown thinning to reduce ladder fuels and canopy fuels. The low thinning component of the treatment is expected to be similar to the other action alternatives. However, given the upper diameter limit and canopy constraints under alternative E, the capacity to reduce crown fuels and stand densities would be limited relative to those proposed in alternatives A, C, and D. This may have an influence on the effectiveness of the treatment in terms of crown separation and would not be as effective with regard to longevity of maintaining less canopy cover relative to alternatives A, C, and D.

The proposed magnitude of group selection and individual tree selection treatments is identical to Alternative D. Under Alternative E, 2.3 percent of the Empire Project area is proposed for individual tree selection. The acres proposed for group selection would account for 1.2 percent of the Empire Project area (table 3.10), which equates to 4.3 percent of the land base “available” for group selection as calculated in chapter 2 of the 2005 Empire FEIS. Alternative E would also reduce the group selection density to less than 11.4 percent of each planning area. This effect would vary for any given stand. Therefore, the cutting cycle would vary but would be limited by the upper range of group density. On the landscape level, the number of acres cut annually would average 0.57 percent over the 175-year regeneration cycle but would vary on an annual basis due to variation in group selection harvest density. This effect would contribute to temporal variation in forest and stand structure over the 175-year regeneration cycle.

Table 3.10. Alternative E: Cumulative effects on landscape distribution of CWHR size class and density within the forest vegetation analysis area.

CWHR Size Class	CWHR Tree Sizes (average)	CWHR Density Class	CWHR Canopy Cover (%)	Alternative B		Alternative E			
				Existing Acres	Existing Percent	Proposed Acres	Change in acres	Proposed Percent	Change in Percent
1	<1" dbh	Total		0	0.0%	1226	1226	1.2%	1.2%
2	1-6" dbh	Total		1694	1.6%	1694	0	1.6%	0.0%
3	6-11" dbh	D	>60	2103	2.0%	2103	0	2.0%	0.0%
		M	40-59	3695	3.6%	3695	0	3.6%	0.0%
		P	25-39	4536	4.4%	4536	0	4.4%	0.0%
		S	10-24	2078	2.0%	2078	0	2.0%	0.0%
		Total		12412	12.1%	12412	0	12.1%	0.0%
4	11-24" dbh	D	>60	14983	14.6%	13517	-1466	13.1%	-1.4%
		M	40-59	33405	32.5%	33731	326	32.8%	0.3%
		P	25-39	12352	12.0%	12567	215	12.2%	0.2%
		S	10-24	2484	2.4%	2484	0	2.4%	0.0%
		Total		63224	61.4%	62299	-925	60.5%	-0.9%
5	>24" dbh	D	>60	6444	6.3%	5334	-1110	5.2%	-1.1%
		M	40-59	5590	5.4%	6264	674	6.1%	0.7%
		P	25-39	751	0.7%	886	135	0.9%	0.1%
		S	10-24	72	0.1%	72	0	0.1%	0.0%
		Total		12857	12.5%	12556	-301	12.2%	-0.3%
Non-forest total				12751	12.4%	12751	0	12.4%	0.0%
Grand Total				102938	100.0%	102938	0	100.0%	0.0%

Residual stand structure in fuel treatments would not be open relative to Alternatives A, C, and D. Mid-seral forest structure would be dominated by closed canopy stands characterized by CWHR Moderate (M). Canopy cover densities characterized by CWHR Open (P) would not be promoted under alternative E relative to alternatives A, C, and D. Consequently, fuel treatments would be have higher stand densities, and the longevity of treatment would be reduced relative to Alternatives A, C, and D, and Therefore, the cumulative effect would be retention of stands at higher stand densities within the context of both treated areas and the project area. The effect would be a relatively larger retention of mid-seral closed canopy forest vegetation types across the Empire project area when compared with Alternatives A, C, and D.

The cumulative effects under this alternative include the persistence of large trees and the retention of snags within the project area. Early seral habitat would be created and persist in the project area with the implementation of group selection thereby promoting the regeneration of shade intolerant species.

This alternative would contribute to a mosaic of different stand structures and densities that contribute to the diversity of forest vegetation throughout the project area. This would occur primarily through the implementation of group selection. However, the contribution to landscape diversity through fuel treatments and individual tree selection would be tempered by retaining a relatively larger amount of mid-seral closed-canopy (CWHR “M” and “D”) forest vegetation types. Fuel treatment and individual tree selection thinning would uniformily maintain 50 percent canopy cover and this homogeneity throughout treatments would perpetuate mid-seral forest closed-canopy vegetation. Group selection would be the only treatment that would contribute to the creation of early seral forest vegetation; thereby contributing to the diversity of seral stages within the project area. Under this alternative, 85.7 percent of public land in the Empire Project area would be left untreated, and conditions in untreated areas would continue as presented in the no-action alternative.

Alternative F

Direct, Indirect, and Cumulative Effects. The fuel treatment prescriptions proposed under alternative F and the related effects would be identical to those in alternative E. This alternative would modify fuel treatments to retain all trees greater than 20 inches dbh and maintain a 50 percent canopy cover.

However, alternative F does not propose individual tree selection and group selection treatments, and the opportunity to test such uneven-aged silvicultural systems would not occur. Regeneration of an additional cohort of shade-intolerant species would be limited to existing gaps and those created by naturally occurring disturbance (i.e., larger mortality or fire events). In the absence of area thinning, many stands would begin or continue to incur density-dependent mortality (mortality due to high stand densities, insects, and disease), which may create openings sufficient for shade-intolerant regeneration, but such mortality would also likely contribute to an increase in surface fuels. Surface fuels would continue to accumulate because the accumulation rate is typically greater than decomposition in many temperate ecosystems characterized by dry forests of the West (Graham et al. 2004).

Stands in the planning areas would continue to develop under succession. Canopy cover, size class, and structure would largely be maintained, thus perpetuating a moderate- to low-level light environment that would promote the establishment and development of shade-tolerant conifer regeneration. In the absence of fire and naturally occurring disturbance, shade-tolerant conifer regeneration currently existing in the understory would develop into codominant canopy trees. Over a longer temporal scale, this may result in a shift in species composition, giving preference to regeneration of shade-tolerant species over shade-intolerant species (Minnich et al. 1995; Ansley and Battles 1998).

This alternative would rely on disturbance, such as mortality due to high stand densities, insects, and disease and fire occurrence (or lack thereof), to shape forest structure outside of fuel treatment areas. Relying on “natural” processes would perpetuate current conditions until such events occur and would delay restoration of desired conditions. This would result in maintaining a relatively homogenous forest structure dominated by CWHR size class 4, which accounts for approximately 61 percent of the Empire Project area. This alternative would not contribute to spatially variable, diverse forest structures across the landscape as described by Skinner (2005), Skinner and Chang (1996), and Weatherspoon (1996) compared to alternatives A, C, D, and E. These processes would not likely meet the desired conditions identified in the *Mount Hough Landscape Assessment* or those identified in the purpose and need section in chapter 1.

Past, present, and reasonably foreseeable future projects common to all alternatives are found under the Cumulative Effects discussion in Alternative A. The past, present, and reasonably foreseeable activities and their associated direct, indirect, and cumulative effects on forest structure and composition would be similar to those described in Alternative E; however, Alternative F does not include any individual tree selection or group selection treatments. Within the context of the project area, cumulative effects include retention of large trees, retention and recruitment of snags, retention of stands at higher stand densities, and retention of mid-seral stands throughout the project area.

Table 3.11. Alternative F: Cumulative effects on landscape distribution of CWHR size class and density within the forest vegetation analysis area.

CWHR Size Class	CWHR Tree Sizes (average)	CWHR Density Class	CWHR Canopy Cover (%)	Alternative B		Alternative F			
				Existing Acres	Existing Percent	Proposed Acres	Change in acres	Proposed Percent	Change in Percent
1	**<1" dbh**	**Total**		**0**	**0.0%**	**0**	0	**0.0%**	**0.0%**
2	**1-6" dbh**	**Total**		**1694**	**1.6%**	**1694**	**0**	**1.6%**	**0.0%**
3	**6-11" dbh**	D	>60	2103	**2.0%**	**2103**	0	**2.0%**	**0.0%**
		M	40-59	3695	**3.6%**	**3695**	0	**3.6%**	**0.0%**
		P	25-39	4536	**4.4%**	**4536**	0	**4.4%**	**0.0%**
		S	10-24	2078	**2.0%**	**2078**	0	**2.0%**	**0.0%**
		Total		**12412**	**12.1%**	**12412**	**0**	**12.1%**	**0.0%**
4	**11-24" dbh**	D	>60	14983	**14.6%**	**14399**	-584	**14.0%**	**-0.6%**
		M	40-59	33405	**32.5%**	**33989**	584	**33.0%**	**0.6%**
		P	25-39	12352	**12.0%**	**12352**	0	**12.0%**	**0.0%**
		S	10-24	2484	**2.4%**	**2484**	0	**2.4%**	**0.0%**
		Total		**63224**	**61.4%**	**63224**	**0**	**61.4%**	**0.0%**
5	**>24" dbh**	D	>60	6444	**6.3%**	**5895**	-549	**5.7%**	**-0.5%**
		M	40-59	5590	**5.4%**	**6139**	549	**6.0%**	**0.5%**
		P	25-39	751	**0.7%**	**751**	0	**0.7%**	**0.0%**
		S	10-24	72	**0.1%**	**72**	0	**0.1%**	**0.0%**
		Total		**12857**	**12.5%**	**12857**	**0**	**12.5%**	**0.0%**
			Non-forest total	**12751**	**12.4%**	**12751**	**0**	**12.4%**	**0.0%**
			Grand Total	**102938**	**100.0%**	**102938**	**0**	**100.0%**	**0.0%**

The cumulative effect of not implementing individual tree selection would be the retention of stands at higher stand densities within the context of both treated areas and untreated areas within the project area. This would contribute to greater retention and recruitment of snags in the project area due to an increase in untreated area. As stand densities increase, the risk of tree mortality due to insects, disease, and wildfire would also be expected to increase, particularly within the relatively large portion of the project area that would be left untreated under this alternative.

The cumulative effect of maintaining higher stand densities and not implementing group selection would be a relatively larger retention of mid-seral forest vegetation types across the Empire project area when compared with Alternatives A, C, D and E. Due to the retention of canopy cover in the fuel treatments and the absence of individual tree selection and group selection, the project area would maintain a high proportion of mid-seral closed canopy forest structure compared to the other action alternatives. As group selection treatments would not be implemented under this alternative, no early seral stages would be created (table 3.11)and the establishment and development of shade intolerant regeneration would not be enhanced; this alternative would likely perpetuate the regeneration of shade tolerant species much like that described under the no action alternative. This alternative would not improve and maintain forest and ecological health by reducing high stand densities and would not implement group selection as identified in Chapter 1; therefore forest composition and structural diversity would not be improved.

Because all individual tree selections and group selections are excluded from this alternative, only 6.5 percent of the entire Empire Project area would be treated, leaving 90.7 percent of public land in the Empire Project area untreated. The effectiveness of the fuel treatments in this alternative may be further tempered by the relative increase in untreated area surrounding them as conditions in untreated areas would continue as presented in the no-action alternative.

FIRE, FUELS, AND AIR QUALITY

Summary of Effects

Alternative A (Proposed Action)

- Fuel treatments would result in a decreased likelihood of crown fire within fuel treatments compared with existing conditions.

- Planted and naturally regenerated conifers in group selection units would remain vulnerable to scorch-related mortality for several years, though fire line intensity would remain lower than that of untreated areas.

- Fuel treatments could remain effective for at least 10 years once established before further treatment is needed.

- Individual tree selection units without biomass removal would not substantially contribute to the enhancement of fire suppression capabilities, though individual tree selection units with biomass removal would perform at a level similar to fuel treatments.

- The rate of line construction and penetration of retardant drops through the canopy to surface fuels would be increased, resulting in enhanced ability of fire management to suppress, control, and contain fires impacting or starting in fuel treatments under *90th percentile weather conditions*. Additionally, firefighter safety would be improved in fuel treatments.

- Smoke from follow up treatment activities may have short-term impacts to Quincy and surrounding areas, though the increased ability to control and contain fires will result in potentially less long-term impacts from smoke during future wildfire events.

- Smoke from prescribed fire only treatment units 9, 10, and 20 would substantially impact air quality in Quincy.

- Fuel treatments would help move areas in *Fire Condition Class* (FCC) 3 towards FCC 2; stands in FCC 1 would remain in FCC 1.

Alternative B (No Action)

- Surface fuels, ladder fuels, and crown fuels would not be modified over the short term. This may result in a higher likelihood of a fire to escape initial attack. The chance for high severity fire would not be directly mitigated.

- High-severity fires, similar to past fires up to 1,600 acres in size or larger in the Empire Project area, would not be mitigated by this alternative. Potential for impacts to Quincy and surrounding communities from smoke emissions from future wildfires would not be mitigated by this alternative.

- *Flame lengths* would continue to exceed 4 feet throughout modeled periods, which would make direct action by firefighting hand crews unsafe and success unlikely under 90th percentile (or higher) weather conditions. Overall, taking no action under alternative B would not improve resistance to control in terms of rates of line construction and penetration of retardant to surface fuels over time across all stand types.

- Alternative B would result in no improvement for firefighter safety, public safety, and fire management's ability to suppress and contain a wildfire in the Empire Project Area.
- Alternative B will not reduce long-term smoke impacts to Quincy and surrounding areas during future wildfire events.
- Fire Condition Classes 2 and 3 would not be modified over the short term.

Alternative C

- The direct, indirect, and cumulative effects of fuel treatments, individual tree selection, and group selection would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 9G, 20G, and 23G. These treatments would not be implemented in these five planning areas, so their direct, and indirect effects to fire, fuels, and air quality would be comparable to alternative B ("no action") from their implementation

Alternative D (Preferred Alternative)

- The direct, indirect, and cumulative effects with respect to fuel treatments, individual tree selection, and group selection would be similar to alternative A, except for effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. Treatments would not be implemented in these eight planning areas, so their direct, and indirect effects to fire, fuels, and air quality would be comparable to alternative B ("no action") from their implementation.
- If fully implemented, the fuel treatments would result in similar direct and indirect effects as described in alternative A except in fuel treatment units 2, 9, 10, 15, 20, and 21. These units would not be treated using prescribed fire, thereby potential air quality impacts to Quincy would be less than alternative A.

Alternative E

- The direct, indirect, and cumulative effects with respect to individual tree selection and group selection would be similar to alternative D.
- Crown fire potential is relatively higher when compared with alternatives A, C, and D. The potential for passive crown fire (torching) in alternatives E and F would be similar to alternatives A, C, and D.
- Higher canopy cover may result in reduced penetration of aerial retardants through the canopy to surface fuels. This reduced penetration may result in a higher likelihood of a fire to escape initial attack.

Alternative F

- Direct, indirect, and cumulative effects would be similar to alternative E with respect to fuel treatments.

- The potential to enhance the effectiveness of fuel treatments by placing individual tree selection with adjacent biomass treatments would not occur under this alternative.

- Potential contribution of smoke from burn piles for slash reduction in group selection would not occur because group selection would not be implemented under this alternative.

This analysis incorporates by reference the "Fire, Fuels, and Air Quality Analysis" located in the Empire Project Record (USDA 2007d). The following discussion on analysis area, analysis methods, affected environment, direct, indirect, and cumulative effects is a summary of information and data contained in the Fire, Fuels, and Air Quality Analysis.

Affected Environment

The Empire Project is located primarily on the south-southwest aspect slopes of Grizzly Ridge, a prominent mountain ridge that extends for approximately 24 miles in a southeast to northwest direction. Small portions of this project are located on the very top of Grizzly Ridge and extend over onto the north aspects of Grizzly Ridge. Grizzly Ridge lies north and east of the community of Quincy, California, the county seat of Plumas County and the counties' most populated community. Grizzly Ridge lies between American Valley to the south (where Quincy is located) and Indian Valley and Genesee Valley to the north (where the communities of Greenville, Taylorsville, Crescent Mills, and Genesee are located).

The top of Grizzly Ridge averages above 7,000 feet in elevation, while the mountain valleys on either side of it average about 3,500 feet elevation. The topography of Grizzly Ridge topography is different between its northeast and southwest aspects. The northeast aspect is typically steep, rocky, and inaccessible, with a few roads providing only minimal access. The southwest aspect is typically less steep, and many roads provide vehicle access. Many of the less-traveled roads in the project area are becoming grown over with encroaching brush, shrubs, and small trees. This growth is beginning to inhibit access for fire engines, crew carriers, and other fire management vehicles.

Proposed vegetation and road treatments would occur primarily within the following vegetation types: Sierra mixed conifer, fir-dominated or red fir forests, and montane chaparral (Mayer and Laudenslayer 1988). The following section provides a brief description of the past and recent fire history, surface fuels, fire regime condition class, and Wildland Urban Interface (WUI) they relate to the Empire Project.

Fire History by Dominant Vegetation Types Prior to 1920

Sierra Mixed Conifer Forest. Prior to the twentieth century, the mean *fire return interval* for the Sierra mixed conifer forest type has been reported as 7 years (range is 1 to 53 years) for the "East Quincy" study plot approximately 7 miles south of the Empire Project area (Moody and Stephens 2002). Other studies have reported fire return intervals in mixed conifer forests in the Sierras as 11.5 years (the range is 1 to 25 years for south-facing slopes) (Beaty and Taylor 2001) and 4.7 years (the range is 4 to 28 years) (Stephens and Collins 2004). From these and other studies (Leigberg 1902), it can be inferred that low to moderate severity fires, whether human or lightning caused, were a common occurrence in the analysis area into the early 20th century.

Montane Chaparral. Montane chaparral (Mayer and Laudenslayer 1988) is the dominant brush type in the Empire Project area. It covers approximately 3,500 acres and is found mostly in areas burned by past wildfires, including the Bell, Oak, and Cashman fires which burned in the early 1970's. These fires burned with high severity resulting in most of the trees being killed. The growth of montane chaparral in previously forested areas that burned under high-severity wildfire was documented by Leigberg (1902).

Fire behavior in montane chaparral differs from typical wind driven chaparral fires more common in Southern California. To understand this difference, it is important to differentiate the montane chaparral found in the northern Sierra Nevada from chaparral typical at lower elevations, coastal, and southern regions of the state (Nagel and Taylor, in press; Holland and Keil 1995; Mayer and Laudenslayer 1988). Large chaparral fires in southern California are typically fast moving, crown fires driven by Santa Ana or *foëhn-type winds* (Keeley and Fotheringham 2001) which can exceed 60 miles per hour. In the Empire project area, foëhn-type winds do not occur, though "north winds" can occur in late summer and fall. North winds typically in the project area are typically less than 20 miles per hour; higher speed North winds are more common in the lower elevations of the Sacramento Valley (Schroeder and Buck 1970). In contrast, southern California chaparral vegetation, fires in montane chaparral can be of high severity but also patchy, indicating that montane chaparral can burn with mixed severity (Nagel and Taylor, in press). In addition, these researchers note that surface fires burning through adjacent conifer forests can stop spreading upon reaching areas of montane chaparral under "average" weather conditions. Nagel and Taylor (in press) determined that the montane chaparral in their study area on the west shore of Lake Tahoe burned approximately every 28 years compared with 14 years in the surrounding forest. This indicates that fire spread under historical conditions may have been constrained by the shrub fuels. This reduction in rate of spread is due to differences in fuel moisture, structure, and abundance (Nagel and Taylor, in press; Skinner 2005). This phenomenon of reduced fire intensity and spread within montane chaparral has also been repeatedly observed by fire management personnel on the Plumas National Forest (Pete Duncan, pers. comm.; Scott Abrams, pers. comm.; Randy Beck, pers. comm.) and described for recent large fires on the Mount Hough Ranger District (MHRD Fire Report PNF-1091). On slopes less than 35 percent, high-intensity crown fires in montane chaparral is rarely encountered by fire management personnel who have worked on the Mount Hough Ranger District over the past 35 years (Duncan, pers. comm.; Abrams, pers. comm.; Beck, pers. comm.). Fires in brush and plantations in this slope range are typically low intensity and relatively easy to suppress under most weather conditions (Shafer, pers. comm.). Fire managers on the Mount Hough Ranger District are more concerned about fires in untreated conifer stands with a heavy accumulation of surface and ladder fuels (typical of the Empire Project area) than fires in montane chaparral.

White and Red Fir Dominated Forests. In higher elevation red and white fir dominated forests (up to 6,400 feet in elevation), mean fire return intervals have been reported as 33.8 years (range is 18 to

54 years) (Beatty and Taylor 2001). In red fir-western white pine dominated forests (up to 7,900 feet in elevation), median fire return intervals have been reported as 70 years (range is 26 to 109 years) when averaged across all aspects (Taylor 2000).

Recent Fire History

The north slope of Grizzly Ridge does not have a history of large, high-severity wildland fires because of its north-northeast aspect. Human-caused wildland fire is not common on the north slopes of the ridge due its remote location and limited vehicle access. Lightning fires, however, are common on the north slopes of the ridge. In contrast to the north slopes of the ridge, the south-southwest aspects of Grizzly Ridge have experienced several wildland fires over the years. Evidence of at least seven past large wildland fires where most trees were killed are visible on the south slopes of Grizzly Ridge from the community of Quincy. Six of these wildland fires were caused by humans. Human-caused wildfire is common due to the proximity of the south slopes of the ridge to a significant population area and its many roads and prevalent vehicle access. Human-caused high-severity fires that have occurred on the south slopes of the ridge typically have their origin at the bottom of the ridge near the populated areas of the valley. These wildfires typically burn upslope in a north-northeast direction to near the top of the ridge under the predominant southwest wind flows. Fires resulting from lightning ignitions are also common on south slopes of the ridge.

Ignitions, both human and lightning caused, are common in the Empire Project area. From 1970 through 2001, fire history records show a total of 355 fires, which have occurred on the south-southwest slopes of Grizzly Ridge, ranging in size from less than 1 acre to over 1,600 acres. Of these 355 fires, 159 were caused by lightning; the remaining 196 were human caused. Between 1916 and 2003, 22 fires have each exceeded 100 acres in size, burning a total of over 14,000 acres or approximately 14 percent of the Empire Project area. At least three of these fires (Bell Fire, 1970; Oak Fire, 1972; Cashman Fire, 1977) burned as high-severity fires through conifer stands with a fuel load best represented by a fuel model 10; these stands were similar to untreated conifer stands currently found in the Empire Project area. Randy Beck, retired fire prevention officer, was on-scene on all three of these wildfires and noted that conditions were not particularly extreme with respect to wind speeds. Mr. Beck also noted that these fires burned with high surface intensity with a high amount of torching and occasional short crown fire runs resulting in high stand mortality due to direct scorch (Randy Beck, pers. comm.).

Surface Fuels: Existing Conditions

Fuel models are widely used to quantify predicted surface fuel characteristics and corresponding fire behavior (Rothermel 1983). Fuel models are generally selected by determining the dominant carrier of fire (grass, brush, needles, slash, etc) (Rothermel 1983). The dominant fuel types in the areas proposed for treatment in the Empire Project area are represented by fuel models 5 and 10, and to a lesser degree, fuel models 8 and 9 (table 3.12). Fuel model 5 is a brush model (montane chaparral) typical of areas that were burned by one of the 3 large fires from the 1970's described under "recent fire history". Fuel model 10 is indicative of heavy fuel accumulations resulting from needle cast, shedding of branches and twigs, and deadfall in conifer stands. Fuel models 8 and 9 represent accumulations of litter, duff, branches, and twigs. Fuel model 9 represents post-treatment conditions of an underburn following scorch related and natural needle fall. Fuel model 11 is a slash model with 1, 10, and 100-hour fuels up to 12 tons per acre. Fuel model 12 is a slash model with higher loadings than model 11 (Rothermel 1983); stands with natural mortality and a high amount of dead fall are classified as a model 12 as well. As the amount of natural and activity generated fuels increase (fuel models 10, 11, and 12) the amount of fire line that can be constructed by fire crews and equipment per hour is reduced (See table 3.15).

Table 3.12. Fuel model by fuel treatment unit, planning area, or areas not planned for treatment.

	Fuel Model							
	0[a]	5	8	9	10	11	12	Total Acres[b]
	Rock, Water, Barren Land	Brush	Timber litter-fir dominated	Timber litter-pine dominated	Heavy natural fuel accumulation	Light logging slash	Heavy logging slash	-
Acres of Fuel Model Within Fuel Treatment Units	9	1,279	0	678	4,646	0	26	6,638
Acres of Fuel Model Within Planning Areas	122	1,416	287	157	17,763	0	1,015	20,760
Acres of Fuel Model Not in Planning Areas or Fuel Treatment Units	1,310	9,239	691	16,092	46,742	54	1,171	75,299
Total Acres	1,441	11,934	978	16,927	69,151	54	2212	102,697

Notes:

a. Fuel model 0 is not an NFFL fire behavior fuel model in Rothermel (1983). It is a designator in the GIS database for ground that does not have flammable surface fuels (e.g., rock, water, barren land).

b. Difference in acres due to rounding.

Fire Condition Class: Existing Conditions

The *National Fire Plan* (2001) provides guidance to reduce the potential for large wildfires and related damage to private property, habitat, and water quality by treating live and dead fuels on federal lands. The *Healthy Forests Restoration Act* (HFRA 2003) provides further guidance and procedures to help accomplish the goal of reducing damage to federal lands by wildfire. The act recognizes three *fire condition classes* used to describe existing and desired standing and surface fuel conditions: Fire Condition Class 1 (FCC 1), Fire Condition Class 2 (FCC 2), and Fire Condition Class 3 (FCC 3). Within FCC 1, vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. FCCs 2 and 3 have moderate to high departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires in FCCs 2 and 3 are moderately to highly uncharacteristic compared to the natural fire regime behavior, severity, and pattern. Fire condition class maps were created regionally using methods described in Appendix I of the “Fire, Fuels, and Air Quality Report” located in the Empire Project Record. The maps were then clipped to produce a forest-level FCC map. Table 3.13 shows the FCC by treatment unit for fuel treatment units and planning areas. As shown in table 3.13, FCC 2 and 3 make up approximately 94 percent of the areas proposed for treatments.

Table 3.13. Fire condition class by fuel treatment unit and planning area.

	Fire Condition Class			
	1	2	3	Total Acres
Fuel Treatment Units	616	2,033	3,950	6,602[a]
Planning Areas	975	5,331	14,349	20,657*

Note:

a. The difference in acres to proposed action is due to unclassified areas (e.g., rock, water, barren land).

Wildland Urban Interface: Existing Conditions

The Empire Project is immediately adjacent to 5 "Communities at Risk". These communities have been identified in the Plumas County Fire Plan, approved by the Plumas County Board of Supervisors on April 19th, 2005 (PSFSC 2005). These communities include: 1) the town of Quincy, which has several neighborhoods bordering fuel treatment units 8, 9, 10, and 20 the south edge of the Empire Project, 2) the community of Massack, which borders fuel treatment units 6 and 7, 3) the community of Greenhorn Ranch, which borders treatment units 23 and 27, 4) the community of Keddie, which borders fuel treatment unit 24, 5) and the community of Butterfly Valley, which borders fuel treatment units 21 and 25.

There are approximately 2,500 acres of WUI extending from the communities at risk into the Empire Project area (PNF 2005). Implementation of the Empire Project would be consistent with the recommendations for treatment of public lands within communities at risk or the 1.5-mile adjacent and extended WUI that surrounds them as described in the approved Wildfire Mitigation Plan (PSFSC 2005).. Fuel treatments would help provide continuity between existing WUI fuel treatments, as well as enhance the effectiveness of projects implemented in the future by landowners and the Plumas County Fire Safe Council. In addition, implementation of treatments within the WUI would assist fire managers to more easily manage and contain fires ignited within or impacting the WUI.

Air Quality: Existing Conditions

The Empire Project area lies immediately adjacent (to the north) of the community of Quincy, CA. The entire project area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin. Counties and areas within this air basin are listed as "in attainment" or compliance with state and federal air quality standards for several airborn compounds. Air quality attainment status for ozone, carbon monoxide, sulfur dioxide, and other compounds are listed in the "Air Quality 1" table in the "Fire and Fuels Report" located in the Empire Project Record. The attainment status was derived directly from the NSAQMD "Annual Air Monitoring Report" (2004). Currently, Plumas County is in non-attainment status for particulate matter $(PM)_{10}$ for the entire county, and $PM_{2.5}$ in Portola Valley. The project area is 17 miles northwest of Portola Valley. $PM_{2.5}$ for the rest of the County is Unclassified; National designation for

PM_{10} is unclassified as well. According to the NSAQMD 2004 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 exacerbated by local weather, 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 46,000-acre 1999 Mount Hough Complex (MHRD Fire Report PNF-1091, 1999). 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 episode $PM_{2.5}$ levels (NSAQMD 2004). Levels of PM_{10} have been greatly decreased due to a reduction of non-EPA approved woodstoves in existing residences. The NSAQMD (2004) report noted four key points relating to current air quality within the NSAQMD:

1. Improvements in air quality, with respect to ozone, will depend largely on the success of air quality programs in upwind areas.
2. Anticipated growth in local population will add to locally generated pollution levels. Therefore, local mitigations are needed to prevent further long-term air quality degradations. Otherwise, the local contribution may increase to the point where the transport excuse will become less viable and more emphasis will then be placed on mandated local controls.
3. State and federal land managers anticipate a marked increase in prescribed burning within the next 5 years. This may have a tremendous impact on local PM_{10} and $PM_{2.5}$ levels, unless appropriate mitigations are employed.

Analysis Area and Methods — Fire, Fuels, and Air Quality

Analysis Area and Temporal Boundaries

The Empire Vegetation Management Project (Empire Project) fire, fuels, and air quality analysis was conducted on the 103,000 Empire Project area analyzed in the *Mount Hough Landscape Assessment* (2004). This area is geographically bound by topographic features including ridges, valleys, and Spanish Creek. The rational for using this boundary for this cumulative effects analysis is because it is large enough to completely encompass the largest past wild fires (up to 1,600 acres) which have occurred in the analysis area. The 103,000 acre fire, fuels, and air quality analysis area encompasses complete perimeters of several past large wildfires and contains all public lands planned fuel treatment, individual tree selection, and group selection under the Empire Vegetation Management Project. The Empire Project is located predominantly on the south-southwest aspect slopes of Grizzly Ridge, a prominent mountain ridge that extends for approximately 24 miles in a southeast to northwest direction on the landscape. Small portions of this project are located on the very top of Grizzly Ridge and extend over onto the north aspects of Grizzly Ridge. Grizzly Ridge lies north and east of the community of Quincy, California, the county seat of Plumas County and Plumas County's most populated community. Grizzly Ridge lies between American Valley to the south (where Quincy is located) and Indian Valley and Genesee Valley to the north (where the communities of Greenville, Taylorsville, Crescent Mills, and Genesee are located).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of prior human actions and both human and lighting caused wildfires that have affected the environment and might contribute to cumulative effects. Temporally, past projects, fires, and activities listed in Appendix G are included in the analysis. This includes fires back to the early 20th century and more recent management activities and uses on public and private lands. Potential fire behavior for all alternatives are modeled pre treatment, immediately post treatment, 10, 20, and 50 years post treatment. Model outputs at 10 years are representative of the soonest time units may need maintenance treatments. Model outputs at 20 and 50 years are only included to include general trends of treatments over time. These modeling intervals capture past, present, and reasonably foreseeable actions (Appendix G), as well modeled changes in tree growth, increase in surface fuels, and understory vegetation between alternatives (Fire, Fuels, and Air Quality Report, Table F-7). Future predictions based on model outputs are reflective of general trends. It is important to note that unknown or un-anticipated future wildfires, drought, wind-throw events, and other treatments may occur within the 50-year analysis window- these un-predictable events may modify these trends at the stand and landscape levels

Indicator Measures, Analysis Methods and Terminology

Fuels Management Analyst software (Carlton 2005) was used to quantify the effects of proposed vegetation treatments on potential fire behavior. Fuels Management Analyst (FMA) incorporates previously established methodologies and fire models to produce fuel inputs, outputs of fire behavior, crown fire potential, crown scorch and mortality based on field collected data (Carlton 2005). Because it can incorporate field-collected data and import tree list data from the Forest Vegetation Simulator (FVS 1997), temporal analysis over time (years or decades) can be done (McHugh 2006). Stand data used for fire modeling were taken directly from the Forest Vegetation Simulator modeling outputs used to assess effects of treatments on Forest Vegetation (see “Forest Vegetation” section) and imported into FMA. It is important to note that results are based on outputs of an empirical fire model. Output data reflect fire modeling assumptions (weather conditions, fuel model characteristics, and spatial variability) and variability within the Forest Inventory Analysis Plot data used in the analysis. Detailed analysis methods are further described in the Empire Fire, Fuels, and Air Quality Report.

Weather data used in fire modeling were taken from the Quincy Weather Station. Wind speeds were increased using the wind speed adjustment factor (Rothermel, 1983) to reflect the post-treatment effect of reductions in canopy cover on increased windspeeds. Weather conditions at the Quincy weather station are recorded in a south facing, open area, reflecting extreme sunlight and wind exposure within an area with virtually no canopy cover. The Fuels Management Analyst software program was used to compare the effects of proposed treatments on 3 indicator measures for each alternative. These indicator measures include 1) flame length, 2) crowning index, and 3) torching index. In addition, a fourth indicator measure, “resistance to control” was described for different treatments. These terms are discussed below and are helpful to understanding the different effects of each alternative.

1. **Flame length (feet) —** The length of flame measured in feet. Increased flame lengths can increase the likelihood of crown fires and the amount of suppression action needed to contain a wildfire. Flame length is influenced in part by fuel type, fire type (surface or crown fire), and weather conditions. Together, fuel type and flame length influence the rates at which firelines can be constructed by different fire resources, including hand crews and mechanical equipment (see table 3.14). Higher flame lengths increase *resistance to control* (see #4 below). Flame lengths above 4 feet present serious control problems—they are too dangerous for crews to directly contain by fire crews using hand tools (Schlobohm and Brain 2002; Andrews and Rothermel 1982). Flame lengths over 8 feet from surface and crown fires are generally not controllable by ground-based equipment or aerial retardant and present serious control problems including torching, crowning, and spotting (see table 3.14).

2. **Crowning index (mph) —** "The open (20 foot) wind speed at which active crown fire is possible for the specified *fire environment*" (Scott and Reinhardt 2001). Crowning index can be used to compare relative succeptability of stands to crown fire. An increase in the crowning index corresponds to a decreased likelihood of an active crown fire moving through a stand, particularly one impacting a given stand from an adjacent area. Crowning index provides an index for relative comparison-Fule et al. (2004) note, "…it would be unrealistic to expect that crowning index values are precise estimates of the exact windspeed at which any real crown fire will be sustained. However, it is reasonable to compare crowning index values across space and time to assess crown fire susceptibility in relative terms."

3. **Torching index (mph) —** "The open (20-foot) wind speed at which crown fire activity can initiate for the specified fire environment" (Scott and Reinhardt 2001). An increased torching index would result in a decreased likelihood of torching initiating within the stand. Torching events within a stand can lead to an active crown fire depending on weather, surface, and canopy fuel conditions. As with crowning index, torching index may be interpreted as the relative susceptibility forests may have to tree torching also called "passive crown fire".

4. **Resistance to control —** "The relative difficulty of constructing and holding a control line as affected by resistance to line construction and by fire behavior" (NWCG 2004b). Components used to describe resistance to control for this analysis include (1) flame length, which in turn determines whether fire crews, machinery, aerial resources can be used to effectively build and hold line (table 3.14), and (2) fire line construction rates for Type I/II crews and Type II bulldozers (Table 3.15) (NWCG 2004a). Based on NWGC (2002), wildland fires with flame lengths of 4 feet or less can be suppressed by hand crews. Fires with flame lengths of 4 to 8 feet usually can not be successfully suppressed by hand crews, and mechanized equipment and aircraft are needed for support to hand crews. Fires with flame lengths exceeding 8 feet may present serious control problems, with torching, spotting, and possible crowning (Schlobohm and Brain 2002; Andrews and Rothermel 1982). In general, as the amount of ladder fuels and naturally accumulated and harvest generated fuels increase, the rate at which fire crews or equipment can construct fire line decreases. A high percentage of aerial retardant is intercepted (blocked) by tree crowns before it reaches the ground, thereby making it less effective for suppressing and holding fires burning through surface fuels in forests with higher canopy covers (Moghaddas 2006; Alexander 2000; Anderson 1974).

Table 3.14. Flame lengths and corresponding challenges to suppression forces.

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

Notes:

Source: NWCG 2004.

Table 3.15. Sustained line production rates.

Fuel Model (Rothermel 1983)	Specific Conditions	Resource Type		
		Type I[a] (chains per hour)	Type II[a] (chains per hour)	Type II Dozer[b,c] (chains per hour)
5-Brush	All	6	4	105
9-Hardwood litter	Conifers	28	16	85
10-Timber (litter and under story)	All	6	4	20
11-logging slash, light	All	15	9	40

Notes:

a. Type I and Type II consist of 20-person hand crews.

b. Type II dozer is stationed at Mount Hough Ranger District.

c. Type II bulldozer is used for construction, burnout, and holding; used on 26 to 40 percent slopes.

Assesment of effects to air quality — Potential emissions from prescribed burns were modeled using methods described in the “Desktop Reference for NEPA Air Quality Analysis” (CH2M Hill 1995). Emissions factors, fuel load, and consumption variables are listed in the “Fire and Fuels Report” (table “Air Quality 2”) located in the Empire Project Record. Total emissions by alternative are listed in table 3.17. Calculations were made assuming prescribed burning of all acres with fuel treatments and pile burning all group selection units. A hypothetical wildfire of 2,500 acres is displayed in alternative B (no action) for comparison. Emissions assume all fuel fuel treatment, individual tree selection, and group selection units are underburned or pile burned. In terms of actual implementation, all treated units would be evaluated after treatment to determine if surface fuels were meeting desired conditions (refer to Appendix F). The units meeting desired conditions may not be burned, thereby decreasing total burned acres and emissions. Harvesting, biomass removal, and road work would be completed primarily with diesel powered equipment including feller bunchers, skidders, tractors, graders, and trucks. This equipment would be inspected by fire management personnel to determine equipment (spark arresters, fire extinguishers, and firefighting equipment) compliance with fire safety standards. The condition of emissions control systems of various pieces of equipment would vary by age, maintenance, manufacturer, and past use. Environmental Consequences — Fire, Fuels, and Air Quality

Alternative A (Proposed Action)

Direct and Indirect Effects. The Quincy Library Group fuel break strategy was incorporated into the HFQLG EIS (2003) and gives general guidelines for locating fuel treatments in the form of Defensible Fuel Profile Zones (DFPZ's). The strategy specifically describes establishing a network of fuel breaks which are located using existing infrastructure (roads) to improve fire suppression capabilities to protect public safety, fire fighter safety, and both human-made and natural resources at risk within and outside the wildland urban interface (WUI). The DFPZ approach is different specifically than the Strategically Placed Area Treatment (SPLATS) described by Finney (2001). The DFPZ approach is designed to establish a continuous network of fuel treatments across the landscape along main access roads. For the Empire Vegetation Management Project, DFPZ treatment units were established along main roads using existing features (past fires, Rhinehardt Meadow) to form a network that is easily accessible from the community of Quincy. Vegetation treatments were determined based on existing vegetation type, structure, and fire hazard- these treatments are further described by unit in the appendix B. A detailed discussion of published literature and local experience on effectiveness of fuel treatments is discussed in detail in the "Background on Fuel Treatments" section of the Fire, Fuels, and Air Quality Report.

Treatment Effects of fuel treatments, individual tree selection, and group selection on fuels and fire behavior

Treatment effect trends are similar for all forest vegetation types and displayed in the Fire, Fuels, and Air Quality report. Treatment effects are displayed in table 3.16 for CWHR size 4m for all mechanical treatments size and class 4p for fire only treatments. Size class 4m is the most prevalent vegetation size class in forested mechanical treatments areas. Within fuel treatment units, surface fuels, ladder fuels, and canopy fuels would be reduced through a combination of mechanical treatments, mastication, chipping, pile burning, and/or under burning. Reduction of this material would reduce flame lengths, increase the height of tree crown bases, and decrease canopy fuels. As a result of these modifications, the potential for crown fire, as measured by the crowning and torching indexes, would be decreased within fuel treatment units under 90th percentile conditions (table 3.16).

Within individual tree selection units, canopy cover would be reduced, and a minor amount (less than 2-3 tons/acre of 1-, 10-, and 100-hour activity fuels) of incidental slash generated by whole tree harvest would remain after harvest activities. Slash in all mechanical treatments was accounted for in fire modeling by using a fuel model 11, which represents up to 12 tons per acre of 1-, 10-, and 100-

hour fuels. This is substantially more fuel than would be expected from a whole tree harvest but accounts for the worst case scenario of surface fuel accumulation due to past and proposed management activities and annual natural fuel accumulation. Slash additions would be minimized by utilizing whole-tree harvesting (Agee and Skinner 2005); after treatment, surface fuels in individual tree selection and fuel treatment units would be evaluated by US Forest Service Staff— areas not meeting desired conditions with respect to surface fuels would be treated with underburning, pile burning, or other appropriate method (see "Appendix F: Standard Management Requirements and Monitoring Plan). In the individual tree selection biomass units (portions of planning areas 14G, 18G, 19G, and 24G), ladder fuels would be decreased, resulting in an increased height to live crown base.

Within group selection unit, the use of whole tree harvesting will limit the amount of additional slash accumulation. Group selection units that do have levels of slash that inhibit planting or result in flame lengths greater than 4 feet under 90th percentile weather conditions, this slash would be removed after treatment through grapple piling and burning (Appendix F) resulting in lower overall 1, 10, and 100 hour surface fuel loads within groups leading to a relatively low surface fire hazard. Group selection units would be prepared for planting using pile burning or under burning as needed for slash disposal, and conifer seedlings would be planted (see "Appendix F: Standard Management Requirements and Monitoring Plan"). Piling and burning of accumulated slash in groups would substantially reduce existing accumulations and activity generated fuels within group selection units to less than 5 tons per acre of 1, 10, and 100- hour fuels. The growth of conifer seedlings, forbs, and brush (deer brush, white thorn, and manzanita) would occur in group selection units. Planted and natural regeneration of conifers in group selection units would continue to be vulnerable to scorch-related mortality in the near future. Group selection units in planning areas and fuel treatment units would not pose excessive fire hazard on slopes less than 35 percent because fires in plantations on the Plumas National Forest in the past have typically been of low intensity due to lack of surface fuels, discontinuous brush cover, and high live fuel moistures (Randy Beck, pers. comm.; Phil Shafer, pers. comm.). Within group selection units, planted and naturally regenerated trees would remain vulnerable to scorch-related mortality for several years, although fireline intensity would remain lower within groups when compared with untreated forested areas.

Underburning is proposed for units that are primarily on steeper slopes, of low tree density, and not available for mechanical harvest, or as a follow-up surface fuel treatment in mechanically treated units. In addition, mastication would be used where feasible to effectively reduce surface and ladder fuels. Prescribed fire (underburning) only in fuel treatment units 2, 5, 7, 9, 10, 20 would help meet deer habitat improvement goals. This burning would likely result in high mortality of both brush and trees within burn units. The actual acreage burned across all units would depend on post mechanical treatment evaluations of surface fuels in fuel treatment units. After mechanical treatment, areas not meeting desired conditions with respect to surface fuels may be further treated with prescribed fire or other appropriate method as determined by Forest Service staff. Units meeting desired conditions would not be burned, thereby decreasing total burned acres and emissions. Underburning and pile burning would be conducted over a 3- to 5-year period, with units in the wildland urban interface (WUI) near communities at risk being given priority where feasible. During this lag time of treatment, surface fuels may be up to 2 tons per acre higher than pre-treatment levels- this potential increase in slash was accounted for in fire modeling and is not expected to increase fire behavior and risk beyond what would occur under current conditions. Follow up treatments would substantially diminish existing and activity generated surface fuels and potential fire behavior compared to current conditions.

Fuel treatments using mechanical treatment followed by fire are not expected to significantly reduce the overall total volume of sound existing large woody debris, though short term reductions in rotten large woody debris may occur due to use of prescribed fire (Stephens and Moghaddas In Press b) before existing snags and prescribed burn related mortality fell over and became part of the large woody debris pool. Fire-only treatments in fuel treatment units would modify fire behavior on steeper slopes where implemented, though repeat entries would be needed on a higher frequency compared to fuel treatments treated with both mechanical and fire treatments. The need for repeat entries would be due to scorched needle, branch, and deadfall from residual live and dead trees in fire-only units

Table 3.16. Treatment effects on tree height to live crown base, flame length, by alternative, treatment, type, and treatment stage.

Alternatives	Treatment	CWHR Size Class	Treatment Stage	Fuel Model	Height to Live Crown Base (Feet)	Flame Length (feet)	Torching Index (20' windspeed, MPH)	Crowning Index (20' windspeed, MPH)
Alt B	**No Action**	4m	Pre treatment	10	7.0	6.3	6	17
Alts ACD	**DFPZ 30" Upper Diameter Limit**	4m	Pre	10	7.0	6.3	6	17
Alts ACD	**DFPZ 30" Upper Diameter Limit**	4m	Post	11	39.0	3.2	>40	39
Alts ACD	**DFPZ 30" Upper Diameter Limit**	4m	10 years Post	9	40.0	2.5	>40	38
Alts EF	**DFPZ 20" Upper Diameter Limit**	4m	Pre	10	7.0	6.3	6	17
Alts EF	**DFPZ 20" Upper Diameter Limit**	4m	Post	11	29.0	3.2	>40	21
Alts EF	**DFPZ 20" Upper Diameter Limit**	4m	10 years Post	9	32.5	2.5	>40	20
Alts ACDE	**ITS-no biomass**	4m	Pre	10	7.0	6.3	6	17
Alts ACDE	**ITS-no biomass**	4m	Post	11	8	3.2	20	21
Alts ACDE	**ITS-no biomass**	4m	10 years Post	11	10.5	3.2	31	20
Alts ACDE	**ITS with biomass**	4m	Pre	10	7.0	6.3	6	17
Alts ACDE	**ITS with biomass**	4m	Post	11	21	3.2	>40	22
Alts ACDE	**ITS with biomass**	4m	10 years Post	11	25	3.2	>40	21
Alts ACDE	**Group Selection**	4m	Pre	10	7	6.3	6	17
Alts ACDE	**Group Selection**	4m	Post	11	1	3.9	0	>40
Alts ACDE	**Group Selection**	4m	10 years Post	5A	1	5.4	0	>40
Alts ACDEF	**Fire only**	4p	Pre	10	6.5	6.3	6	15
Alts ACDEF	**Fire only**	4p	Post	9	8	2.3	33	18
Alts ACDEF	**Fire only**	4p	10 years Post	9Z	11	2.9	32	20

Effects on Enhancement of Fire Suppression Capabilities and Fire Fighter Safety

The “resistance to control” would decrease-fuel in treatments would enhance the ability of fire firefighters to safely manage wildfires in the Empire Project area. This is particularly true of fires that start in areas with fuel treatments in place or in places where surface and spot fires impact the fuel treatment unit. In addition, fuel treatments would provide evacuation and movement corridors for fire personnel, equipment, and the public should a wildfire occur in the Empire Project area. Greater amounts of aerial retardant would penetrate tree crowns and reach surface fuels resulting in an increased ability to control or extinguish surface fires (Moghaddas 2006). The overall decreased resistance to control would allow fire managers to more easily and efficiently initially contain ignitions and control larger fires using the DFPZ network. Similar treatments have had a similar effect on the Stream Fire (Beckman 2001) and Bell Fire (Moghaddas 2006) on the Plumas National Forest. The Bell Fire had been thinned using a whole tree harvest, though there was no follow-up surface fuel treatment. Within treated areas on the Bell Fire, retardant was better able to reach surface fuels where it was used to hold and suppress surface fires, leading to decreased suppression intensity. Within the Empire Project Area, decreased suppression intensity would likely require less intensive post burn rehabilitation treatments and associated costs. In addition, fuel treatments would be used as an anchor point for future prescribed burns or other fuel treatments. Overall, this would result in a relative improvement for firefighter and public safety and increase the ability of fire managers to contain fires adjacent to communities at risk, including Quincy, Greenhorn Ranch, Massack, Keddie, and Butterfly Valley. Fuel treatments within Riparian Habitat Conservation Areas (RHCA’s) will reduce the likelihood for high severity fire in these areas. Fuel treatments would help move areas in Fire Condition Class (FCC) 3 towards FCC 2; stands in FCC 1 would remain in FCC 1.

Compared to alternative B (No Action), alternative A would moderately improve the potential fire behavior in individual tree selection units without biomass removal. With biomass harvest, fire behavior in individual tree selection units would be modified similar to fuel treatments units in terms of crown fire potential. The effectiveness of fuel treatments adjacent to individual tree selection units with biomass harvest would likely be enhanced, as well, due to a greater continuous area of ladder fuel treatment. Road access would be decreased due to closures and decommissioning, though many of the roads proposed for closure are dead-end spurs and do not provide extensive access for fire management in their current state.

Air Quality

The potential emissions for all alternatives, including alternative A, along with all other alternatives, are shown in table 3.17. Prescribed burning in treatment units 9, 10, and 20 north east of Chandler road would have a high probability of substantially impacting Quincy with smoke.

Pile burning may be used for site preparation in group selection units. Under alternative A, pile or underburning may be required in approximately 1,300 acres of groups for slash disposal. The standard mitigation measures that would be used to reduce potential smoke impacts on the community of Quincy and surrounding smoke sensitive areas (SSA) would include ignition of a test burn prior to ignition to determine smoke path and dispersion, monitoring general transport and diurnal wind patterns, allowing adequate drying time of piled slash, minimizing dirt in burn piles, limiting daily acres burned, allowing for majority of smoke to vent prior to nighttime inversion, modifying or ceasing of ignitions if a smoke impact occurs, and constantly monitoring smoke conditions during active ignition and burnout. Both pile burning and underburning would be accomplished in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District. This smoke management plan would prescribe specific weather conditions that would minimize the potential for smoke impacts on Quincy and surrounding communities depending on burn unit location and burn prescription. Coordination with the local AQMD official would be done prior to, during, and post burn, as specified by the local Air Quality Management District (AQMD) official. Underburning and pile burning would occur over a 3-5 year period. The actual degree of reduction in air quality would depend on several factors: burn unit size, fuel type, duration of burn, number of piles, and weather patterns. In addition, potential for escape resulting from prescribed burn activities must be considered during planning and implementation.
In conjunction with other treatments, underburning and pile burning would reduce potential for high severity wildfire, resulting in lower potential for wildfire smoke impacts to Quincy and surrounding communities.

Monitoring for dust abatement as it pertains to roads would be ongoing during the project and would primarily be mitigated by watering the affected roads. Mitigations for dust are covered in timber sale contracts (contract provision C5.33 “Dust Abatement for Temporary Roads for Use”) and contract provision C5.31, which includes dust abatement specifications for road maintenance. Additional standard road building mitigation practices (listed in Appendix F) would be implemented to minimize impacts on air quality.

Table 3.17. Predicted emissions for all burned acres in the Empire Project area

Alternative	Total PM_{10} emissions (tons)	Total $PM_{2.5}$ emissions (tons)	Total PM CH_4 emissions (tons)	Total CO emissions (tons)	Total PM CO_2 emissions (tons)	Total NMHC emissions (tons)	Total VOC emissions (tons)
A	1,288	1,165	879	11,901	205,174	756	1,545
B (hypothetical 2,500-acre wildfire)[a]	820	752	1,024	8,040	126,600	392	960
C	1,374	1,243	955	12,671	219,779	809	1,654
D	1157	1051	813	10860	184513	634	1391
E	1157	1051	813	10860	184513	634	1391
F	737	674	448	7131	113741	378	861

Notes:

a. Alternative B assumes emissions for a 2,500-acre wildfire in the mixed conifer forest type

PM = particulate matter

CH_4 = methane

CO_2 = carbon dioxide

NMHC = nonmethyl hydrocarbons

VOC = volatile organic compounds

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

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. Focusing on individual actions would be less accurate than looking at existing conditions because there is limited information on the environmental impacts of individual past actions, and it is not reasonably possible to identify each and every action over the last century that has contributed to current conditions. By looking at current conditions, the Forest Service is sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” For these reasons, the analysis of past actions in this section is based on current environmental conditions. The past, present, and reasonably foreseeable actions used in this analysis are described in Appendix G for the analysis area described under Fire, Fuels, and Air Quality “Analysis Area Geographic and Temporal Boundaries, Indicator Measures, and Terminology”.

Past Fires, Forest Management, and Other Activities

There are several factors that contribute to the current forest structure and fire regime within Empire Project Area. These factors include past management activities, drought, and exclusion of large surface fires (see Chapter 3- “Forest Vegetation”). Fire has been a common occurrence within the Empire Project Area, both historically and continuing into present times (Appendix G). There has been an average of 11 human and lightning-caused ignitions per year between 1970 and 2001 in the Empire Project area. Many of these fires are small and easily contained to less than 1 acre. Some of these ignitions have resulted in high-severity wildfires, including the Bell, Oak, and Cashman fires, that grew to over 1,600 acres in size (Appendix G), converting forested areas to fields of montane chaparral still found today in the Empire Project area. These fields of montane chaparral continue to persist even 30 years after the fire event and are easily visible 1.5 miles away from the town of Quincy. Tree cover in these burned areas is sparse; these large fields of brush will likely persist as montane chaparral fields for at least the next two decades. Proposed treatments are not expected to modify this trend except in treatment units containing montane chaparral fields, where prescribed burning, hand thinning, or mastication may be implemented. These areas include portions of DFPZ units 2, 9, 10, 15, 20, and 21. Overall, past high severity fires have increased cover of montane chaparral within the Empire Project Area when compared with mapped occurrences of montane chaparral mapped in the project area in 1902 (Leigberg 1902).

Past timber harvest activities on public and adjacent private lands (Chapter 3, “Forest Vegetation”; Appendix G) have influenced current stand structure within the Empire Project Area. With respect to potential fire behavior, past silvicultural treatments which utilized over story removal, sanitation salvage, and single tree selection often removed dominant and co-dominant trees without removal of biomass or follow up treatments of surface fuels. Overall, past timber harvest activities that favored removal of dominant and co-dominant trees and retained high densities of biomass (trees less than 10”DBH) have led to less fire resilient forest structure within the Empire Project Area. Implementation of fuel treatments within these stand types in the Empire Project Area will reduce potential for high severity fire within treated areas. Past even-aged management activities have created plantations which typically have low surface fuel loads due to past site preparation activities. While plantations have been shown to burn under high severity under modeled conditions (Stephens and Moghaddas, in press a), fires in or impacting young plantations on slopes less than 35 on the Mt. Hough District in the past have typically been of low intensity due to lack of surface fuels, discontinuous brush cover, and high live fuel moistures (Randy Beck, pers. comm.; Phil Shafer, pers. comm.). Specific examples (neither of which are located within the Empire Project area) of fires in plantations being of low severity in the recent past include the Mount Hough Complex (1999) and the Stream Fire (2001). The Mount Hough Lookout Sale (completed) removed trees around the lookout which improved the overall ability to see smoke and fires from the lookout. Overall, implementation of the Empire Vegetation Management Project will not directly influence forest vegetation on adjacent private lands, though fuel treatments will enhance the ability of fire managers to contain fires originating from or moving towards these private lands.

On-going, Present Activities

Activities listed in Appendix G include implementation of the Corridor Fuel Reduction and Dancehouse-Chandler Fuel Treatment Projects. Remaining activities for the Dancehouse-Chandler project include approximately 300 acres of underburning and pile burning. A portion (~100 acres) of the Corridor Fuel Reduction Project falls within the vegetation analysis area. Both of these projects are interspersed in the Wildland Urban Interface immediately north of developed private residential properties along Chandler Road and on both sides of Highway 70/89. Overall, the Empire Vegetation Management Project, in conjunction with implementation of the Dancehouse-Chandler Fuel Treatment and Corridor Fuel Reduction Projects, would enhance the ability of fire management personnel to contain fires within the Chandler and Highway 70/89 WUI. This enhanced ability to contain fires in the WUI should lead to decreased potential for damage to homes and other structures within communities at risk due to wildfire.

Approximately 2,500 cords per year of firewood are removed by commercial woodcutters and the public in the form of snags. Fire wood is typically removed within 50 to 100 feet of forest roads. Overall, the continued removal of roadside snags by commercial and "personal use" fire wood cutters would decrease the chance of snag-related injuries, spotting, or snag fall over fire lines during wildfires at points of snag removal. There are no active grazing allotments within the Empire Project area. Lack of grazing may result in a relatively minor accumulation of fine fuels in the project area in the form of cured grasses and forbs but is not expected to exacerbate overall fire behavior and severity in the Empire Project Area. Other activities (such as special use permits) may increase the potential for human ignitions from maintenance personnel and equipment. Special uses (such as antennas, power lines, microwave lines, or other related critical infrastructure) might receive priority for protection during large wildfires. The continued removal of Christmas trees by permit would not substantially affect potential fire behavior in the Empire Project area as typically small diameter trees are removed leaving little or no residual slash.

Reasonably Foreseeable Future Actions

Under burning and pile burning from treatments over 3-5 years may result in possible smoke impacts to Quincy and surrounding communities. The resulting reductions in the potential for high severity fires due to these treatments will likely reduce future, unmanageable smoke impacts to Quincy from wildfires as wildfire smoke is typically more extensive in terms of amount, area, and duration than smoke from prescribe burn activities. In conjunction with mechanical fuel treatments, underburn activities are expected to reduce accumulated fuels and reduce the “unacceptable risk of wildfire” and related uncontrollable emissions as described in U.S. Environmental Protection Agency (2006).

Recreation activities and permitted uses (Appendix G) including OHV use, hiking, camping, mining, hunting, and woodcutting are likely to continue to contribute to future human ignitions in the Empire Project Area. Overall, the trend of increased human ignitions is likely to continue (Stephens, in press) throughout the Empire project area. Slash and potential slash-related fire hazards resulting from past treatments on National Forest lands may be reduced by implementation of alternative A, particularly where slash is encountered in proposed fuel treatment units. Slash and potential slash-related fire hazards resulting from past and future treatments on adjacent *private* lands would not be reduced by implementation of alternative A. Some past and future treatments, including thinning from below on private lands may reduce potential for fire spread onto public lands. Overall, implementation of alternative A would enhance fire management’s ability to contain, control, and suppress fires spreading from private onto public lands, particularly in fuel treatment units. Overall, implementation of fuel treatments in alternative A would enhance the ability of fire managers to contain and control future fires in the project area leading to decreased potential for large scale high severity fires.

The 2003 HFQLG Final Supplemental EIS and ROD in combination with the HFQLG Act FEIS and ROD provide programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot Project Area. Potential DFPZ maintenance acres within the Empire Project Area are described in Appendix G. Based on model outputs in the Fire, Fuels, and Air Quality Report and the 2003 HFQLG EIS, fuel treatments could remain effective for at least 10 years or longer once established and without further treatment, depending on vegetation type. Additional growth of understory vegetation and conifer regeneration may occur in fuel treatments – these treatments would be monitored as specified in the Appeal Resolution Agreement (Californians for Alternative to Toxics Appeal #04-05-00-0148-A215) regarding Meadow Valley DFPZ maintenance and monitoring in the Mount Hough Ranger District. Overall, future fuel treatment maintenance activities, as analyzed in the 2003 HFQLG EIS, would enhance the longevity and effectiveness of these treatments. Fuel treatments using fire only would likely need re-treatment to reduce surface fuels created by tree mortality resulting from prescribed burn implementation. Resulting dead fall from this mortality would likely increase surface fuel loads more quickly than similar sites treated mechanically and followed up with prescribed burn treatments where needed.

Summary of Cumulative Effects for Alternative A

Overall, alternative A of the Empire Vegetation Management Project, when implemented with future activities listed in Appendix G, including the Old Sloat Fuels Reduction Project, the five acre roadside hazard sale, wildlife habitat improvement projects, Rhinehart Meadow OHV Restoration, road maintenance, and the Medusahead Treatments will have a beneficial positive effect potential fire behavior, severity, and the ability of crews to contain and control wildfires within the Empire Project area. Fuel treatments implemented within the Empire Project Area under alternative A would: a) establish a DFPZ network within the Empire Project Area, b) would help provide continuity between the Dancehouse-Chandler and Corridor WUI fuel treatments (Appendix G), c) enhance the ability of fire management to safely suppress, control, and contain fires impacting or starting in fuel treatments under *90th percentile weather conditions,* and d) enhance the effectiveness of work that would be completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council. This would lead to enhance protection of communities at risk, the Wildland Urban Interface, and resource values at risk. These communities include: 1) the town of Quincy, which has several neighborhoods borders fuel treatment units 8, 9, 10, and 20 the south edge of the Empire Project, 2) the community of Massack, which borders fuel treatment units 6 and 7, 3) the community of Greenhorn Ranch, which borders treatment units 23 and 27, 4) the community of Keddie, which borders fuel treatment unit 24, 5) and the community of Butterfly Valley, which borders fuel treatment units 21 and 25. Individual tree selection units without biomass removal would not substantially contribute to the enhancement of fire suppression capabilities, but the units with biomass removal would perform at a level similar to fuel treatments at the stand level. Planted and natural regeneration of conifers in group selection units would continue to be vulnerable to scorch-related mortality in the near future. In terms of overall cumulative effects, the Empire Vegetation Management Project, combined with past activities, future fuel treatments, maintenance activities, and other reasonably foreseeable future activities listed in Appendix G will likely enhance, maintain, or have a negligible effect would not adversely effect potential fire behavior, severity, or the ability of crews to contain and control wildfires within the Empire Project area.

Alternative B (No Action)

Direct and Indirect Effects.

Effects on Fuels and Fire Behavior

Existing stand conditions would persist and develop unaltered by, active management with the exception of continued fire suppression activities, on-going actions, and reasonably foreseeable actions listed in appendix G. Wildfire, drought, disease, and insect related mortality would continue to occur. Stands would remain dense, particularly in the smaller diameter classes, in terms of trees per acre and basal area. The stand-level surface, ladder, and canopy fuels (Scott and Reinhardt 2001) would not be modified from existing conditions. Potential for high severity fire would not be mitigated over the short term from existing conditions.

Predicted fire behavior and other model outputs showed similar trends for all vegetation size and cover classes across each treatment area. Predicted mortality of suppressed trees, loss of lower limb foliage, and tree growth over time would slowly contribute to an increasing height to live crown base, contributing to a slow increase in the torching index at 50 years. The torching index would stay below 25 mph for approximately 35 years, resulting in a high likelihood of passive and active crown fires fire during 90th percentile weather conditions. The crowning index would stay at or below 15 mph under current conditions, making active crown fires relatively more likely under dry summer weather conditions. Canopy bulk density and canopy fuel load would be slightly higher than those reported for mixed conifer forests under "initial conditions" (Scott and Reinhardt 2005). Flame lengths would continue to exceed 4 feet throughout modeled periods (Table 3.16).

Effects on Enhancement of Fire Suppression Capabilities and Fire Fighter Safety

Flame lengths would continue to exceed 4 feet throughout modeled periods, which would make direct action by firefighting hand crews unsafe and success unlikely under 90th percentile (or higher) weather conditions. Overall, taking no action under alternative B would not improve resistance to control in terms of rates of line construction and retardant penetration through the canopy to surface fuels over time, across all stand types. Alternative B would result in no improvement for firefighter safety, public safety, and fire management's ability to suppress and contain a wildfire in the Empire Project area and adjacent communities at risk. Fire Condition Classes 2 and 3 would not be modified over the short term.

Air Quality

During wildfires, local and regional air quality could be significantly impacted, both in terms of potential health risk and visual quality. There is usually no opportunity to mitigate smoke impacts on local communities and Smoke Sensitive Areas during a wildfire. Previous large wildfires, including the 1999 Mt. Hough Complex impacted Quincy with smoke for at least a week. The degree of reduction in air quality would depend on factors including wildfire size, fuel type, duration of fire, and weather patterns. The community of Quincy and associated smoke sensitive areas, including schools and hospitals, would likely be most impacted by smoke emitted from a wildfire in the Empire Project area.

Cumulative Effects.

Past Fires, Forest Management, and Other Activities

There are several factors that contribute to the current vegetative landscape of the Empire Project Area including past management activities, drought, and fire exclusion (Chapter 3- “Forest Vegetation”). Fire has been a common occurrence within the Empire project area, both historically and continuing into present times (Appendix G). There has been an average of 11 human- and lightning-caused ignitions per year between 1970 and 2001 in the Empire Project area. Many of these fires are small and easily contained to less than one acre. Some of these ignitions have resulted in high-severity wildfires, including the Bell, Oak, and Cashman fires, that grew to over 1,600 acres in size (Appendix G), converting forested areas to fields of montane chaparral found today in the Empire Project area. These fields of montane chaparral continue to persist even 30 years after the fire event and are easily visible 1.5 miles away from the town of Quincy. These fields of montane chaparral were not present in vegetation maps of the area prepared in 1902 (Leigberg 1902). Conifer cover in these burned areas is sparse; these contiguous areas of brush will likely persist as montane chaparral fields for at least the next two decades. Implementation of Alternative B is not expected to modify this trend.

There has been an average of 11 human- and lightning-caused ignitions per year between 1970 and 2001 in the Empire Project area. Many of these fires are small and easily contained to less than 1 acre. Some of these ignitions have resulted in high-severity wildfires that grew to over 1,600 acres in size, converting forested areas to fields of montane chaparral seen today in the Empire Project area. The trend of increased human ignitions is likely to continue (Stephens, in press) throughout Region 5 (California), which could lead to a relatively higher probability of a severe wildfire in the project area over the next 50 years. Without treatment, greater amounts of suppression resources may be required to control fires in the Empire Project area, resulting in increased risk to firefighting personnel. Increased suppression intensity may lead to increased suppression cost and post burn rehabilitation needs after the fire is out. Alternative B, as the no-action alternative, does not propose any treatments; hence, this alternative would not improve the ability of firefighters to protect life, private property, and natural resources. A lack of road reconstruction and/or maintenance could result in reduced access for fire management personnel and equipment.

Past timber harvest activities on public and adjacent private lands (Chapter 3, “Forest Vegetation”; Appendix G) have influenced current stand structure within the Empire Project Area. The Mount Hough Lookout Sale (completed) removed trees around the lookout which improved the overall ability to see smoke and fires from the lookout. With respect to potential fire behavior, past silvicultural treatments that utilized over story removal, sanitation salvage, and single tree selection typically removed dominant and co-dominant trees without removal of biomass or follow up treatments of surface fuels. The treatments typically result in areas with higher density stands that are more susceptible to high severity fire. Implementation of alternative B would do nothing within these stand types in the Empire Project Area to reduce potential for high severity fire.

On-going, Present Activities

Recreation activities and permitted uses (Appendix G) including OHV use, hiking, camping, mining, hunting, and woodcutting are likely to continue to contribute to future human ignitions in the Empire Project Area. The trend of increased human ignitions is likely to continue (Stephens, in press), which could lead to a relatively higher probability of a severe wildfire in the project area. While this chronic source of ignitions is expected to continue indefinitely into the future, alternative B does not enhance the ability of fire management to contain and suppress fires caused by these and other ignitions. This will likely lead to additional high severity fires and associated prolonged impacts of smoke to the town of Quincy and outlying communities. Comparable smoke impacts occurred during the Mount Hough Complex of fires in 1999.

Additional reasonably on-going activities listed in Appendix G include implementation of the Dancehouse-Chandler Fuel and Corridor Fuel Reduction Projects. These projects are interspersed in the Wildland Urban Interface immediately north of developed private residential properties along Chandler Road and Highway 70/89. Implementation of the Dancehouse-Chandler and Corridor Fuel Treatment Projects will enhance the ability of fire management personnel to contain fires within portions of the Chandler and highway 70/89 WUI leading to a decreased potential for damage or loss of structures adjacent to these treatments, though no continuity between these and other fuel treatments would occur under alternative B.

Approximately 2,500 cords per year of firewood are removed by commercial woodcutters and the public in the form of snags typically found within 50 to 100 feet of forest roads. The continued removal of roadside snags by commercial and “personal use” fire wood cutters would decrease the chance of snag-related injuries, spotting, or snag fall over fire lines during wildfires at points of snag removal. There are no active grazing allotments within the Empire Project area. Lack of grazing may result in a relatively minor accumulation of fine fuels in the project area in the form of cured grasses and forbs but is not expected to exacerbate overall fire behavior and severity in the Empire Project Area. Other activities (such as special use permits) may increase the potential for human ignitions from maintenance personnel and equipment. Special uses (such as antennas, power lines, microwave lines, or other related critical infrastructure) might receive priority for protection during large wildfires. The continued removal of Christmas trees by permit would not affect potential fire behavior in the Empire Project area as typically small diameter trees are removed leaving little or no residual slash.

Reasonably Foreseeable FutureActions

Alternative B, in conjunction with future activities listed in Appendix G, including the Old Sloat Fuels Reduction Project, the five acre roadside hazard sale, wildlife habitat improvement projects, Rhinehart Meadow OHV Restoration, road maintenance, and the Medusahead Treatments will not improve potential fire behavior, severity, or the ability of crews to contain and control wildfires within the Empire Project area. Overall, implementation of alternative B would not provide continuity between existing fuel treatments in the wildland urban interface, nor would enhance it the effectiveness of work that would be completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council.

Summary of Cumulative Effects for Alternative B

Implementation of alternative B would not enhance the ability of fire management to safely suppress, control, and contain fires impacting or starting in fuel treatments under *90th percentile weather conditions* leading to continued risk of high severity fire and extended smoke impacts to Quincy and outlying communities. Future DFPZ maintenance activities would not occur under alternative B. Other future activities listed in Appendix G will not adversely affect current potential fire behavior, severity, or the ability of crews to contain and control wildfires within the Empire Project area.

Alternative C

Direct and Indirect Effects. Overall, the direct effects of proposed fuel treatments, individual tree selection, and group selection under alternative C would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 9G, 20G, and 23G. These treatments would not be implemented in these five planning areas, so their direct, and indirect effects to fire, fuels, and air quality in these planning areas would be comparable to alternative B (“no action”) from their implementation. None of the individual tree selection units in planning areas 1G, 2G, 9G, and 20G have been proposed for biomass removal. Therefore, the beneficial effects to fire behavior of these treatments would not be modified. Group selections would be implemented in up to 1,600 acres of the planning areas. Fuel treatments would be fully implemented in this alternative as they would in alternative A. There would be 253 acres more of group selection implemented under alternative C when compared with alternative A. Road closures, reconstruction, and decommissioning would occur as specified for this alternative.

Overall, the indirect effects (including effects on air quality) of fuel treatments, individual tree selection, and group selection would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 9G, 20G, and 23G. The addition of 253 acres of group selection would result in additional pile burning for slash disposal, resulting in an approximately 8 percent increase in emissions listed in table 3.17 when compared with alternative A during the period of project implementation. DFPZ treatments would be fully implemented as in alternative A. Road access would be decreased as a result of closures and decommissioning, though many of the roads proposed for closure are dead-end spurs and/or do not provide extensive access for fire management in their current state.

Cumulative Effects. Overall, the cumulative effects of fuel treatments, individual tree selection, and group selection proposed in alternative C would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 9G, 20G, and 23G. These treatments would not be implemented in these four planning areas; in these planning areas, cumulative effects would be represented by alternative B (“no action”).. None of the individual tree selection units have been proposed for biomass removal, therefore the beneficial effects to fire of individual tree selection combined with biomass removal would still occur. As implemented, the fuel treatments would result in the same cumulative effects as described for alternative A. The fuel treatments would help provide continuity between existing WUI fuel treatments, as well as enhance the effectiveness of work completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council. The cumulative effects of past, present, and reasonably foreseeable future projects would be similar to those described for alternative A.

Alternative D (Preferred Alternative)

Direct and Indirect Effects. Overall, the direct effects of fuel treatments, individual tree selection, and group selection proposed in alternative D would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. These treatments would not be implemented in these eight planning areas, so the direct, and indirect effects to fire, fuels, and air quality in these planning areas would be comparable to alternative B (“no action”). None of these individual tree selection units have been proposed for biomass removal. If fully implemented, the fuel treatments would result in direct and indirect effects as described in alternative A except in fuel treatment units 2, 9, 10, 15, 20, and 21. These units would not be treated using prescribed fire, thereby reducing potential air quality impacts to Quincy (table 3.17).

Overall, the indirect effects (including effects on air quality) of fuel treatments, individual tree selection, and group selection proposed in alternative D would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. There would be no group selection or individual tree selection treatments in planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G, so the potential for smoke emissions would be decreased over all of the Empire Project area. The reduction of 121 acres of group selection and 1,800 acres of prescribed burning would result in less pile burning for slash disposal, leading an approximately 5 percent decrease in emissions listed in table 3.17 when compared with alternative A during the period of project implementation. Road access would be decreased due to closures and decommissioning, though many of the roads proposed for closure are dead-end spurs and/or do not provide extensive access for fire management in their current state.

The indirect effects of prescribed burning would be similar to those described for alternative A, except under alternative D, pile burning may be required in up to about 1,200 acres of groups.

Cumulative Effects. Overall, the cumulative effects of fuel treatments, individual tree selection, and group selection proposed in alternative D would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. These treatments would not be implemented in these areas, cumulative effects would be represented by alternative B (“no action”). None of the individual tree selection units have been proposed for biomass removal, therefore the beneficial effects to fire of individual tree selection combined with biomass removal would still occur. If the fuel treatments proposed in alternative D were fully implemented, the cumulative effects would be the same as described in alternative A. With respect to group selection, relatively fewer acres of small planted trees would be at risk from scorch-related mortality, which would also be the case in alternatives A and C. Fuel treatments would help provide continuity between existing WUI fuel treatments, as well as enhance the effectiveness of work completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council. The effects of past, present, and reasonably foreseeable future projects would be similar to those described for alternative A.

Alternative E

Direct and Indirect Effects. The direct effects of individual tree selection and group selection proposed in alternative E would be similar to alternative D. The primary difference in this alternative is the modification of fuel treatments to retain all trees greater than 20 inches dbh, and maintain a 50 percent canopy in habitat for the California spotted owl, Northern goshawk, and mesocarnivores. Based on modeling output, these treatments would be relatively less effective at reducing active crown fire at wind speeds greater than 22 mph than fuel treatments in alternatives A, C, and D under ninetieth percentile weather conditions. Road closures, reconstruction, and decommissioning would occur as specified for this alternative.

The indirect effects (including effects on air quality) of group selection and individual tree selection proposed in alternative E would be similar to alternative D, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. These treatments would not be implemented in these eight planning areas, so the direct, and indirect effects to fire, fuels, and air quality in these planning areas would be comparable to alternative B (“no action”). Also, the potential for smoke emissions would be decreased over the entire Empire Project area due to a reduction in pile and under burning resulting from the withdrawal of the eight planning areas (table 3.17). None of the individual tree selection units have been proposed for biomass removal. Fuel treatments would be fully implemented as in alternative A, although they would be implemented to maintain trees greater than 20 inches dbh and retain a 50 percent canopy. Aerial retardant is used to construct a "wet" fire line in terrain inaccessible to fire crews, or bulldozers, or when terrain, fire behavior, and immediate crew availability make manual construction of a fire line unsafe or unfeasible. To be effective, retardant should be applied to surface fuels where it can be used to extinguish, "hold", or slow surface fire rate of spread beneath the forest canopy. Reduced penetration to surface fuels decreases application efficiency in turn making it more difficult to contain small fires at initial attack and large fires during extended suppression operations. For application of aerial retardant to be effective, whether by an airplane or helicopter, retardant drops need to be established from an anchor point and extended or intersected relatively easily by pilots flying above the fire itself (NFES 1992). The higher canopy cover in alternative E may result in reduced penetration of aerial retardants through the canopy and down to surface fuels (Moghaddas 2006). A relative increase in retardant penetration in fuel treatment areas with reduced canopy cover was witnessed by fire management staff at the Bell Fire on the Plumas National Forest in September of 2005 (Moghaddas 2006). Road access would be decreased due to closures and decommissioning, though many of the roads proposed for closure are dead-end spurs and/or do not provide extensive access for fire management in their current state.

Indirect effects of prescribed burning would be similar to those described for alternative A, except under alternative E, pile burning may be required in up to about 1,200 acres of groups.

Cumulative Effects. The cumulative effects of fuel treatments, individual tree selection, and group selection proposed in alternative E would be similar to alternative A, except for the effects of individual tree selection and group selection as they pertain to planning areas 1G, 2G, 3G, 7G, 8G, 9G, 20G, and 23G. These treatments would not be implemented in these areas, cumulative effects are represented by alternative B ("no action"). None of the individual tree selection units have been proposed for biomass removal, therefore the beneficial effects to fire of individual tree selection combined with biomass removal would still occur. Fuel treatments would be fully implemented as in alternative A, except trees greater than 20 inches would be retained. One difference between fuel treatments would be the reduced penetration of aerial retardant to surface fuels, which may result in a greater likelihood of a fire to escape initial attack. This could lead to potentially more large fires within the analysis area. With respect to group selection, relatively fewer acres of small planted trees would be at risk from scorch-related mortality compared to alternatives A and C. Fuel treatments would help provide continuity between existing fuel treatments in the WUI, as well as enhance the effectiveness of work completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council.

The effects of past, present, and reasonably foreseeable future projects would be similar to those described under alternative A.

Alternative F

Direct and Indirect Effects. The direct, indirect, and cumulative effects of individual tree selection and group selection would not occur because these treatments are not proposed under alternative F. The primary difference in this alternative is the implementation of fuel treatments to retain all trees greater than 20 inches dbh and maintain a 50 percent canopy. The direct effects of fuel treatments in alternative F would be similar to those described for alternative E.

Fuel treatments would be fully implemented as in alternative A, although they would retain all trees 20 inches dbh and maintain a 50 percent canopy cover. The indirect effects of fuel treatments in alternative F would be similar to those described for alternative E. Individual tree selection with biomass removal adjacent to fuel treatments would not occur in this alternative; therefore, the ability to enhance effectiveness of fuel treatments with adjacent treatments would not be possible. There would be no group selection or individual tree selection treatments, so the potential for smoke emissions would be decreased by approximately 40 percent over all of the Empire Project area when compared with alternative A.

Cumulative Effects. Fuel treatments would be fully implemented as in alternative A, although they would retain all trees 20 inches dbh and maintain a 50 percent canopy cover. The cumulative effects of fuel treatments in alternative F would be similar to those described for alternative E. There would be no emissions from group selection slash pile burning under alternative F, though emissions from under burning in fuel treatment and individual tree selection units would still occur. Fuel treatments would help provide continuity between existing WUI fuel treatments, as well as enhance effectiveness of work completed or implemented in the future (either privately or through other sources) by landowners and the Plumas County Fire Safe Council. The effects of past, present, and reasonably foreseeable future projects would be similar to those described for alternative E.

WILDLIFE AND FISHERIES

Summary of Effects

The fuel treatments proposed in alternatives A, C, and D would change suitable spotted owl nesting and foraging habitat to unsuitable habitat in wildlife habitat designated as California Wildlife Habitat Relationship (CWHR) classes 4M, 4D, 5M, and 5D. Fuel treatments would be designed to reduce the fuel ladders; this would be accomplished by eliminating the lower tree layer and modifying the mid and upper tree layer by removing trees to create open spacing between residual crowns. Alternatives A, C, and D would remove the lower vegetation canopy layer and modify both the mid- and upper-canopy layers to achieve 30 to 45 percent canopy cover. This action would create a more monotypic, evenly spaced structure, remove thickets that provide hiding/roosting habitat for both fledgling and adult spotted owls, create a warmer site with increased light and heat penetration, which reduces the cool microclimates that owls seem to prefer; and modify structural diversity with removal of trees across all size classes up to 30 inches. Removal of structures less than 30 inches dbh usually results in a decrease in potential future snags/down woody material and deformities in structures, all attributes providing habitat for spotted owls and owl prey. With alternatives A, C, D, and E, suitable habitat would be removed from all group openings, as would 350 acres of biomass in the individual tree selection units.

Alternatives E and F would modify fuel treatments to retain all trees greater than 20 inches dbh and maintain a 50 percent canopy cover in habitat for the California spotted owl, northern goshawk, and mesocarnivores. Fuel treatments would be designed to reduce the fuel ladders; this would be accomplished by eliminating the lower tree layer and modifying the mid tree layer by removing trees to create open spacing between residual crowns. Both alternatives would remove the lower vegetation canopy layer, but the upper canopy layers would be designed to achieve 50 percent canopy cover. This would provide vegetative diversity and structural layering. Overall, retaining trees greater than 20 inches dbh and maintaining 50 percent canopy cover would also contribute to stand and environmental conditions that more closely resemble what is found in owl habitat, such as clumped distribution of trees, cooler microclimates and higher amounts of decadent wood. This may increase the possibility that owls would continue using such fuel treatment units for nesting, roosting, and foraging or that the habitat quality owls seek could be attained faster over time than with the open simplicity provided by alternatives A, C, and D.

Threatened and Endangered Animal Species

No federally listed threatened or endangered species would be affected by the proposed action or alternatives. The three federally listed species, valley edlerberry longhorn beetle, California red-legged frog, and bald eagle are either not present within the analysis area or there is no suitable habitat present to sustain individuals or populations (USDA 2007).

Selected Sensitive Species Associated with Older Forest Stands

The cumulative changes in CWHR classes 4M, 4D, 5M, and 5D as a result of implementing DFPZs, group selection, and individual tree selection with biomass, as proposed in the action alternatives, are displayed for the wildlife analysis area in table 3.18.

Table 3.18. Approximate amounts in CWHR habitat types in the wildlife analysis area (based on 76,121 National Forest acres).

CWHR Type	Pre-Project Alternative B	Post-Project Alternative A (% remaining)	Post Project Alternative C (% remaining)	Post Project Alternative D (% remaining)	Post Project Alternative E (% remaining)	Post Project Alternative F (% remaining)
4M	22,186	19,436 (87.6%)	19,327 (87.1%)	19,527 (88%)	21,895 (98.6%)	22,770 (102%)
4D	11,577	10,708 (92.4%)	10,661 (92%)	10,729 (92.6%)	10,729 (92.6%)	10,993 (94.9%)
5M	4,991	4,235 (84.8%)	4,186 (83.8%)	4,252 (85.1%)	5,288 (105%)	5,540 (110%)
5D	7,173	6,446 (89%)	6,399 (89.2%)	6,440 (89.7%)	6,440 (89.7%)	6,624 (92.3%)
Total	45,927	40,825 (88.8%)	40,573 (88.3%)	40,948 (89.1%)	44,352 (96.5%)	45,927 (100%)

Alternatives A, C, and D would increase the level of risk and uncertainty associated with effects of habitat change on the below-listed sensitive species occupancy and productivity and the potential re-occupancy of the Pacific fisher. Alternatives E and F would increase the level of risk to a lesser degree than alternatives A, C, and D. Alternative B would pose no risk and uncertainty associated with the proposed actions, but it would maintain a high risk of potential habitat loss from wildfire, while the action alternatives would reduce this risk. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating this risk and uncertainty.

California Spotted Owl. None of the fuel treatments, group selections, or individual tree selections proposed in the action alternatives would occur in *Protected Activity Centers* (PACs) or *Spotted Owl Habitat Areas* (SOHAs). These reserved lands were created to protect the areas most important for owls from being modified by fuel treatments, including nest and roost sites. The proposed fuel treatments would be designed to reduce high-intensity fires around these reserved areas.

Depending on alternative, the availability of nesting habitat (5M and 5D) following project completion would range from 10,585 acres (87 percent of existing nesting habitat) to 12,164 acres (100 percent of existing habitat) distributed across the 76,121 National Forest acres identified within the Empire wildlife analysis area. The availability of post-project foraging habitat (4M and 4D) would range from 29,988 acres (89 percent of existing habitat) to 33,763 acres (100 percent of existing habitat) distributed within the wildlife analysis area. Nesting and foraging habitat would be distributed across the analysis area, including lands in PACs, SOHAs, Home Range Core Area's (HRCAs), and the forested habitat connecting these owl sites, providing for continued occupancy of PACs. Fourteen of the twenty-three 700-acre plus HRCAs would not be affected by treatments. The potential risk of reduced PAC/HRCA occupancy resulting from project implementation would be low. Habitat change in habitat currently unoccupied by the owl may affect future occupancy, including dispersal of sub-adults.

Northern Goshawk. None of the fuel treatments proposed in the action alternatives would occur in goshawk PACs.

Depending on alternative, the availability of post-project nesting habitat would range from 40,573 acres (88 percent of existing nesting habitat) to 45,927 acres (100 percent of existing habitat) distributed across the 76,121 National Forest acres identified in the wildlife analysis area.

Mesocarnivores (American Marten and Pacific Fisher). The availability of post-project denning habitat would range from 17,060 acres (91 percent of existing denning habitat) to 17,617 acres (94 percent of existing habitat) distributed across the 76,121 National Forest acres indentified in the analysis area.

Changes to Continuous Forest Cover and Forest Interior Habitat

The consequence of creating 0.5- to 2-acre openings in forested stands of CWHR classes 4M, 4D, 5M, and 5D would be that these openings would break up the continuous forest habitat into smaller parcels by increasing the amount of forested edge to open habitat edge within the Empire treatment units. This would potentially reduce the effective habitat quality for those species requiring larger tracts of unbroken forest habitat. As the number of openings grows, the increased edge and subsequent reduced amount of forested habitat between the openings would create unsuitable forest interior habitat, possibly affecting species behavior and resulting in conditions unsuitable for nesting, denning, foraging, and travel within the planning areas. The forested habitat between group openings could be further modified through removal of additional forested cover for skid trail placement and tree removal in individual tree selection units. The greater the density (number) of group openings in a planning area, the more open the forested habitat between groups would become. The creation of openings and edges would also increase habitat suitability for competitive species and spotted owl predators, such as great horned owls.

A higher number of openings in a planning area would result in a greater amount of edge habitat and the smaller amount of forest interior habitat provided by that planning area. All alternatives that propose group selection would create openings in the forest, resulting in conditions that could reduce habitat quality and future use by both spotted owls and martens, increasing the risk and uncertainty associated with habitat alteration.

Alternative C would support the greatest density of group openings and individual tree selection between groups, resulting in approximately 6,975 acres of forest supporting more edge habitat than forest interior habitat. This would also decrease habitat connectivity across the wildlife analysis area, potentially creating barriers to movement and isolating large blocks of suitable habitat. Thus, alternative C would increase the risk of reducing forest interior species movement and use in the planning areas, as well as in the wildlife analysis area. Forest interior species are defined as species that require large patches of a relatively homogenous habitat type and that may be negatively affected by management practices that fragment larger patches of habitat into smaller patches with numerous edges (Harris 1984; Scalet et al. 1996). Sensitive species that are considered forest interior species include the spotted owl and Pacific fisher (Hunter 1990), goshawk, and American marten (Luman and Neitro 1979).

Alternative A, with 1,585 acres in planning areas supporting more edge habitat than forest interior habitat, would increase the risk of reducing species movements and use in the planning areas but at much less risk than alternative C. Alternatives D and E, with group density at 11.4 percent or less, would increase the risk of reducing forest interior species movement and use in the planning areas but at potentially less risk than the other alternatives that propose group selection.

Affected Environment

The “Empire Vegetation Management Project: Biological Assessment / Biological Evaluation for Terrestrial and Aquatic Wildlife” (USDA 2007), the “Management Indicator Species Report” (USDA 2007a) and a Wildlife Supplemental Report (USDA 2007c) are located in the Empire Project Record and incorporated by reference.

For the analysis of effects of the Empire Vegetation Management Project documented in the above three reports, the “wildlife analysis area” geographic boundary for all the species evaluated was delineated based on the potential direct, indirect and cumulative effects on spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. The geographic scope of the cumulative effects analysis was selected to encompass the directly affected spotted owl PAC/HRCA’s and provide some indication of affects to neighboring PACs/HRCAs, allowing an evaluation of the project’s cumulative effects upon the nesting, foraging and dispersal capabilities of owls within and adjacent to the project area. The direct and indirect effects of the project would not magnify beyond this boundary and would encompass cumulative effects to owls as a result of project treatments. The analysis area extends to a point at which no direct or indirect effects are discernable and would not act cumulatively with other actions. The Empire Project analysis area (or wildlife analysis area) is approximately 94,502 acres, of which 76,121 are National Forest managed by the Plumas National Forest and 18,381 acres of private land within National Forest boundary. All cumulative effects discussed, occur within this 94,502 acre analysis area.

The average home range of the owl is representative of the home range of other terrestrial species using similar habitats (4M, 4D, 5M, 5D, and 6), and therefore effects to the owl at this spatial scale would be indicative of the effects to other late seral stage species. This analysis area contains twelve goshawk PACs; all goshawk PACs and goshawk habitat included in this analysis area is analyzed for project level effects analysis. No known locations of marten or fisher exist in the analysis area. For the Empire Project, the owl is used as a surrogate for bounding marten and fisher effects due to known owl locations on the landscape, and the fact that similar habitats are used by these species. Effects (direct, indirect, cumulative) to owl habitat will be reflective of effects (direct, indirect, cumulative) to marten, fisher and goshawk habitat within this same analysis area.

The wildlife analysis area developed for the Empire Project overlaps the wildlife analysis area developed for the Meadow Valley Project (FY2004 planning project implemented in 2005). This overlap consists of approximately 2,200 acres near Butterfly Valley. No Meadow Valley treatments (DFPZ, group selection units) occur within the Empire analysis area; no Empire Project treatments (DFPZ, group selection, individual tree selection/biomass) occur within the Meadow Valley Analysis area.

This section introduces the affected environment, in general, then specifically addresses the affected environment for

- Threatened and Endangered species
- Four sensitive species: the California spotted owl, northern goshawk, and American marten, which are also Management Indicator Species on the Plumas NF; and Pacific fisher.
- Additional Management Indicator Species (mule deer, golden eagle, prairie falcon, trout)
- Neotropical migratory birds

General

The California Wildlife Habitat Relationships (CWHR) vegetation codes are used to describe terrestrial wildlife habitat. The CWHR codes fall into these forest types: Sierra mixed conifer, ponderosa pine, red fir, white fir, and montane hardwood. The CWHR codes also describe tree size: small trees between 11 and 24 inches dbh are labeled size class 4, and medium to large trees greater than 24 inches dbh are labeled size class 5. Furthermore, the CWHR codes describe canopy cover: class “D” (dense) represents greater than 60 percent canopy cover, and class “M” (moderate) represents 40 to 59 percent canopy cover. (The “Glossary” contains additional information on CWHR). Table 3.19 summarizes the acres of the most affected CWHR types on National Forest lands in the wildlife analysis area. A complete list of the CWHR types is available in the Empire Project biological assessment / biological evaluation (BA/BE) (USDA 2007).

Table 3.19. Summary of the acres of CWHR classes 4M, 4D, 5M, and 5D on Plumas National Forest lands in the Empire wildlife analysis area.

CWHR Type	Analysis Area
Sierra mixed conifer (4M)	14,543
Sierra mixed conifer (4D)	7,684
Sierra mixed conifer (5M)	3,738
Sierra mixed conifer (5D)	5,088
Ponderosa pine (4M)	45
Red fir (4M)	711
Red fir (4D)	83
White fir (4M)	6,263
White fir (4D)	3,614
White fir (5M)	1,215
White fir (5D)	2,085
Montane hardwood (4M)	624
Montane hardwood (4D)	196
Montane hardwood (5M)	38
Total	**45,927**

Threatened and Endangered Species

Table 3.20 shows all threatened and endangered animal species that potentially occur on the Plumas National Forest.

Table 3.20. Threatened and endangered animal species that potentially occur on the Plumas National Forest.

Species	Category
Invertebrates	
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Threatened
Amphibians	
California red-legged frog (*Rana aurora draytonii*)	Threatened
Birds	
Bald eagle (*Haliaeetus leucocephalus)*	Threatened

Valley Elderberry Longhorn Beetle. The beetle inhabits elderberry shrubs in riparian, savannah, and moist valley oak woodland habitats below 2,500 feet (Barr 1991). There have been no sightings of this species on the Plumas National Forest (Rotta 1999, Roberts pers. comm. 2006). The Empire wildlife analysis area is outside the elevational and geographical range of this species and its habitat; therefore, this species is not present in the project area. Informal consultation with the U.S. Fish and Wildlife Service on the Herger-Feinstein Quincy Library Group environmental impact statement, the supporting BA/BE and its supplement, and the Record of Decision concluded that the actions implemented on a programmatic level would likely not adversely affect this species within its current range (USFWS 1999).

Bald Eagle. The bald eagle is a Management indicator Species (MIS) on the Plumas NF. Forest or bioregional scale monitoring requirements for the Plumas NF's MIS are found in the Monitoring Plan of the LRMP (USDA 1988a, Chapter 5, pages 5-1 to 5-21) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) (USDA 2001a), as adopted by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004a).

The habitat monitoring direction for bald eagles comes from the Plumas LRMP, Table 5-1. This monitoring direction is being met by the Plumas through monitoring of changes/trends in habitat within designated Bald Eagle Habitat Area Management Plans (BEHAMP) and areas identified as bald eagle wintering areas by Plumas National Forest wildlife biologists. For project level analysis of habitat trends, the habitat indicators that will be tracked include: changes in acres of habitat affected within designated BEHMAP's and changes in acres of habitat within identified wintering areas. The population monitoring direction comes from the Plumas LRMP. This direction is being met by the Plumas at the forest scale through monitoring of all bald eagle territories on the Forest. The Plumas monitors 15 territories and PG&E monitors eight territories within and adjacent to their water projects.

There are currently 23 bald eagle nesting territories on the PNF (PNF 2006). In 2006, thirteen bald eagle nesting territories were active. In three locations (Lake Davis, Antelope Lake, Little Grass Valley Reservoir), one pair occupies two different territories. Thus in 2006, the resident population on the PNF was approximately 26 individual birds (PNF 2006). In California, bald eagles are not known to nest further than two miles from an open water body, (Lehman 1979; USFWS 1986). The only open water body in the Empire Project that could potentially support a nesting pair of eagles is Spanish Creek, but no known riverine nesting bald eagles are known along Spanish Creek or downstream along the East Branch of North Fork Feather River or along Indian Creek. All nesting bald eagles on the Plumas National Forest are associated with reservoirs or lakes, including the Poe Powerhouse nesting pair located along the North Fork Feather River but associated with Lake Oroville. There is no other open water body in the project area suitable for supporting nesting eagles.

There are no nesting bald eagles in the Empire wildlife analysis area, but eagles are occasionally seen along Spanish Creek and in Indian and American valleys at all seasons of the year.

California Red-legged Frog. The historical range of this species was limited to the coastal ranges, central valley, and the western slopes of the Sierra Nevada in California (Jennings and Hayes 1994). The Empire Project is outside the frog's historical range. The current range of the California red-legged frog extends into Butte and Plumas counties (USFWS 2002), but there are no populations of this species in Plumas County (SNFPA 2001a, 2001b). There are no historical voucher specimens of *Rana aurora* from within the forest boundaries, based on a review of collections (Roberts, pers. comm.). There are no known sightings in the Empire wildlife analysis area based on Amphibian surveys conducted in 2004. The Empire wildlife analysis area is not in any designated critical habitat (Federal Register, Vol. 71, No. 71, April 13, 2006).

Sensitive Wildlife Species

Table 3.21 displays the sensitive animal species that potentially occur on the Plumas National Forest.

Table 3.21. Sensitive animal species that potentially occur on the Plumas National Forest.

Species	Category
Fish	
Hardhead minnow (*Mylopharodon conocephalus*)	Sensitive
Amphibians	
Foothill yellow-legged frog (*Rana boylii*)	Sensitive
Mountain yellow-legged frog (*Rana muscosa*)[a]	Sensitive
Northern leopard frog (*Rana pipiens*)	Sensitive
Reptiles	
Northwestern pond turtle (*Clemmys marmorata marmorata*)	Sensitive
Birds	
American peregrine falcon (*Falco peregrinus anatum*)[b]	Delisted[b]
Northern goshawk (*Accipiter gentilis*)	Sensitive
California spotted owl (*Strix occidentalis occidentalis*)	Sensitive
Great gray owl (*Strix nebulosa*)	Sensitive
Willow flycatcher (*Empidonax trailii brewsteri*)	Sensitive
Greater sandhill crane (*Grus canadensis tabida*)	Sensitive
Swainson's hawk (*Buteo swainsoni*)	Sensitive
Mammals	
Sierra Nevada red fox (*Vulpes vulpes necator*)	Sensitive
American marten (*Martes americana*)	Sensitive
Pacific fisher (*Martes pennanti pacifica*)[c]	Sensitive
California wolverine (*Gulo gulo luteus*)	Sensitive
Pallid bat (*Antrozous pallidus*)	Sensitive
Townsend’s big-eared bat (*Corynorhinus townsendii*)	Sensitive
Western red bat (*Lasiurus blossevillii*)	Sensitive

Notes:

a. The Sierra Nevada population of the mountain yellow-legged frog designated as a candidate species by the USFWS (*Federal Register*, January 16, 2003, vol. 68, no. 11), but listing under the *Endangered Species Act* is precluded by the need to take other listing actions of a higher priority.

b. The peregrine falcon was delisted from threatened status by the USFWS; status to be monitored for 5 years.

c. The West Coast population of the Pacific fisher is designated as a candidate species by the USFWS (*Federal Register*, April 8, 2004, vol. 69, no. 68), but listing under the *Endangered Species Act* is precluded by other higher priority listing actions.

The “Empire Vegetation Project: Biological Assessment / Biological Evaluation for Terrestrial and Aquatic Wildlife Species” (USDA 2007) provides a discussion of the affected environment for all sensitive animal species analyzed for this project. The BA/BE is located in the Empire Project Record, and the analysis of effects on the species identified in Table 3.21 is incorporated by reference. The California spotted owl, northern goshawk, American marten, and Pacific fisher are highlighted in this Empire Project EIS because of the potential direct, indirect and cumulative impacts of the proposed action and alternatives on their habitat. The California spotted owl, northern goshawk, and American marten are also Plumas Forest Management Indicator Species.

California Spotted Owl. The California spotted owl is a Management Indicator Species (MIS) on the Plumas NF. Forest or bioregional scale monitoring requirements for the Plumas NF's MIS are found in the Monitoring Plan of the LRMP (USDA 1988a, Chapter 5, pages 5-1 to 5-21) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) (USDA 2001a), as adopted by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004a).

The habitat monitoring direction for spotted owl is being met by the Plumas through tracking of changes/trends in habitat within the 54 Spotted Owl Habitat Areas designated under the LRMP (i.e. network territories). In an effort to monitor changes in old growth and nesting habitat (CWHR 5M, 5D and 6) at a larger scale, the Plumas is using data collected under the Herger-Feinstein Quincy Library Group monitoring program for tracking the 10% threshold set for old growth habitat (USDA 1999, pg 2-8). For project level analysis of habitat trends, the habitat indicators that are tracked include: changes in acres in the amount of foraging and nesting habitat affected within the respective analysis area for each project.

Forest plan monitoring and survey efforts (USDA 1988a) to determine population trends were conducted annually from 1991 to 1995 (PNF 2006). Distribution and demographic population monitoring direction comes from SNFPA 2001, Appendix E (USDA 2001a). This monitoring direction is being met by the Plumas through: 1) implementing project level surveys to detect changes in the forest owl population (i.e. new territorial singles or pairs that would result in the formation of a Protected Activity Center (PAC); 2) continued implementation of the Plumas-Lassen Administrative Study as part of the bio-regional distribution and demographic monitoring.

A petition to list the California spotted owl as an endangered species under the *Endangered Species Act* was filed with the U.S. Fish and Wildlife Service on September 1, 2004. This resulted in a 90-day finding that listing the California spotted owl may be warranted (*Federal Register*, vol. 70, no. 118, June 21, 2005/Proposed Rules) and initiated a 12-month status review. In responding to this petition, the USFWS conducted a comprehensive study of California spotted owl populations. It assessed the best scientific and commercial information available; reviewed comments and information received during two public-comment periods; and consulted with recognized spotted-owl experts and federal and state resource agencies, including an interagency Science Team. On May 15, 2006 the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the Endangered Species Act (*Federal Register* Vol. 71, Number 100, May 24, 2006).

Stands suitable for nesting and roosting have (1) two or more canopy layers; (2) dominant and codominant trees in the canopy averaging at least 24 inches dbh; (3) at least 70 percent total canopy cover (including the hardwood component); (4) higher than average levels of very large old trees; and (5) higher than average levels of snags and downed woody material (*Federal Register*, vol. 70, 35610, June 21, 2005). The CWHR classes 5M and 5D have the highest probability of providing stand structures associated with preferred nesting, roosting, and foraging. The threshold canopy cover value that contributes to or detracts from occurrence and productivity is a value near 50 percent (USDA 2001a, 2001b; Hunsaker et al. 2002). Comparison of the Vestra vegetation mapping with 2000 color aerial photos, together with field examination of selected stands, resulted in no discernable difference between the forest structure and heterogeneity between 40% and 50% canopy cover. Thus it is a reasonable assumption that for the Empire Project, all 5M is considered owl nesting habitat.

For purposes of this analysis, the following affected CWHR classifications provide high nesting habitat capability for the spotted owl (USDA 2004a):

- CWHR 5M (trees greater than 24 inches dbh and moderate canopy between 40 percent and 59 percent)
- CWHR 5D (trees greater than 24 inches dbh and dense canopy greater than 60 percent)

These CWHR classifications occur in the Sierra mixed conifer, white fir, montane hardwood–conifer, and ponderosa pine forest types

Suitable foraging habitat is found in the same forest types listed above for nesting habitat (CWHR classes 5D and 5M), as well as class 4D (trees 11 to 24 inches dbh with dense canopy (60 to 100 percent), and class 4M (trees 11 to 24 inches dbh and moderate canopy cover between 40 and 59 percent). The stands considered to be suitable for foraging have at least two canopy layers, dominant and codominant trees in the canopy averaging at least 11 inches dbh, at least 40 percent canopy closure, and higher than average levels of snags and downed woody material (15- to 30-square-foot basal area in snags, 10 to 15 tons/acre downed woody debris) (Verner et al. 1992). Although canopy cover down to 40 percent is suitable for foraging, it appears to be only marginally so (based on owl occurrence and productivity threshold at around 50 percent canopy cover [ibid.]). In its most recent notice concerning the California spotted owl, the U.S. Fish and Wildlife Service states that owl foraging habitat "is generally described as stands of trees 30 centimeters (12 inches) in diameter or greater, with canopy cover of 40 percent or greater" (*Federal Register*, vol. 70, 35610, June 21, 2005), with no other habitat parameters for foraging habitat described. Thus there appears to be an element of uncertainty associated with what constitutes foraging habitat. For the Empire Project analysis, all 4M is considered owl foraging habitat. In the red fir type, stands with 30 percent or greater canopy cover should be considered suitable for foraging (USDA 2001a, 2001b). For this analysis, no red fir 4P or 5P (<40 percent canopy cover) was considered suitable foraging habitat.

The wildlife analysis area totals 94,502 acres, of which 76,121 are National Forest lands. The wildlife analysis area differs from the Empire Project area because the analysis area was based on the distribution of spotted owls PACs, SOHAs, and HRCAs and not confined to watersheds. Table 3.22 summarizes the potential acres of suitable spotted owl habitat on National Forest land in the wildlife analysis area.

Table 3.22. Potential acres of suitable owl habitat in the wildlife analysis area based on 76,121 Plumas National Forest acres.

CWHR Class	Habitat Type	Acres of Suitable Spotted Owl Habitat in the Wildlife Analysis Area
4M	Foraging	22,186
4D	Foraging	11,577
	Total foraging acres	**33,763**
5M	Nesting	4,991
5D[a]	Nesting	7,173
	Total nesting acres	**12,164**
Total	**Suitable Habitat**	**45,927**

Note:

a. CWHR class 6 is negligible and incorporated into 5D.

Surveys for spotted owls have occurred within the analysis area and project area annually from 2002 up to and including 2005, following the survey methodology described in "Protocol for Surveying Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas" (1991 revised 1993). In 2006, a portion of the project area was surveyed for owls as a continuation of the Plumas Lassen Administrative Study.

Protected Activity Centers and Home Range Core Areas—There are approximately 296 spotted owl PACs and HRCAs on the Plumas NF (PNF 2006). There are a total of 23 PACs and associated HRCAs in the Empire wildlife analysis area, including five SOHAs. PACs are 300 acres in size and designated for owl activity centers based on criteria described in CASPO Technical Report (Verner et al. 1992). HRCAs on the Plumas National Forest are 1,000 acres in size, comprised of the 300-acre PAC and 700 acres of the best available habitat around or adjacent to the PACs (USDA 2001a; USDA 2004). SOHAs, developed between 1982 and 1988 as a strategy for spotted owl management and viability for land management planning efforts (Verner et. al. 1992), continue to apply to the HFQLG Pilot Project. For the analysis, the five 1,000-acre SOHAs in the wildlife analysis area have each been delineated as a PAC/HRCA and included in the total of 23 PACs/ HRCAs. All PACs and SOHAs have been established based on owls found on National Forest; there are no known private land PACs within the analysis area. No vegetation management activities proposed for the Empire Project would occur in PACs or SOHAs.

The 23 PACs with associated HRCAs within the analysis area represent approximately eight percent of the 296 total PACs/HRCAs on the Plumas National Forest.

Areas of Concern—Areas of Concern (AOC) were identified within the range and distribution of the California spotted owl (Verner et al. 1992). These AOCs were identified to indicate potential areas where future problems may limit owl populations and may be greatest if the owl's status were to deteriorate. Two AOCs identified in the CASPO Technical Report are adjacent to the Plumas National Forest. The Empire Project is not located in these AOCs; AOC 1 is approximately 20 miles to the north, and AOC 2 is approximately 10 miles to the northwest. The factors identified for the two AOCs are not applicable to the Empire Project wildlife analysis area.

Prey Species- The most common prey species for spotted owls are northern flying squirrel (*Glaucomys sabrinus*) and dusky-footed woodrat (*Neotoma fuscipes*). The common foods of northern flying squirrels, primarily fruiting bodies of underground fungi (referred to as truffles) and arboreal lichens, are usually found in mature and older forests. The abundance of underground fungi is known to be strongly associated with the presence of well-developed soil organic layers and a large volume of decaying logs. In addition, higher snag densities may be important to flying squirrel densities, since flying squirrels often use old woodpecker cavities as den sites.

Woodrats are typically associated with brush fields, early successional habitats with a mixed conifer/oak component, and in stands with a mix of overstory trees and brush. Brush is usually dominated by thick-leaved evergreen species. Woodrats move from brush fields into the edges of forest where spotted owls forage (USDA 1993). On the Plumas NF, woodrat density consistently responds in a linear fashion to the density of mature (>13" dbh), black oak trees; increase in density of black oaks results in increased density of woodrats (USDA 2006). Project activities are designed to retain the largest black oaks in DFPZs, groups and ITS treatments in a range of 25-35 square feet basal area.

Northern Goshawk. The northern goshawk is a Management Indicator Species (MIS) on the Plumas NF. Forest or bioregional scale monitoring requirements for the Plumas NF's MIS are found in the Monitoring Plan of the LRMP (USDA 1988a, Chapter 5, pages 5-1 to 5-21) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) (USDA 2001a), as adopted by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004a).

The habitat monitoring direction is being met by the Plumas as follows:1) established PAC designations are maintained and habitats are measured (currently, the Plumas has 144 goshawk PACS) and 2) tracking of changes to PACs and suitable nesting, roosting and foraging habitats over time. In an effort to monitor changes in old growth and nesting habitat (CWHR 5M, 5D and 6) at a larger scale, the Plumas is using data collected under the Herger-Feinstein Quincy Library Group monitoring program for tracking the 10% threshold set for old growth habitat.

Forest plan monitoring and survey efforts (USDA 1988a) to determine occupancy on 25 percent of known nest groves was attempted annually from 1988 to 2000. The distribution and demographic population monitoring of northern goshawk populations in the Sierra Nevada is occurring using the following methods: 1) goshawk occurrence data is tracked through a geodatabase (Fauna, CalGos, etc.). From 2000 to 2005, PAC monitoring has occurred on approximately 30 percent of all PACs across the northern province of the Sierras (Region 5 statistics); 2) focused research and monitoring of select established PACs. The Redwood Science Lab (RSL), of the Pacific Southwest Research Station, is currently (2004-2007) conducting a goshawk OHV study on the Plumas National Forest where they are annually evaluating and monitoring the effects of OHV noise on goshawks. One aspect of this study is providing distribution monitoring by annually monitoring goshawk PACs on the Forest for occupancy and nesting success.

In addition and as discussed in the BA/BE (USDA 2007), there has been recent monitoring of nest sites on the Mount Hough Ranger District plus comprehensive surveys throughout much of the Empire wildlife analysis area from 2002 through 2005 (North State Resources 2003, KWR 2004b). These surveys provide distribution monitoring useful at the Regional, Forest, and Project levels.

Based on numerous studies (Bloom et al. 1986; Reynolds et al. 1992; Kennedy 1997; Squires and Reynolds 1997; Smallwood 1998; DeStefano 1998 – all referenced in SNFPA FEIS 2001), there is concern that goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality.

The latest published information regarding the goshawk, in terms of population status, distribution, population and habitat trends, and species requirements can be found in the 2001 *Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement* (chapter 3, part 4.4.2.2), and in part 3.2.2.4 of the 2004 *Sierra Nevada Forest Plan Amendment Final Supplement Environmental Impact Statement*. A total of 588 northern goshawk breeding territories have been reported from National Forests in the Sierra Nevada. The Plumas National Forest supports approximately 144 goshawk nesting territories. This is approximately 19 percent of the total within the Sierra Nevada. These numbers represent goshawks that have been found as a result of both individual project inventories to standardized protocols, as well as nest locations found by other incidental methods. The 1988 *Plumas National Forest Land and Resource Management Plan* calls for a network of 60 nesting territories to provide for the viability of the goshawk. The Plumas National Forest develops 200-acre PACs (SNFPA 2004a) for all goshawk breeding sites. It is believed that the current density of goshawk territories (PACs) is contributing to goshawk viability on the Plumas National Forest.

Annual monitoring of nest sites on the Mount Hough Ranger District from 1998 to 2002 indicated that nesting activity occurred at approximately 36 percent of the monitored sites. In 2002 and 2003 surveys for goshawks occurred in the northern portion of the Empire wildlife analysis area designated as TU3 (North State Resources 2003). Goshawk surveys were conducted on approximately 11,500 acres of suitable habitat in the project area between June and August 2004, by contractors Steve Holmes Forestry/Klamath Wildlife Resources. These surveys followed the methodologies for broadcast acoustical surveys as described in the USDA Forest Service Region 5 Northern Goshawk Survey Protocols (August 9, 2000). Two new goshawk nesting sites, as well as one potential territory or PAC, were located with this effort (KWR 2004a) and PACs were designated for these sites by the Forest Service. This survey was repeated in 2005 to complete the two-year survey required by the protocols. An additional goshawk nesting site was discovered and a PAC established in 2005. A total of 12 goshawk PACs are present on National Forest in the wildlife analysis area, accounting for approximately eight percent of the total goshawk PACs on the Plumas NF (12/144).; there are no known goshawk nest sites on private land within the analysis area.

The wildlife analysis area totals 94,502 acres, of which 76,121 are National Forest lands. This analysis area encompasses potential directly affected goshawk territories as well as neighboring goshawk sites. Approximately 45,133 acres of National Forest land provide high capability nesting habitat in the wildlife analysis area. High capability nesting habitat consists of CWHR classes 4M, 4D, 5M, and 5D in Sierra mixed conifer, ponderosa pine, and lodgepole pine (table 3.23).

Table 3.23. Acres of high and moderate capability northern goshawk nesting habitat in the wildlife analysis area (76,121 total Plumas National Forest acres).

CWHR Type	Nesting Habitat Capability	Acres in Wildlife Analysis Area[a]
4M[b]	High	21,475
4D	High	11,494
5M	High	4,991
5D[c]	High	7,173
Total	**High**	**45,133**
Red fir 4M	Moderate	711
Red fir 4D	Moderate	83
Total	**All nesting**	**45,927**

Notes:

a. The acres shown are prior to treatment proposed by the Empire Project.

b. The classes 4D, 4M, 5D, and 5M consist of Sierra mixed conifer, ponderosa pine, and lodgepole pine.

c. Due to the small amount of acres, CWHR class 6 was included in class 5D.

Mesocarnivores (Pacific Fisher and American Marten). The habitat requirements for forest mesocarnivores can be found in CWHR (Zeiner et al. 1990a), habitat capability models (Freel 1991), and in Ruggerio et al. (1994). Habitat requirements and risks are further described in the Sierra Nevada Forest Plan Amendment (SNFPA 2001a).

The Empire wildlife analysis area has been surveyed several times over the years for mesocarnivores using both baited camera stations and track plates as detailed in Zielinski and Kucera (1995). This includes survey efforts by private contractors (Jones and Stokes Associates, Inc in 1996), Plumas National Forest crews in 1994, 1999, 2001; research by the Pacific Southwest Research Station in 2001; and Mathews and Associates in 2002/2003. Using baited photo stations, the entire Empire Project analysis area was surveyed from February 28 to April 13, 2004, by contractor Mathews and Associates. Forty-two camera stations were monitored for a total of 1,157 survey days. No target mesocarnivores were found (Mathews and Associates 2004). To date, no mesocarnivores have been detected in the wildlife analysis area by any survey efforts using these methods.

Pacific Fisher—The U.S. Fish and Wildlife Service completed an initial 90-day review of a petition submitted by 20 groups seeking to list the Pacific fisher as endangered in Washington, Oregon, and California. After reviewing the best available scientific information, the U.S. Fish and Wildlife Service found that substantial information indicated that listing the Pacific fisher as endangered in its West Coast range may be warranted (USFWS news release July 10, 2003). After a 12-month status review, the West Coast population of the fisher was designated as a candidate species by U.S. Fish and Wildlife Service (*Federal Register*, April 8, 2004, vol. 69, no. 68), but listing under the *Endangered Species Act* is precluded by other higher priority listing actions.

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

Reintroduction of Pacific fisher to the central and northern Sierra Nevada has been proposed and has strong support in the scientific and research community. The USDA Forest Service, Pacific Southwest Region, supports reintroduction and will actively pursue partnerships in this effort as a feature of the Sierra Nevada Forest Plan Amendment management strategy (USDA 2004).

The 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement identifies large trees, large snags, large down wood, and higher-than-average canopy closure as habitat attributes important to the Pacific fisher. CWHR classes 4M, 4D, 5M, and 5D are identified as being important to the fisher. A vegetated understory and large woody debris appear important for their prey species. Preferred fisher forest types include montane hardwood conifer, mixed conifer, Douglas-fir, redwood, montane riparian, Jeffrey pine, ponderosa pine, lodgepole pine, subalpine conifer, aspen, eastside pine, and possibly red fir. The higher elevation forests are less suitable for fishers because of deep snowpacks (in Federal Register, 2004), although fishers are found in the southern Sierra Nevada at elevations up to 8,500 feet (USDA 2001). The Empire Project ranges in elevation from 3,100 to 7,711 feet. Table 3.24 displays the acres of habitat present in the Empire wildlife analysis area.

Table 3.24. Available suitable Pacific fisher habitat based on 76,121 Plumas National Forest acres in the wildlife analysis area.

Species	Available Habitat[a]	Wildlife Analysis Area (acres)
Pacific Fisher	4D, 5D	18,750
	4M, 5M	27,177
Total		**45,927**

Note:

a. Available suitable habitat includes Sierra mixed conifer, white fir, montane hardwood, ponderosa pine, and red fir. 4D, 5D = denning habitat; 4M,5M = foraging habitat.

The physical structure of the forest and prey associated with forest structures are thought to be the critical features that explain fisher habitat use. Powell (in *Federal Register*, 2004) states that forest type is probably not as important to fishers as the vegetative and structural aspects, and fishers may select forests that have low and closed canopies. Numerous studies, as referenced in the 2004 *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement*, indicate that canopy closure over 60 percent is important, and fishers preferentially select home ranges that include high proportions of dense forested habitat. The fisher's need for overhead cover was very well documented in the April 8, 2004, *Federal Register*. Fishers select stands with continuous canopy cover to provide security cover from predators. Dense canopy increases snow interception and lowers the energetic costs of traveling between foraging sites. The fisher's preferred prey species may be more abundant and vulnerable in areas of higher canopy closure (ibid.). A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and prefers large areas of contiguous interior forest (ibid.).

Habitat fragmentation has contributed to the decline of fisher populations because they have limited dispersal distances and are reluctant to cross open areas to recolonize historical habitat (ibid.). There is no evidence that fishers are successfully dispersing outside known population areas in California and Oregon. This is possibly due to the extent of habitat fragmentation, developed or disturbed landscapes, and highways/interstate corridors (ibid.). Based on studies of home range sizes referenced in the above-mentioned *Federal Register* notice, estimates of potentially suitable and contiguous habitat that must be present before an area can sustain a population of fishers range from 31,600 acres in California; 39,780 acres in the northeastern United States; and 64,000 acres in British Columbia (ibid.). These same studies also showed a positive association between fisher presence and forest stand area, detecting fishers more frequently in contiguous forest stands over 247 acres and 126 to 247 acres than in smaller stands (ibid.).

American Marten. The American marten is a Management Indicator Species (MIS) on the Plumas NF. Forest or bioregional scale monitoring requirements for the Plumas NF's MIS are found in the Monitoring Plan of the LRMP (USDA 1988a, Chapter 5, pages 5-1 to 5-21) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) (USDA 2001a), as adopted by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004a).

Habitat monitoring direction is being met by the Plumas through monitoring of changes/trends in old growth habitat (CWHR 5M, 5D and 6). At a larger scale, the Plumas will be using data collected under the Herger-Feinstein Quincy Library Group monitoring program for tracking the 10% threshold set for old growth habitat. For project level analysis of habitat trends, the habitat indicators that will be tracked include acres of foraging and denning habitat affected within the respective analysis area for each project. The Plumas MIS Report (PNF 2006) describes the current habitat and population trends for American marten on the Plumas NF. Distribution information is provided by the California Department of Fish & Game (CDFG), project surveys, and incidental sightings of animals and sign occurrence data. Data is tracked in geo-databases and used at the forest level for distribution and trend monitoring and at the project level for effects analysis. Geographic distribution monitoring for the marten is occurring at the bio-regional scale under the Sierra Nevada Forest Plan Amendment Province furbearer monitoring project. Information on bioregional monitoring for the American marten is available at: http://www.fs.fed.us/r5/snfpa/am/2005mareport.html and the data summarized in the Plumas NF MIS Report (PNF 2006).

In the Sierra Nevada, martens are most often found above 7,200 feet, but the species' core elevational range is from 5,500 to 10,000 feet (USDA 2001a). The Empire project ranges in elevation from 3,100 to 7,711 feet. Approximately fifty percent of the Plumas has been systematically surveyed to protocol using track plates and baited camera stations, totaling 2,121 survey stations (Plumas GIS database). Based on this survey information, as required by the LRMP, it appears marten are locally distributed in and around the Lakes Basin area of the forest.

The distribution of American marten, a mature-forest specialist, has substantially changed since the early 1900's and this distribution appears to have decreased in the northern Sierra Nevada and southern Cascade region and populations appear to be discontinuous. Comparing the historical and contemporary locations centered on Plumas County indicate large gaps between detections that were not present historically. Zielinski (2005) points out that these gaps are largely areas composed of National Forests that have received more impacts from humans, including timber harvest, road building and – until the mid-1950's – trapping. The reduction in marten distribution is probably more closely linked to the influence of timber harvest and forest management during the historical and the contemporary periods. Based on Zielinski (2005), trends in marten detections in Plumas County, and by inference Plumas National Forest, from the early 1900's to the late 1900's are downward, primarily due to relatively small amounts of late seral/old-growth forest attributes.

There are over 40 records of marten observations/detections on the Plumas National Forest dating back to 1975. One of these records was on Grizzly Ridge near Brady's Camp in the project area (unverified 1976 report), but as mentioned, subsequent survey efforts have failed to detect the presence of martens. Numerous surveys conducted in the Empire wildlife analysis area beginning in 1996 have not detected the presence of martens. Extensive surveys using both soot-covered track plates and baited camera stations have been conducted since the mid-1990s across the majority of the Mount Hough Ranger District, but no marten have been detected (documented survey results on file). Based on surveys conducted in and adjacent to the Empire wildlife analysis area over the last eight years that have not detected marten, it is suspected that marten are not present in the wildlife analysis area. It has been suspected for several years that a gap in marten detections across the forest may indicate this species may be locally extirpated over much of the Plumas, with the Lakes Basin area supporting the only known marten population. Based on past survey efforts, there is no evidence that marten are successfully dispersing from this area to other locations of the Plumas.

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

Important forest types include mature mesic (moderately moist) forests of red fir, Sierra mixed conifer, lodgepole pine, Jeffrey pine, and eastside pine (USDA 2001a). CWHR classes 4M, 4D, 5M, and 5D are identified as moderately to highly important for the marten (ibid.). The red fir zone forms the core of marten occurrence in the Sierra Nevada (ibid.). Table 3.25 displays the acres of habitat present in the Empire wildlife analysis area. The wildlife analysis area totals 94,502 acres, of which

76,121 are National Forest lands. This analysis area encompasses potential directly affected marten habitat, running along Grizzly Ridge in a southeast to northwest direction on the Plumas Landscape.

Table 3.25. Available suitable American marten habitat based on 76,121 Plumas National Forest acres in the wildlife analysis area.

Species	Habitat[a]	Wildlife Analysis Area (Acres)
American marten	4D, 5D	18,554
	4M, 5M	26,515
	Total	**45,069**

Note: a. Available suitable habitat consists of Sierra mixed conifer, white fir, and red fir. 4D,5D = denning habitat; 4M,5M = foraging habitat

Small openings and regenerating stands (or plantations) are used by marten as foraging habitat (ibid.). These openings are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forest stands (CWHR classes 4D, 5M, and 5D). Small, dispersed tree harvest units in a forest may be more conducive to marten populations than large contiguous openings (ibid.).

Management Indicator Species

Management Indicator Species (MIS) are animal or plant species identified in the Plumas NF LRMP (USDA 1988a), Appendix G, Pages (G-1 and G-2), which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the Plumas NF LRMP directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitats of each MIS affected by such projects, and (2) at the national forest (forest) or bioregional scale, monitor populations and/or habitat trends of forest MIS, as identified by the LRMP.

Adequately analyzing project effects to MIS, including Threatened, Endangered, and Sensitive (TES) species that are also MIS, involves the following steps:

- Identifying which MIS have habitat that would be either directly or indirectly affected by the project alternatives; these MIS are potentially affected by the project.
- Identifying the LRMP forest-level or bioregional-level monitoring requirements for this subset of forest MIS.
- Analyzing project-level effects on MIS habitats or habitat components for this subset of forest MIS.
- Discussing forest or bioregional scale habitat and/or population trends for this subset of forest MIS.
- Relating project-level impacts on MIS habitat to habitat and/or population trends for the affected MIS at the forest or bioregional scale.

These steps are described in detail in the Pacific Southwest Region's draft document "MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination" (USDA 2006a). The Empire Project Management Indicator Species (MIS) Report (USDA 2007a) documents application of the above steps to select and analyze MIS for the Empire Project and is incorporated by reference.

Management Indicator Species (MIS) for the Plumas NF are identified in the LRMP (USDA 1988a). The animal MIS analyzed for the Empire Project were selected from this list of MIS identified in the LRMP, as indicated below in Table 3.26. In addition, Table 3.26 identifies the status of the MIS, reason each MIS was identified in the LRMP and discloses whether or not the MIS is potentially affected by the Empire Project.

Table 3.26. Animal Management Indicator Species, Plumas NF, and Selection of MIS for Project-Level Analysis for the Empire Project.

Management Indicator Species	Species Status	LRMP Habitat Indicator	Category for Project Analysis [1]
Bald Eagle	Federally Threatened	Mature forest adjacent to open water bodies	1
Peregrine Falcon	Forest Service Sensitive	cliff nesting habitat	1
California Spotted Owl	Forest Service Sensitive	mature, mixed conifer conditions	3
Northern goshawk	Forest Service Sensitive	mature, mixed conifer and red fir conditions	3
American marten	Forest Service Sensitive	mature, red fir conditions	3
Mule Deer	Harvest	early seral, shrub	3
Canada Goose	Harvest	wetlands	1
Golden Eagle	Special Interest	open forest	3
Prairie Falcon	Special Interest	early seral/cliff	3
Trout Group	Harvest	coldwater aquatic	3
Largemouth Bass	Harvest	warmwater aquatic	1

[1] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to project 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 bald eagle is a Category 1 species and is briefly discussed in this document to disclose impacts to a federally listed species. The peregrine falcon, Canada goose and largemouth bass, identified as Category 1 above, will not be further discussed because the habitat factors for these species are not in or adjacent to the project area. The project will not directly or indirectly affect the habitat for these Category 1 species and will, therefore, have no impact on forest-level bald eagle, peregrine falcon, Canada goose or largemouth bass habitat or population trends.

The MIS whose habitat would be either directly or indirectly affected by the Empire Project, identified as Category 3 in Table 3.26, are carried forward in analysis. The Empire MIS report (USDA 2007a) evaluated the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of the Category 3 non-TES MIS and summarized effects to those TES MIS discussed in the BA/BE (USDA 2007). The MIS selected for Project-Level MIS analysis for the Empire Project are: California spotted owl, northern goshawk, American marten, mule deer, golden eagle, prairie falcon and trout group.

Neotropical Migratory Birds

Neotropical migratory birds are defined as species whose breeding area includes the North American temperate zones and that migrate, in many cases, south of the continental United States during nonbreeding seasons (Hunter et al. 1993). The Breeding Bird Survey coordinated by the U.S. Fish and Wildlife Service indicates that certain populations of Neotropical migratory bird species in California have been declining over the past 26 years (1996 data). Although there appear to be multiple causes for declines, the causes that are largely responsible include habitat fragmentation and decreases in habitat quantity and quality resulting from changes in land use (Sherry and Holmes 1993; Terborgh 1992).

Saab and Dudley (1997) found that Neotropical migratory bird species with decreasing population trends tend to be those that nest in shrub layers, and species with increasing population trends tend to nest in tree canopies. In the 1996 *Revised Draft Environmental Impact Statement for Managing California Spotted Owl Habitat in the Sierra Nevada National Forests of California, An Ecosystem Approach*, a summary table of Sierran Neotropical migratory bird species with measurable population declines based on Breeding Bird Surveys conducted in coordination with the U.S. Fish and Wildlife Service indicates that 32 species showing population declines have some habitat association with grassland/shrubland/open forest and/or riparian.

The Pacific Southwest (Region 5) Land Bird Monitoring Implementation Plan (USDA-Forest Service 1996) identified certain migratory birds as having a high priority for monitoring and mitigation efforts. In the *Sierra Nevada Forest Plan Amendment Environmental Impact Statement* (USDA 2001a), terrestrial birds were classified as having high, moderate, and low vulnerability (high vulnerability species are at greatest risk to loss of viability in the Sierra Nevada bioregion (SNFPA FEIS, appendix R [USDA 2001a]). Forty land bird species (not all Neotropical migrants) that are of particular concern and are a high priority for monitoring efforts in the Sierra Nevada bioregion were identified in the *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* (ch. 3, p. 173).

Executive Order 13186 was issued in 2001 to outline the responsibilities of federal agencies to protect migratory birds under the *Migratory Bird Treaty Act* (66 FR 3853-3856). This order directs federal agencies to work with the U.S. Fish and Wildlife Service to promote conservation of migratory bird populations. The Forest Service and U.S. Fish and Wildlife Service entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. This interim MOU expired on January 15, 2003, yet the conservation measures that are contained in the MOU are still applicable for use in environmental planning (SNFPA FSEIS 2004, ch. 3, p. 172 [USDA 2004]). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities as authorized by Congress may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

Environmental Consequences — Threatened and Endangered Species

Valley Elderberry Longhorn Beetle

The Empire Project is outside the range of the beetle; therefore, this species would experience no project-related effects.

Determination: It is determined that the Empire Project will not affect the Valley Elderberry Longhorn Beetle.

Bald Eagle

Direct/Indirect Effects. There would be no direct effect on individuals as a result of implementing either the action alternatives or the no-action alternative. The *Plumas National Forest Land and Resource Management Plan* does not identify any habitat in the wildlife analysis area for bald eagle management. There are no bald eagle territories or bald eagle management areas in the project area or wildlife analysis area.

Changes in the fishery production are not expected in Spanish Creek (the only aquatic system capable of supporting a forage source for bald eagles) as a result of implementing proposed fuel treatments, group selection, and individual tree selection. Implementing Best Management Practices and meeting all Riparian Management Objectives (the RMO analysis is located in the "Cumulative Watershed Effects Report") ensure that there would be no indirect effects on the fishery or fishery habitat.

Cumulative Effects. Implementation of the Empire Project would not contribute to cumulative effects on bald eagles or bald eagle habitat and known bald eagle territories, management areas, and winter roosts on the Plumas National Forest. None of the 23 nesting territories on the Plumas National Forest would be affected by this project. No changes in bald eagle territory occupancy or the bald eagle population on the PNF would occur. There are no known future actions planned on private or state lands in the wildlife analysis area that would affect bald eagles or bald eagle habitat.

Determination: It is determined that the Empire Project will not affect the bald eagle.

California Red-legged Frog

Informal consultation with the U.S. Fish and Wildlife Service for the HFQLG FEIS, the supporting BA/BE and its supplement, and the Record of Decision concluded that the actions implemented on a programmatic level would likely not adversely affect this species (USFWS 1999).

Direct and Indirect Effects. There would be no direct or indirect effects on this species from implementation of the proposed action or any of the alternatives. As past surveys have shown, including those conducted in the project area in 2004, as well as species distribution maps (USFWS 2002; USDA 2001a), there are no California red-legged frogs in Plumas County or the Empire Project. Therefore, no direct or indirect effects on individuals or populations would occur. The Empire wildlife analysis area has not been identified as an area designated to contribute to the recovery of the California red-legged frog (USFWS 2002; Federal Register, Vol. 71, No. 71, April 13, 2006).

Cumulative Effects. California red-legged frog habitat would not be affected by any of the proposed alternatives because there is no suitable breeding habitat for the frog in the Empire Project analysis area. Cumulative effects on these frogs would not occur because they are not present in the project area or within a drainage system that supports the frog; this includes Spanish Creek, Indian Creek, and North Fork Feather River and their tributaries.

The Empire Project would not contribute to cumulative effects because there would be no direct or indirect effects on the California red-legged frog or its habitat. No changes in California red-legged frog occupancy or populations on the PNF would occur. There are no known future actions planned on private or state lands in the wildlife analysis area.

Determination: It is determined that the Empire Project will not affect the California red-legged frog or any critical habitat.

Environmental Consequences — Sensitive Species

Methodology and Assumptions CWHR habitat typing was derived from VESTRA mapping. Forest Inventory Analysis (FIA) plot data gathered for the Empire Project indicated that the Quadratic Mean Diameter (QMD – diameter corresponding to average basal area) for all trees (greater than 1 inch) ranged from 7.7 inches to 12.5 inches, indicating a dominance of small trees in the inventory areas. The relationship between QMD and trees/acre makes it difficult to crosswalk between the VESTRA data and the plot data because of different methods for quantifying size classes. VESTRA utilizes aerial photo interpretation to estimate crown diameter as a proxy for dbh, which is used to determine CWHR size class, while stand inventory data utilizes QMD to estimate size class. Stand Inventory considers stocking and diameter of smaller, subordinate canopy trees, thus providing a more conservative estimate of CWHR size class. This difference between the current CWHR classification and the stand exam plots represents uncertainty in the accuracy of the amount of each CWHR habitat type in the analysis area. The FIA plot data was run through the Forest Vegetation Simulator model (FVS). This model run showed that the VESTRA CWHR size classes matched the appropriate size class based on the QMD for all trees >10" dbh and is accurate enough to complete the habitat analysis for the Empire project. The VESTRA-generated CWHR classification continues to be used as the habitat baseline for wildlife habitat analysis during the life of the HFQLG Pilot Project as it maintains consistency for monitoring changes in species habitat over the life of the HFQLG Pilot Project. This includes the requirement to cumulatively not reduce old-forest-dependent species habitat (5M and 5D) more than 10 percent below 1999 levels (USDA 1999).

Methods and assumptions used to analyze impacts of implementing fuels treatments, group selctions, ITS, and biomass removal on wildlife habitats, specifically CWHR 4M, 4D, 5M, 5D, are described in the effects analysis for California spotted owl.

Determinations The "Empire Vegetation Project: Biological Assessment/Biological Evaluation for Terrestrial and Aquatic Wildlife Species" (USDA 2007) provides a discussion of the direct, indirect, and cumulative effects for all sensitive animal species analyzed for the Empire Project. The BA/BE is located in the Empire Project Record and incorporated by reference. The BA/BE concluded that the Empire Project would not affect the following species: hardhead minnow, northern leopard frog, willow flycatcher, greater sandhill crane, Swainson's hawk, and American peregrine falcon (a Forest MIS).

Based on the direct, indirect, and cumulative effects discussed in the BA/BE, it was concluded that the Empire Project may affect individuals but would likely not result in a trend toward listing or loss of viability for the following species: foothill yellow-legged frog, mountain yellow-legged frog, northwestern pond turtle, great gray owl, Sierra Nevada red fox, California wolverine, pallid bat, Townsend's big eared bat, western red bat, Pacific fisher, and three Management Indicator Species including California spotted owl, northern goshawk, and American marten. The NEPA (*National*

Environmental Policy Act) process requires agencies to identify “the significant environmental issues deserving study and de-emphasizing insignificant issues, narrowing the scope of the environmental impact statement,” 40 CFR 15001.1(d). Due to the high visibility of old-forest species in California, and the potential impacts of fuels treatment, group selection, and individual tree selection on forested habitat, the effects on California spotted owl, northern goshawk, American marten, and Pacific fisher are emphasized in this EIS.

Environmental Consequences — California Spotted Owl

Issues and Indicator Measures

Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable spotted owl habitat, including affected acres in the wildlife analysis area and HRCAs.

Effects Common to the Action Alternatives

The proposed treatment units are located in predominately Sierra mixed conifer forest habitat. Units would be treated with fuels treatment, including DFPZs, on approximately 6,636 acres, as well as up to 1,600 acres of group selections and access roads to the groups, and the 4,000 acres available to individual tree selection and biomass removal. The project is located at elevations ranging from 3,100 feet at American Valley and Spanish Creek to approximately 7,711 feet at Grizzly Peak.

Protected Activity Centers and Spotted Owl Habitat Areas. The action alternatives propose no activities in the PACs and SOHAs, which are lands reserved for the protection of those areas most important for owls. These important areas include nest and roost sites. There are twenty-three PACs (including five 1,000-acre SOHAs) located in the wildlife analysis area. No fuels treatments (including DFPZ construction), group selection, or individual tree selection would occur in the designated 1,000-acre SOHAs or 300 acre PACs. Portions of approximately nine owl HRCAs would be treated under the proposed action (each HRCA is associated with an established PAC, attachments 5 and 7a-e and maps at attachment 8a-c, SOHAs at attachment 8d, in the BA/BE). The remaining fourteen PACs are located outside the proposed treatment areas and would not be directly affected, but may be indirectly affected by proposed management activities. Fuel treatments would be designed to reduce high-intensity fires around these reserve areas. Table 3.27 displays the amount of suitable habitat present within the nine HRCA’s and the amount modified by alternatives.

Implementation of the action alternatives during the nesting season around known nest sites may cause disturbance that could disrupt nesting activity and potentially lead to nest failure. Site-specific Limited Operating Periods designed to prevent disturbance to known spotted owl nest sites can be found in appendix F of the FEIS

Alternatives A, C, D, E, and F (Action Alternatives)

Direct and Indirect Effects on the Spotted Owl.

Suitable Habitat in Analysis Area

Based on the VESTRA mapping and CWHR model, about 12,164 acres of the national forest land within the wildlife analysis area may be considered suitable spotted owl nesting habitat (CWHR classes 5M and 5D), and about 33,763 of the National Forest acres may be considered suitable foraging habitat (classes 4M and 4D) (refer to table 3.22).

Changes to suitable habitat as a result of implementing fuels treatments under the proposed action (alternative A), as well as action alternatives C and D, would occur when large structural components would be removed, and canopy cover would be opened up to 30 to 45 percent, resulting in open canopy forested stands considered unsuitable habitat. Reductions in canopy cover are expected to occur with the removal of some trees less than or equal to 29.9 inches dbh. The combined impacts of mechanical thinning of the understory and achieving the desired conditions for fuel treatments by opening up the overstory would result in creating more open forest from dense forest (moderate [M] and dense [D] stands decreasing to poor [P], thus opening up to around 40 percent canopy cover). Individual tree selection with biomass removal would also create more open forest and reduced-quality owl habitat and thus, was analyzed as decreasing to “P.” There may also be some additional risks (removing trees, opening up the canopy, and reducing nesting opportunities) associated with isolated torching events during prescribed fire.

Changes to suitable habitat as a result of implementing fuels treatments under alternatives E and F would be more subtle when structural components up to 20 inches dbh would be removed, and canopy cover would be retained at 50 percent where it currently exists. The combined impacts of mechanical thinning of the understory and removing up to 20 inches dbh trees would result in “M” stands staying “M” and “D” stands decreasing to “M” (would fall to 50 percent canopy cover but not below 50 percent canopy cover). Individual tree selection with biomass removal would create more open forest, reduced-quality owl habitat and thus, was analyzed as decreasing to “P” on 350 acres under alternative E. There is no biomass removal proposed in alternative F. There may also be some additional risks (removing trees, opening up the canopy, and reducing nesting opportunities) associated with isolated torching events during prescribed fire.

Irwin and Rock (2004) found that the probability of stand use by spotted owl increased strongly as basal area rose from 80 to 320 square feet/acre (optimum range is between 160 and 320 square feet/acre) and was positively influenced by the number of trees/acre that were greater than 26 inches dbh. With implementation of alternatives A, C, and D in fuel treatment (DFPZ) areas, the residual basal area in 4M would be 111 square feet/acre, 112 square feet/acre in 4D, 196 square feet/acre in 5M, and 171 square feet/acre in 5D. Trees greater than 30 inches dbh within these CWHR types would be 5/acre, 2/acre, 11/acre, and 4/acre, respectively (see the "Vegetation Report" in the Empire Project Record). These figures represent what is projected to remain on site immediately after fuels treatment.

With implementation of alternatives E and F in fuel treatment (DFPZ) areas, the residual basal area (immediately post-project implementation) in 4M would be 195 square feet/acre, 195 square feet/acre in 4D, 236 square feet/acre in 5M, and 209 square feet/acre in 5D (all are within optimum range for probability of use by spotted owls). Trees greater than 30 inches dbh in these CWHR types would be 5/acre, 2/acre, 11/acre, and 4/acre, respectively.

Based on the description of the proposed action, there should be no change in CWHR type (including tree size and canopy cover) in the areas designated for individual tree selection, except in stands treated for biomass removal. All individual tree selection stands that would be treated for biomass removal (as described in the proposed action) would incur the same changes to CWHR type as those described for fuel treatment above. Snags and large woody debris would be similar to what is described in the proposed action for fuel treatments.

1. *Individual tree selection without biomass in CWHR 4M, 4D, 5M, and 5D.* There would be no change in CWHR type because stands greater than or equal to 50 percent canopy cover would be maintained at 50 percent canopy cover. Allowance is made to allow for 40 percent canopy cover averaged within the treatment unit, but the proposed action is not designed to do this.

2. *Individual tree selection with biomass.* This would simplify the complexity and structure of the stand; open up the stand by treating the lower and mid-level vegetative layers; remove more structures that provide the vegetative layering, deformities, snags, and future decadence; and reduce the closed nature of the stand (which provides diverse microclimates owls seek) to control exposure and changes in ambient temperature for roosting. Biomass removal would degrade/remove hiding cover in the lower and mid canopy often used by young of the year. Feller-bunchers used to remove biomass would also create open paths and disrupt down woody material through crushing, moving, etc. Thus, biomass removal in individual tree selection units in suitable owl habitat would result in habitat degradation and a direct reduction in suitable habitat.

The group selection treatments would result in the creation of forest openings and gaps that would have (1) most conifers below 30 inches dbh removed - desirable conifer species (such as sugar pine) and regeneration, and oaks/hardwoods would be retained as explained in the proposed action; (2) two of the largest snags/acre retained; and (3) project-generated fuels treated with prescribed fire, but 10 to 15 tons per acre of the largest down logs greater than 12 inches in diameter would be retained where it exists. With any of the four action alternatives that propose group selection, allowance would be made for up to two of the largest snags/acre be retained within group selection units, unless removal would be necessary for safety/operability. Based on past projects (Stony Ridge, Meadow Valley) and discussions with Occupational Safety and Health Administration safety representatives, it is anticipated that the majority of snags would be felled, and very few snags would be left in the 1,347 acres of group selection (alternative A); 1,600 acres of group selection under (alternative C); and 1,226 acres of group selection (alternatives D and E).

Total acres of suitable owl habitat (4M, 4D, 5M, 5D) remaining within the analysis area by alternative is presented in Table 3.18.

The Forest Inventory and Analysis data collected from the Empire Project area was run through the Forest Vegetation Simulator growth and yield model. The modeling results show that tree growth and subsequent habitat recovery would follow the trends projected in the HFQLG FSEIS. The modeling indicates that all action alternatives that implement fuels treatments and individual tree selection in the Empire Project could result in additional suitable owl habitat over time (project years 20 through 50). Individual groups are projected to be CWHR class 3M by year 50, with structurally suitable habitat occurring beyond year 50 (refer to the "Vegetation Report" in the Empire Project Record).

As part of a strategic system of DFPZs, the Empire Project would help eliminate understory fuel buildup and reduce the potential for high-severity wildfires, which have a great potential to eliminate vast tracts of habitat for this species. Fire history, as well as the large parcels of burned-over areas in the Empire Project, indicates the area is prone to large stand-replacing fires.

Home Range Core Areas

Home ranges of neighboring spotted owls commonly overlap (Verner et al. 1992: 149). Indirect effects of the action alternatives could possibly cause a shift in owl home range use and increase the potential for intraspecific (single species) competition between neighbors. The increased competition associated with using the same restricted habitat parcels could impact owl behavior, possibly affecting nesting and reproduction. Because of this, the direct affects (changes in habitat) in HRCAs could have indirect affects on the neighboring PACs/HRCAs that are not directly affected by the proposed action. This is especially true if the directly affected HRCA overlaps with another HRCA. There are a total of 23 PACs/HRCAs in the wildlife analysis area: nine would be directly affected, and fourteen would be indirectly affected. The wildlife analysis area also contains five SOHAs (BA/BE attachments 5, 7a-e, and 8a-c); these SOHAs are included in the 23 PACs/HRCAs figure. The nine directly affected PACs account for approximately three percent of the total PACs on the Plumas NF (9/296). Table 3.27 displays the amount of suitable habitat present within the nine HRCA's and the amount modified by alternatives

Table 3.27. Suitable Habitat Impacted within each Home Range Core Area

HRCA	Existing 4M/4D	Existing 5M/5D	Total Suitable	Reduction in Suitable Acres A	C	D	E	F	% 4M/4D remaining*	% 5M/5D remaining*
PL011	569	0	569	13	13	0	0	0	100	-
PL018	336	334	670	36	30	33	33	0	93	96
PL036	356	43	399	125	132	132	15	0	65	86
PL133	316	251	567	61	65	49	24	0	95	87
PL139	473	10	483	3	1	4	0	0	99.7	100
PL170	360	257	617	33	27	20	20	0	97.7	95.3
PL331	203	20	223	64	69	57	0	0	72	100
PL352	547	154	701	49	58	55	65	0	92	92
G1	433	313	746	6	6	6	6	0	99.3	99
TOTALS			4975	390	401	353	163	0		

*Figure displayed is for Alternative D, the identified preferred alternative.

It appears that with implementation of Alternative C, approximately eleven more acres of habitat would be treated over what Alternative A treats in HRCA's. Alternatives D & E result in 37 and 227 less acres of habitat reduction than Alternative A.

Based on acres that would be affected in individual HRCAs, it is difficult to predict if there would be a shift in owl use due to habitat alteration. Two HRCAs that would be directly affected by habitat reduction as a result of the Empire Project are located adjacent to each other between Taylor Creek and Dry Taylor Creek (PL352 and PL018).[1] The potential suitable habitat reduction in PL352 would be 55 acres, and in PL018, 33 acres (alternative D). PL352 was discovered in 2004 and produced two young. In 2005 it was occupied with a nonnesting pair. PL018 was discovered in 1979, and surveys indicate it was last recorded occupied in 1993, although surveys did not occur between 1993 and 2003. No owls were found in PL018 in 2004 or 2005.

The potential habitat reduction (alternative D) in the HRCAs of PL036 would be 132 acres; and in the HRCAs of PL133, 49 acres. PL036 is based on an owl detection in 1981; there have been no detections since that year. PL133 is based on a 1989 pair detection, with no further detections. Surveys conducted annually between 2002 and 2004 found no owls in these sites.

There would be an average reduction of 43 acres of suitable habitat per HRCA under alternative A, and an average reduction of 45, 39, and 18 acres of suitable habitat per HRCA under alternatives C, D, and E, respectively. It is anticipated that owl behavioral and competitive interactions may increase, which could impact owl activity and occupancy of PACs/HRCAs that are already low in suitable habitat. Although the HRCAs are well-distributed across the wildlife analysis area, they are also confined by large blocks of unsuitable habitat as a result of past wildfires. There would be no reduction of suitable habitat in any HRCA with alternative F.

[1]. The PAC label includes the abbreviation for county of location (PL = Plumas County). The number of the PAC is provided by the California Department of Fish and Game.

Risks to owl occupancy would increase in PACs/HRCAs PL036, PL133, PL331, and PL352 due to changes in habitat in portions of HRCAs. The PACs and SOHAs would be avoided during treatments, and the majority of the habitat in the 700-acre plus HRCAs would not be affected by treatments. Thus, the potential risk of reduced PAC/HRCA occupancy resulting from project implementation would be low. There would be no change to habitat in the fourteen PACs that would be indirectly affected, and the associated HRCAs would still be present to support owl occupancy. The fuels treatments proposed under the action alternatives could decrease the risk of losing owl habitat, including PACs, SOHAs, and HRCAs, to high-intensity wildfire.

Nest Core Areas

Several studies provide insight into spatial availability of habitat for California spotted owls. (Hunter et al. 1995; Bingham and Noon 1997; Meyer et al. 1998; Franklin et al. 2000; and Zabel et al. 2003). Blakesley (2003). Each of these studies found that areas within about 200 hectares (500 acres) of nests were influential in determining occupancy and/or fitness. Blakesley (2003) states that occupancy, apparent survival, and nesting success all increased with increasing amounts of old-forest characteristics and that reproductive output decreased with increasing amount of non-habitat within the nest core area (nest core area = 203 ha scale, or 500 acres surrounding nest sites). Blakesley’s data indicates that 71 percent suitable habitat within this nest core area should be a minimum management target. Based on these studies, it could be assumed that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area. Table 3.28 shows the potential acres treated within the 500-acre area around an owl PAC for the owl PACs that would be directly affected by alternatives D and E. The PAC is the main feature within the 500 acre nest core area. There would be no activities within owl PAC’s with the Empire Project.

Table 3.28. Analysis of potential acres treated in the 500-acre area of each directly affected PAC with alternatives D and E.[a]

500 Ac Nest Core	% Nest Core Suitable habitat	% Nest Core in PAC	% Nest Core composed of HRCA	Acres DFPZ in Nest Core Suitable habitat	Acres of Groups in Nest Core Suitable Habitat	Acres groups in HRCA in Nest Core	% Nest core in suitable habitat Post Alt.
PL018	86	86	2	0	0	0	86
PL036	71	50	10	0	0	0	71
PL133	43	61	4	0	0	0	43
PL139	51	41	56	1	0	0	51
PL170	99	50	9	0	10	0	97.6
PL331	60	76	6	0.5	0	0	59.9
PL352	100	55	38	0	11.5	11.5	97.7
G1	58	73	14	0	0	0	58

*Alternative D analyzed due to identification in DEIS as preferred alternative. With Alternative E, GS & ITS same as Alternative D. ITS does not change habitat suitability. PL011 not treated with alternatives..

With Alternatives D and E, approximately four HRCAs would have potential habitat reduction within the 500-acre area around the activity center. Table 3.28 indicates that four of the eight nest cores directly affected by these alternatives are currently above the 71% threshold of suitable habitat identified by Blakesley; these will remain above the threshold post project. Four of the nest cores are currently below the threshold; there will be no change in the amount of suitable habitat within these nest cores as a result of project implementation. Based on Table 3.28, vegetation treatment would have minimal change from the existing condition on the amount of suitable habitat present in the affected nest cores in the Analysis Area.

Recent survey efforts indicate that not all PACs within the analysis area are occupied (attachment 5, BA/BE). Owl populations may go through periodic declines with cycles of nonbreeding followed by breeding pulses (Verner et al. 1992: 72–73). The loss of available nest sites due to stand replacement fire events or habitat disturbance may preclude population expansion following breeding pulses. It is possible that owl use of vacant PACs/HRCAs may be “transitory” in nature; that is, they are used by owls during periods of peak owl populations and are possibly empty during lower owl population periods. They might also provide areas for occupation by dispersing juveniles and subadults. LaHaye et al. (2001) reported that frequently vacant sites had records of successful reproduction, and these frequently vacant sites supported high survival and reproduction when they were occupied. These authors felt that dispersal of individuals may be cued to the existence of suitable habitat and that individuals may preferentially disperse to unoccupied sites, thus taking advantage of suitable vacant sites.

Prey Species Habitat

Fuel treatments including thinning and prescribed burning would result in a shift in stand microclimate that would have a negative impact to flying squirrels (Lehmkuhl et al. 2006). These treated stands would have fewer trees, a less complex and more open canopy structure (<50% canopy cover), resulting in a higher variability stand microclimate, all of which create more xeric conditions that would likely lower availability and biomass of truffles. Retention of down woody material and the largest trees may retain some level of lichen and truffle diversity and biomass, providing flying squirrel forage resources within treated stands. With regular maintenance through prescribed burning every 10 or so years, downed wood retention would be hard to retain in the long term, resulting in lower density of truffles. These potential losses would be offset by the benefit that fuel treatment could have for reducing the large scale loss of habitat through wildfire. Less than 15% (10,232 acres) of the National Forest land within the analysis area would be treated with the Empire Project, while 61,530 acres of National Forest terrestrial forested habitat would not be treated. Location of treatment acres are constrained across the landscape for various resource reasons (PACs & SOHAS for example) such that untreated habitat is spread across the analysis area likely providing well distributed flying squirrel populations.

The purpose of the habitat modeling conducted for the *Sierra Nevada Forest Plan Amendment Environmental Impact Statement* and subsequent supplemental EIS was to project trends in woodrat and flying squirrel habitat as a result of implementing fuel-reduction activities and group selection harvest in the Sierra Nevada range. Modeling results indicated that populations of both species would apparently increase slightly over current conditions, but the difference in populations in either the short or long term would be very small.

In group selections, as the brush/seedling habitat matures after reforestation, woodrats may recolonize sooner because they are known to use earlier successional habitats (CDFG 2002; G. Rotta, personal observation). Project activities are designed to retain the largest black oaks in DFPZs, groups and ITS treatments in a range of 25-35 square feet basal area. Woody structures that provide habitat for prey species would be available in the form of downed logs created by snag retention. Flying squirrels would likely be absent in the group selection openings but could possibly use the edges to their advantage and eventually inhabit these areas as the forest matures. Truffle abundance would probably be reduced more in groups than in fuel treatments due to increase ground disturbance activity. It is not known if spotted owls would use these small openings for foraging. Reforestation could hasten the development of forested stands, as well as accelerate the development of old-forest conditions that owls prefer. The small mammal component of the Plumas-Lassen Administrative Study would monitor changes in small mammal density/distribution that may occur as a result of project implementation.

In terms of acres treated, with the subsequent potential for snag removal, alternative C proposes approximately 253 more acres of group selection than alternative A; thus, less snags would be removed under alternative A. Alternatives D and E would treat approximately 1,711 less acres than alternative A; therefore, both of these action alternatives could potentially retain the most snags of these four alternatives (A, C, D, and F). Alternative F would only treat about 3,409 forested acres, so more snags would be retained due to less acres treated. (Refer to table 2.7 in chapter 2 for the total acres proposed for vegetation treatments under the six alternatives.)

Multiple edges created by multiple group selection in suitable owl habitat may reduce the owl's use of habitat and potentially increase use by great horned owls (an effective competitor and predator of the spotted owl). Franklin et al. (2000) found a positive relationship between the amount of edge between owl habitat and non-owl habitat, and that spotted owls showed higher reproductive success in sites with intermediate numbers of owl habitat patches intermixed with non-owl habitat areas. Blakesley (2003), on the other hand, reported a model of reproductive output showing a weak negative relationship between elevation and the amount of non-owl habitat in the nest area. It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use, or non-use by old-forest species, including spotted owls. Alternative D reduces the risk and uncertainty of impacts associated with group placement and density reflective of alternatives A and C. Understanding the response of prey species, including spotted owl use of group openings, is one of the main objectives of the post-implementation monitoring that would be conducted by Pacific Southwest Research Station through the Plumas-Lassen Administrative Study. This study could provide information as to (1) spotted owl use of small edges created by groups, (2) spotted owl use of habitat between groups, and (3) changes in great horned owl use and occupancy of the Empire Project analysis area and contribute knowledge as to the coexistence of these two owl species.

The alternatives that propose group selection (alternatives A, C, D, and E) could potentially affect the forest habitat between groups. Alternatives A, C, D, and E would implement group selection at densities that could reduce the effective functioning of forest interior habitat, thus potentially affecting the use of forest interior habitat by spotted owls.

Cumulative Effects common to old forest species, including the California Spotted Owl. The analysis of cumulative effects of the proposed project evaluates its anticipated impact on TES and MIS wildlife from the existing condition (i.e., existing condition reflected by changes that have occurred in the past) within the 94,502 acre analysis area. Past actions in the area include timber harvest, large wildfires, recreation use, and mining. Past timber harvesting on National Forest and private land, together with the large wildfires, have created a diverse mix of vegetation types and age classes across the analysis area that has shaped the distribution of old forest and early seral wildlife species. The direct and indirect effects of each project alternative on forest vegetation has been described and discussed. Since spotted owl, goshawk, marten and fisher prefer similar habitats, the cumulative effects analysis area is bound the same for these species and the cumulative effects of alternatives on suitable habitat for these species are essentially the same as described here for spotted owl.

Timber harvest related activities on public lands from 1970 to 2000 affected approximately 5,464 acres within the 94,502 -acre wildlife analysis area (approximately 6% of the wildlife analysis area). Various silvicultural prescriptions were employed including 1,876 acres of regeneration (clearcut), 110 acres of group selection, 2,288 acres of overstory removal, 320 acres of shelterwood, 230 acres of sanitation, 235 acres of salvage, and 1,884 acres of selection. In addition, approximately 1,949 acres of pre-commercial thinning occurred and 1,687 acres were site-prepped and planted to conifers (Appendix G). These harvest activities have resulted in either loss of suitable habitat (stands taken below 40% canopy cover) or reduction in habitat value through reductions in canopy cover and removal of stand decadence. These past actions resulted in reduced canopies and simplified overstory and understory structure within treated stands, which could have increased overall habitat diversity at the landscape level at the time of implementation. Attachment 2 in the BA/BE lists the existing vegetative condition on National Forest land within the Empire analysis area, expressed in CWHR types (Vestra 2002), which reflects past management activities that have resulted in vegetative change, which in turn dictate current wildlife species occurrence and distribution.

In the past, numerous timber harvest operations within the analysis area implemented even-age forestry, resulting in approximately 1,876 acres of clearcuts. These clearcuts ranged from total stand clearing, to clearings with reserve trees retained, including small patch clearcuts. All clearcuts have resulted in plantations that now range in age from 17 to 30 years. Many of these older plantations provide unsuitable owl habitat classified as CWHR 2 or 3 (trees from 1-6” dbh up to 10” dbh). Aside from a small three acre opening up at the Mt. Hough lookout in late 2004 designed to increase lookout visibility, the last effort to create openings with even-aged management on National Forest land within the analysis area was in 1990. Past clearcuts created openings within continuous forest cover, that today contribute to both habitat diversity and edge effect in the form of early and mid-seral stage stands, as well as an element of forest habitat discontinuity and fragmentation. This action has increased habitat for species that use early seral habitat and decreased habitat for species that require forested stands and continuous cover. Early seral habitat, including plantations created as a result of even-aged forestry, make up less than one percent of the 94,502-acre analysis area. The bulk of the plantations within the analysis area exist as a result of reforestation efforts after large wildfires.

Private land logging activity within the analysis area that has occurred since 1994 includes: 271 acres of shelterwood/seed cut, 60 acres seed tree removal, 1,049 acres of shelterwood removal, 53 acres group selection, 4,417 acres commercial thin, 960 acres selection, 2,082 acres sanitation/salvage, 138 acres of rehabilitation, and 1289 acres clearcut. This amounts to about 10 percent of the entire analysis area. Approximately 822 of the 1,289 acres of clearcut harvest activity (64 percent) has occurred since 2001. These clearcuts created early seral habitat and will remain as early seral (grass/forb/brush/seedling-sapling) for at least the next 10-20 years. After year 20, conifers may start to dominate the vegetative cover, and by year 50 should be classified as size class 3 trees (6-11" dbh), which is still unsuitable owl habitat. With brush control and release activities, trees could attain this size class earlier than 50 years.

Brushfields within the analysis area are a result of wildfires that occurred from 17 to 70 years ago: Mt. Hough 1931, TollCash 1943, Clear Creek 1946, Bell 1970, Oak 1972 Cashman in 1977 and Greenhorn 1990. Several of these burns occurred within older burns. These burn areas support very decadent, impenetrable, brush. These wildland fires burned at high intensity and created large, monotypic openings of early seral brush habitat within the forest that contribute to very large scale fragmentation of continuous forest cover across the landscape. Much of this habitat is currently occupied by montane chaparral and hardwood forest. Within the analysis area there were 418 wildfires from 1970-2001. The fires ranged from 0.1 to approximately 1,600 acres. Eight fires were greater than ten acres. Large brushfields created by wildfire are used extensively by early seral and mid-seral wildlife species but not used by species requiring old forest and continuous forest conifer cover.

In the Fall of 2005 approximately five acres of roadside hazard tree removal ocurred within the analysis area up along Grizzly Ridge (Tramway Hazard Tree Project), with the majority of the project on Beckwourth RD. This project removed those trees that were dying and could become snags. This minimally reduced habitat for snag and down wood dependent species along roads.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and would continue. This program allows the public to purchase a woodcutting permit and remove fuel and firewood from National Forest lands. A 10-year average (1991-2000) indicates that 3,273 permits were issued annually resulting in the annual sale of 10,417 cords of wood on the Plumas. Since 1993 there has been a declining trend in both number of permits and cords sold (for the year 2000, 2,227 permits issued selling 6,392 cords, while in 2003, 819 permits were sold for a total of 2,154 cords). Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Empire project analysis area (excluding the Butterfly Botanical Area) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape, negatively affecting those species dependent on such structures. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the analysis area; snag and log removal is most common on flat ground (<30%

slope) and along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

Most of the recreation use within the analysis area consists of dispersed activities, including use by individuals and small groups, of hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATV's, hunting, fishing, camping, rock hounding, mining, and firewood gathering. There are two developed, free-use Forest Service Campgrounds, Brady's Camp and Spanish Creek Campground, within the analysis area. Approximately 100 campers use Brady's Camp from June 1 to October 15th, mainly by deer hunters in the fall. The analysis area is within deer hunting zone X6A, which allocated 380 deer tags in 2005. Game animals are hunted under regulations designed to allow for resource use while maintaining species viability. Recreational activities and use within the analysis area at various times throughout the year can result in increased harassment of wildlife, specifically mammals such as deer, and potentially nesting birds such as goshawks, resulting in movements in and out of the area. These disturbances and movements are temporary in nature and do not result in long term cumulative effects.

There is a developed Off Highway Vehicle (OHV) track, with unloading ramp and trailhead at Four Corners at junction of FS road 25N14 and County Road 403. Approximately 200-250 people a year use this site and use is increasing. In addition there are six designated OHV routes for approximately 103 miles of established OHV routes within the analysis area, which are used seasonally by approximately 50-100 people a year, with a combination of motorcycles, ATVs and 4X4s from March thru November. During the winter months snowmobile use is dispersed across the analysis area. Snowmobile use up in high elevation forests has the potential to temporarily displace forest carnivores, although these species are not present in this analysis area. Extensive horseback riding is found in this area as well as within the parcel just south of Greenhorn Ranch. This recreational use results in increased movements and short term displacement from habitats of wildlife species, such as big game, but are temporary in nature and do not result in long term cumulative effects.

Many of the creeks within the area are subjected to mining activities, especially up Squirrel Creek. There are 70 mining claimants and 45 placer mining claims along the creeks. The time frame for dredging season is from the third week of May thru October 15 each year. Mining activity within the Empire analysis area does not have much cumulative effect on the terrestrial vegetation. Mining within aquatic habitats can increase sediment transport, increase bank instability and alter streambed and riparian habitat at localized areas, contributing to both short and long term degradation of aquatic habitat quality.

Several of the past and present uses identified in Appendix G and discussed below have no measurable cumulative effect on wildlife habitat and do not contribute to cumulative effects.These uses are dispersed spatially and temporally and do not alter habitat structures. There are 43 Special

Use Permits within the analysis area. These include road use permits, TV antennas, a cemetery, power and telephone lines, microwave antennas, reflectors, livestock areas, organizational camps, residence, irrigation and domestic waterlines, and horse trails. Two livestock grazing allotments (Bear Creek and Long Valley) overlap into the analysis area but both are vacant allotments. Since 2001, approximately 47 commercial woodcutting permits allowing for the removal of 385 cords of wood have been issued for the Mt. Hough RD. Since 2001, approximately 6600 Christmas tree permits have been sold on the Mt. Hough RD. It is speculated that both commercial woodcutting and Christmas tree cutting has occurred within the analysis area.

The ongoing Empire medusahead control project involves burning individual noxious grass (medusahead) plants with a high intensity hand-held torch on approximately 25 acres. Reducing the spread of noxious weeds can improve early seral wildlife habitat by allowing for increased growth and availability of native grass/forb species.

Wildlife habitat improvement projects have included the placement of three water catchments in 2004 to collect water for upland game species. Future plans include the creation of two earthen waterholes, placement of up to 10 additional water catchments, and approximately 500 acres of underburning. All these projects are subject to funding and could occur between 2007 and 2010. Improved water availability can increase carrying capacity and habitat use by wildlife, including numerous species considered prey species for goshawks and forest carnivores. A meadow protection project is planned for 2007 at Rhinehart meadow that would prevent off highway vehicle use from entering the meadow.

The earliest the District Fuels Specialists projects a need for DFPZ maintenance is approximately 10 years from DFPZ completion. The future maintenance for the fuels treatments is predicted to include approximately 6000 acres of prescribed fire, 230 acres of mechanical treatment, and 380 acres of hand treatment. This applies to all action alternatives. The effects of DFPZ maintenance actions within 10 years on habitat are not anticipated to cause any changes to forest canopy cover or residual tree size; only brush, small seedlings/saplings, and any natural slash accumulations would be removed by these actions.

The past, present and future effect of these actions, specifically to those species associated with old forest characteristics has, and would be, to shift forest successional stages to somewhat earlier stages, opening up forested stands and modifying within stand structure while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads, and reduction in habitat losses due to large, damaging wildfires.

In addition to the above mentioned past, present and future activities within the analysis area, site-specific cumulative effects analysis on spotted owl habitat in the Empire analysis area can be found in the Empire Fuel Treatment, Group Selection and ITS Project BA/BE (USDA 2007).

In 2004 the Dancehouse-Chandler fuel treatment projects were planned and implementation of the hand thinning began in the summer of 2004 and mechanical thinning began in the fall 2004. These areas consisted of three separate parcels present in the wildland urban interface along Spanish Creek near Oakland Camp and the north end of American Valley. The Chandler Project consisted of 62 acres mechanical thinning, 10 acres of hand thinning, and 19.5 acres of a combination of mechanical and hand thinning within the RHCA. The Dancehouse Project consisted of 33 acres mechanical thinning and 278 acres of hand thinning.

Based on the treatment prescriptions within identified CWHR types, the analysis indicated that neither the Dancehouse or Chandler projects would have a direct or indirect effect on suitable spotted owl habitat, including PACs, or the distributional range of the owl on the Plumas National Forest (BE/BA Chandler – Dancehouse Project March 26, 2004). The SMC4M type was identified as being low capability habitat, being less than 50 percent canopy cover pre-treatment. It is anticipated that stands opened up to 4P should close in and again support 4M in 10-20 years. Hand thinning in this project was completed in 2005. Some pile burning and underburning is ongoing and not yet completed. The project will result in more open, fire resilient stands supporting less surface and ladder fuels.

A portion (approximately 100 acres) of the Corridor Fuel Reduction Project falls within the wildlife analysis area. This 2007 project is designed to reduce stand density by thinning from below, reducing ladder and canopy fuels. Analysis indicates that within this 100 acre area, approximately 40 acres of SMC4D (composed primarily of trees 11-20” dbh) would be thinned to 40% canopy cover resulting in SMC4M; there would be no change to the remaining habitat, composed of approximately 40 acres of CWHR 2 and 3

No other vegetation or fuels type projects have occurred within the project area or analysis area on National Forest lands since 2000, except for a three acre opening in unsuitable owl habitat at Mt. Hough lookout in 2004. In contrast, since 2001, the private land within the project area has experienced extensive logging and vegetation management on the majority of the in-holdings within the project area, including approximately 822 acres clearcut, and 1700 acres commercial thinning (appendix G).

A foreseeable future project is the Old Sloat Fuels Reduction project, located at the south end of the analysis area on Beckwourth RD. Approximately 165 acres of mechanical fuels treatment and 108 acres of maintenance hand thinning and burning are proposed to be treated in 2007. The mechanical thinning is designed to connect with the Empire project to improve fuel treatment continuity. The BA/BE developed for this project (USDA 2007) indicates that the proposed action would reduce foraging habitat quality on 209 acres of owl habitat; there would be no reduction in total nesting habitat. Within one HRCA (PL297) approximately 22 acres of suitable habitat (CWHR 4M, 4D, 5M, 5D, 6) could potentially be rendered unsuitable. It was concluded that this 22 acre reduction of suitable habitat within the PL297 HRCA would not result in an increase in owl behavioral and competitive interactions amongst other PACs/HRCAs in the vicinity.

The cumulative effect of HFQLG Pilot Project actions (such as the Empire Project and other vegetation management actions in the Sierra Nevada) was assessed in the *Sierra Nevada Forest Plan Amendment Final Supplement Environmental Impact Statement* (SNFPA FSEIS), to which this Empire Project EIS is tiered. The habitat modeling used for the FSEIS was intended to indicate the direction, magnitude, and time frames (general trends) of change and was not intended to provide precise information. That assessment (pages 260–280 in the SNFPA FSEIS) acknowledged that suitable foraging habitat provided by CWHR size class 4 stands would diminish in early decades under the Sierra Nevada Forest Plan Amendment but would be offset by increases in acreage of CWHR size class 5 and 6 stands. According to projections (SNFPA FSEIS, table 4.3.2.3g), 20 years after implementation of the Sierra Nevada Forest Plan Amendment, there would be an 11 percent increase of total spotted owl habitat (classes 4M, 4D, 5M, and 5D) in the HFQLG Pilot Project planning area. By project year 50, there would be a drop in net gain of 6 percent; by year 130, there would be a net reduction of 7 percent. However, in the Sierra Nevada bioregion as a whole, there would be a 13 percent increase in total habitat by project year 20, 18 percent by year 50, and 20 percent by year 130.

Within the HFQLG Pilot Project planning area, full implementation of HFQLG Pilot Project under the SNFPA 2004 Record of Decision is projected to result in roughly 65,000 fewer acres of suitable habitat (4M, 4D, 5M, 5D and 6) in project year 20 than with the SNFPA 2001 Record of Decision (alternative S1). This is primarily due to (1) implementation of group selection harvests, and (2) the fact that standards and guidelines for CWHR classes 4M and 4D do not have any minimum canopy cover requirements and have a 30 percent basal area retention standard. Also, under the 2004 Record of Decision, the canopy cover in CWHR classes 5M and 5D stands is more likely to drop to 40 percent in the DFPZs (SNFPA FSEIS ch. 4, p. 269). Because the spotted owl population is currently within the 95 percent confidence limits of a stable population (Franklin et al. 2003 in SNFPA FSEIS 2004), the FSEIS and BA/BE concluded that these cumulative habitat changes (within the range of the California spotted owl in both the Sierra Nevada and HFQLG Pilot Project planning area) would not result in a trend toward listing or loss of viability of the California spotted owl.

Within the Empire BA/BE (USDA 2007), tables 3.27 and 3.28 indicate that between 1,575 and 5,354 acres of 4M, 4D, 5M and 5D would be reduced as a result of implementing Alternatives A, C, D and E. This is approximately 2.4 percent to 8.2 percent of the 65,000 acres projected in the SNFPA 2004 FSEIS. Table 3.29 indicates that the Empire Project (Alternatives A, C, D and E) would result in a reduction in nesting spotted owl habitat from 436 to 1579 acres. This is approximately 0.6 percent to 2.4 percent of the 65,000 acres projected in the SNFPA 2004 FSEIS.

Table 3.29 provides a cumulative total on the amount of suitable owl nesting habitat that would be impacted by the fuel treatments, group selection harvests, and individual tree selection harvests projects implemented under the HFQLG Pilot Project on the Mount Hough Ranger District.

Table 3.29. Cumulative reductions in spotted owl nesting habitat (CWHR classes 5M ,5D and 6) on Mount Hough Ranger District for HFQLG Pilot Project implementation.

	Past Project Meadow Valley (acres)	Present project Empire Project Analysis Area* (acres)					
	Alternative C	**Alternative A**	**Alternative C**	**Alternative D**	**Alternative E**	**Alternative F**	**Potential Cumulative Change**
Spotted Owl Nesting Habitat	-945	-1,483	-1,579	-1,472	-436	0	945–2,524 acres

As Table 3.29 indicates, four of the action alternatives (A, C, D, and E) could contribute to a cumulative reduction in spotted owl nesting habitat. As noted above in the direct and indirect effects sections, spotted owl PACs and SOHAs have been excluded from the Empire Project treatment units. Additional PACs and HRCAs would be created in the future, if warranted, by new site-specific owl information.

As a requirement of the HFQLG FEIS, over the course of the pilot project, suitable habitat for old forest-dependent species shall not be reduced by more than 10 percent below 1999 levels. CWHR types selected by the monitoring team to represent suitable habitat for late successional species includes CWHR labels 5M, 5D, and 6. Data from the HFQLG FEIS indicates that the baseline total for 5M, 5D, 6 is 186,401 acres within the HFQLG Planning Area. The Empire project analysis concludes that there would be a reduction in these strata types of approximately 1,483 acres with Alternative A, 1,579 acres with Alternative C, 1,472 acres with Alternative D, 436 acres with Alternative E, and 0 acres with Alternative F (table 3.29). Therefore, there would be a cumulative contribution to the loss of suitable habitat for old forest-dependent species within the HFQLG Planning Area as a result of implementing four of the five action alternatives.

The project analysis considered the cumulative effects of reductions of habitat and complies with the ROD direction to limit the loss of this habitat type to no more than 10% below 1999 levels for the HFQLG project . The HFQLG 2005 Monitoring Summary Report (3/3/2006) reported that as of the date of the report, 3,282 acres have or will have a reduction based on projects with a signed Record of Decsion; this is approximately 1.7 percent of the acres with these CWHR types in the pilot project area. This figure includes 1,472 acres projected to be reduced by the Empire Project with the preferred alternative.

Large scale changes in owl habitat as a result of recent wildfires and anticipated future fires in spotted owl habitat have been identified as a potential threat affecting spotted owl distribution (70 Federal Register, 35613, June 21, 2005). An annual average of 4.5 PACs have been lost or severely modified by wildfire since 1998 within the range of the California spotted owl (SNFPA SFEIS Chapter 3, page 145). Table 3.2.2.3b within the SNFPA SFEIS indicates that approximately seven PACs on the Plumas National Forest are considered to be lost due to fire effects. None of these PACs have been removed from the Plumas designated PAC network, and at least three have been re-designated around the periphery of the Stream Fire and owls have been found in all three sites (Sloat, 2002, GANDA 2003, surveys in 2005 by Holmes Forestry). Approximately 2,300 acres of suitable owl habitat (CWHR 4M, 4D, 5M, 5D, & 6) was removed with the Stream Fire. Spotted owls may have re-located in habitat outside of the fire perimeter, which could have resulted in increased crowding and competition with established owls, resulting in lower owl numbers and occupancy in the general area. None of these large scale fires, including the Stream Fire used as an example above, have occurred within the Empire Project analysis area during the last seventeen years, although the analysis area has had several large scale fires in the past that consumed spotted owl habitat and probably displaced spotted owl.

The petition to list the California spotted owl identified West Nile Virus (WNV) as a serious potential threat to owls and that its effects on owls be monitored (70 Federal Register, June 21, 2005). West Nile Virus has not yet been detected in a wild spotted owl (Ibid). In 2004 researchers tested for WNV (California spotted owls in Eldorado study area, northern spotted owls in the Willow Creek Study area) and in 2005 blood samples were taken from spotted owls in the Plumas and Lassen National Forests. None of these owls tested positive for WNV exposure (Ibid, J. Keane, personal communications, 2005). The USFWS found there was no substantial information that WNV may threaten the continued existence of spotted owl (70 Federal Register, 35612, June 21, 2005).

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

Barred owls have expanded their range in California as far south as Sequoia National Park, and in the last two years (2004/2005), the known range of barred owls has expanded 200 miles southward in the Sierras (*Federal Register*, vol. 70, 35613, June 21, 2005). The U.S. Fish and Wildlife Service concluded that barred owls constitute a potential threat to site occupancy, reproduction, and survival of the California spotted owl, but that there currently is not enough information to conclude that hybridization with barred owls poses a threat (ibid). In their May 15, 2006 conclusion of the 12 month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA. This conclusion was based in part on the fact that barred owl movements into the Sierra Nevada have been at much slower rates than their movements into other parts of western North America.

According to Keene (2005) in a presentation of the Plumas-Lassen Administrative Study spotted owl module, there have been 33 barred owl detections in the entire northern Sierra Nevada (El Dorado National Forest north) since 1989, 20 of which have been between 2001-2004. Of these 20, nine have been barred owls, and eleven have been sparred (barred X spotted hybrid). There have been ten detections (six barred and four sparred) in the Plumas-Lassen Administrative Study analysis area within the HFQLG area.

One barred owl sighting occurred just north of the Empire Project analysis area. A female barred owl was located and moused in fuel treatment unit 3 near Long Valley on the Mount Hough Ranger District in 2002 (Merlin Biological). This owl was not relocated in the subsequent 2003 or 2004 spotted owl calling effort (Shacklee, pers. comm. 2004). More recently, a barred owl has been detected in Butterfly Valley (which is in the Empire Project analysis area) in 2005 and 2006. The potential for the barred owl to establish and compete with spotted owls in the Empire Project analysis area is a possible additional cumulative effect, as evidenced by the presence of this individual in Butterfly Valley.

Summary of Effects

The spotted owl has recently undergone a 12-month status review by the U.S. Fish and Wildlife Service (*Federal Register*, vol. 70, no. 118, June 21, 2005/Proposed Rules). The key uncertainties related to viability in the Sierra Nevada include (1) uncertainty about factors driving population trends; (2) uncertainty about habitat relationships and habitat quality; (3) uncertainty about current distribution, amount, and quality of habitat; and (4) uncertainty about treatment effects, including fuels and silvicultural treatments, on habitat and populations at multiple scales.

On May 15, 2006, after the 12-month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA (FR, Vol 71, N0. 100, May 24, 2006). This conclusion was based in part on the best available data that indicated “most California spotted owl populations in the Sierra Nevada are stable or increasing and adult survival rates show an increasing trend”. The USFWS considered the information presented in a 2006 meta-analysis (Blakesley et al. 2006) and found that populations of California spotted owl in the Sierras showed little evidence of a decline, and concluded that the owls’ status in the Sierra Nevada, which includes Plumas County and the Plumas National Forest, is not deteriorating as is evidenced by the increasing adult survival and stationary trend of the populations.

Within the Empire wildlife analysis area, approximately 60% of the National Forest land is composed of CWHR types considered suitable owl habitat (from Table 3.18). Post Project (Alternative D) approximately 54% of the wildlife analysis area would be composed of these same CWHR types. None of the 23 PACs/SOHAs would be modified, thus maintaining the most important owl habitat for breeding and adult survival. Adult occupancy in the currently occupied PACs and SOHAs is not expected to decline. The decline in owl habitat as a result of the Empire Project within owl Home Range Core Areas and in habitat across the analysis area could increase risk to natal dispersal and short term owl recruitment.Thus, based on PAC and habitat availability, the current adult population and distribution within the analysis area would continue post project, but no short term increase in spotted owls is expected These PACs, SOHAs, and the remaining 54% of the suitable habitat would be in a more fire resilient condition than currently exists, thus providing for a longer term increased retention and recruitment of large tree habitat over the analysis area. This increased availability of habitat in the long term could provide for longer term owl recruitment.

Lee and Irwin (2005), using a combination of population data from the southern Sierra Nevada and canopy cover measurements and forest simulation models, demonstrated that modest fuels treatments (mechanical thinning plus fuelbreak construction) in the Sierra Nevada would not be expected to reduce canopy cover sufficiently to have measurable effects on owl reproduction. They predicted that with mechanical thinning plus fuelbreak construction treatments (including DFPZ construction scenario), in combination with either no fire or mixed, lethal fire scenarios, would not degrade canopy conditions in productive owl territories nor impede improvement of nonproductive territories. In contrast, lethal fire simulations produced a pronounced and lasting negative effect. The general trend with all fuel treatments was towards higher proportions of intermediate canopy covers (40 to 69 percent canopy cover) and lower proportions of sparse canopy cover (0 to 39 percent) over time, whereas lethal fire scenarios produced sparse canopy cover discernible four decades later. “The immediacy of the fire threat creates an urgency to act even as key uncertainties remain” (Lee and Irwin 2005). On May 15, 2006, after a 12 month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA. This conclusion was based in part on the best available data that indicated “most California spotted owl populations in the Sierra Nevada are stable or increasing and adult survival rates show an increasing trend” and that “Forest fuels reduction activities, notably those provided for in the Sierra Nevada Forest Plan Amendment of 2004, may have a short-term impact on owl populations. But fuels reduction will have a long-term benefit to California spotted owls by reducing the risk of stand replacement wildfires that pose a major threat to California spotted owl habitat”.

Alternative A (Proposed Action)

- There would be a potential decrease in spotted owl foraging habitat of about 3,613 acres, and a decrease in nesting habitat of about 1,483 acres, leaving 89.2 percent of the existing suitable foraging habitat and 87.8 percent of the existing suitable nesting habitat on Plumas National Forest acres in the wildlife analysis area.

- A total of approximately 390 acres of suitable nesting and foraging habitat in nine HRCAs would become unsuitable, with an average reduction of 43 acres/HRCA.

- The proposed density of group selection units could result in up to 1,585 acres of planning areas supporting more edge habitat than forest interior habitat creating additional risk and uncertainty associated with habitat suitability.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative A would involve a level of risk to owl habitat in the short term and uncertainty about future owl activity; this level of risk would be less than under alternative C.

- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase the ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of owl habitat as a result of high-intensity wildfire. This alternative would reduce the risk of loss from wildfires for a minimum of six PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative B (No Action)

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

The indirect effects of no action would include the potential for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn. Increased rates of spread would result in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable habitat for productive owl sites could become patchy or unevenly distributed, and the abundance of owls in the wildlife analysis area could decline.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of spotted owl habitat from stand replacement fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USDA

2001a), which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

With the current Plumas National Forest woodcutting program, the entire Empire Project treatment units and analysis area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use in the areas used by spotted owls, especially during the breeding season, could cause disturbance that might disrupt and preclude successful nesting. No roads would be closed or decommissioned under this alternative.

- There would be no short-term reduction in owl habitat, no treatments in HRCAs, and no change in forest interior habitat.
- There would be no fuel treatments, which would make habitat vulnerable to high-intensity wildfire and increase the risk of large-scale habitat fragmentation, loss of PACs, and loss of owl habitat.
- Implementation of Alternative B involves little to no risk to owl habitat in the short term and thus short term future owl activity would be less uncertain. Not reducing the risk of stand replacement wildfire would pose a threat to long term availability and recruitment of owl habitat.

Alternative C

- There would be a potential decrease in spotted owl foraging habitat by about 3,775 acres, and a decrease in nesting habitat by about 1,579 acres, leaving 88.9 percent of the existing suitable foraging habitat and 87 percent of the existing suitable nesting habitat on Plumas National Forest acres in the wildlife analysis area.
- Approximately 401 acres of suitable nesting and foraging habitat in nine HRCAs would become unsuitable, with an average reduction of 45 acres/HRCA.
- The proposed density of group selection units could result in up to 6,975 acres of planning areas supporting more edge habitat than forest interior habitat, which would create more risk and uncertainty associated with habitat suitability than all action alternatives.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative C would produce the highest risk of all alternatives to owl habitat in the short term and greatest uncertainty about future owl activity.
- The implementation of fuel treatments could decrease the likelihood of active crown fires and increase the ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of owl habitat from high-intensity wildfire. This alternative would reduce the risk of loss from

wildfires for a minimum of six PACs immediately adjacent to and upslope of the proposed fuel treatment units.Alternative D (Preferred Alternative)

- There would be a potential decrease in spotted owl foraging habitat by about 3,507 acres, and a decrease in nesting habitat by about 1,472 acres, leaving 89.6 percent of the existing suitable foraging habitat and 87.8 percent of the existing suitable nesting habitat on Plumas National Forest acres in the wildlife analysis area.

- Approximately 353 acres of suitable nesting and foraging habitat in nine HRCAs would become unsuitable, with an average reduction of 39 acres/HRCA.

- The proposed density of group selection units could result in more edge habitat than forest interior habitat. This would create additional risk and uncertainty associated with habitat suitability, but this risk would be less than alternatives A and C due to lower group density providing for larger forested blocks between groups.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative D would result in a level of risk to owl habitat in the short term and uncertainty about future owl activity; this level of risk would be less than either alternatives C and A.

- Implementation of fuel treatments could decrease the likelihood of active crown fires and increase the ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of owl habitat as a result of high-intensity wildfire. This alternative would reduce the risk of loss from wildfires for a minimum of six PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative E

- There would be a potential decrease in spotted owl foraging habitat by about 1,139 acres, and a decrease in nesting habitat by about 436 acres, leaving 96.6 percent of the existing suitable foraging habitat and 96.4 percent of the existing suitable nesting habitat on NF acres in the wildlife analysis area. It is acknowledged that the quality of the foraging habitat may be reduced due to understory thinning and removal of structural attributes comprising the understory canopy layer.

- Approximately 163 acres of suitable nesting and foraging habitat in nine HRCAs would become unsuitable, with an average reduction of 18 acres/HRCA.

- The proposed density of group selection units could result in more edge habitat than forest interior habitat, creating additional risk and uncertainty associated with habitat suitability. This risk, however, would be less than alternatives A and C due to lower group density, which would provide for larger forested blocks between groups.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50+ years in group selection areas. Implementation of alternative E would involve a level of risk to owl habitat in the short term and uncertainty about future owl activity; this level of risk would be less than alternatives A, C, and D.

- Implementation of the fuel treatments proposed in alternative E could result in a higher likelihood of crown fire events at wind speeds greater than 22 mph and would not be as effective for fire management to suppress, control, and contain wildfire compared to alternatives A, C, and D. Thus, there would be more potential for increased large-scale habitat fragmentation, loss of PACs, and loss of owl habitat as a result of high-intensity wildfire compared to the other action alternatives. This alternative could reduce the risk of loss from wildfires for a minimum of six PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative F

- There would be no decrease in spotted owl foraging or nesting habitat.
- None of the suitable nesting habitat in the nine HRCAs would become unsuitable.
- There would be no change in forest interior habitat quality.
- Based on the direct/indirect effects, implementation of this alternative would contribute slightly to cumulative effects on spotted owl and spotted owl habitat as fuel treatments would remove some structural components such as live trees, snags, and down logs within owl habitat. Implementation of alternative F would involve little to no risk to owl habitat in the short term, making future owl activity more certain.
- Implementation of the fuel treatments proposed in alternative F could result in effects on habitat that are similar to those described under alternative E, but the treatments would be slightly less effective than alternative E because there would be fewer acres treated with biomass removal.

Determination. No Action. It is determined that the No Action Alternative will not affect the spotted owl. Alternative B is not without risk to spotted owl habitat, as no action is taken to reduce existing fuel levels, create areas that could allow for better and more efficient fire suppression efforts, and leaves existing owl habitat vulnerable to large scale fragmentation as a result of wildfire.

Determination. Action Alternatives: It is determined that the Empire Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. This determination is based on 1) PAC avoidance; 2) retention of 88.9% to 96.6% of existing foraging habitat and 87% to 96.4%% of existing nesting habitat on National Forest within an 94,502 acre analysis area (Alternatives A, C, D, E), and 100% retention with Alternative F; 3) at least 96% of all PAC and HRCA combined acres would not be treated with action alternatives; 4) with an average suitable habitat reduction within HRCAs ranging from 18 to 43 acres within 9 of the 23 HRCAs within the analysis area (Alternatives A, C, D, E), owl occupancy of each established PAC within the analysis area should remain the same as pre-treatment; 5) the greatest risk to owl occupancy occurs within three PAC/HRCAs that have not been occupied by owls the last two years that they were surveyed, and; 6) creation of a network of fuel reduction areas (DFPZ's) designed to reduce the loss of habitat due to wildfire. It is acknowledged that implementation of alternatives involve some risk to habitat and subsequent uncertainty with regards to owl activity. Alternative C poses greatest risk and uncertainty, with A, D, E, and F having less risk respectively.

As a **Managemnent Indicator Species,** the Plumas NF LRMP (as amended by the SNFPA) requires spotted owl forest-scale habitat monitoring of habitat trends in network Territories (54 SOHA's) and status and change monitoring at the Bioregional scale (USDA 2001a, Page E-50). The habitat and population status and trend data for the spotted owl is summarized below. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (USDA 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Impacts to spotted owl nesting habitat can be related to the amount of CHWR size classes 5M, 5D and 6 that have been tracked across the HFQLG Pilot Project, which includes the Plumas, Lassen and Sierraville District of the Tahoe (USDA 1999 pg. 2-8, HFQLG 2005 Monitoring Summary Report (3/3/2006). Reductions are documented and a cumulative total is tracked to make sure that no greater than a 10% reduction occurs over the life of the Pilot Project (1999 to 2009). There are currently 186,394 acres classified as 5M, 5D and 6 in the pilot project area. According to the HFQLG 2005 Monitoring Summary Report (3/3/2006) habitat suitability on 3,282 acres has or will have been reduced (includes the projected acres of reduction for the Empire Project, based on projects with a signed decision). These acres total approximately 1.7% of the acres in 5M, 5D and 6 within the Pilot Project. These acres have been reduced to either CWHR 5P in DFPZ's or CWHR 1 and 2 in group selections.

Most of the projects affecting the spotted owl on the Plumas NF have been HFQLG projects, so the amount of 5M, 5D, and 6 affected by HFQLG appears to be a good indicator of habitat trend. The 1.7% of 5M, 5D and 6 habitat affected to date is relatively low compared to the overall amount of suitable habitat available across the pilot area. Thus across the HFQLG area there has been a slight decrease in nesting/roosting habitat since 2000.

Population Status and Trend. The PNF MIS Report (PNF 2006) provides background information on the status, population estimates and trends of spotted owl populations located on the Plumas NF. The Plumas LRMP, Table 4-4, set a minimum management objective of providing suitable habitat for a Forest-wide network of 54 spotted owl habitat areas. The Plumas LRMP established this minimum objective in order to provide for owl viability on the Forest. In addition, Table 4-2 from the LRMP estimated 69 owl pairs in the 1st decade (1986 – 1995) and maintaining that same number of pairs over the 2nd decade (1996 – 2005). The forest exceeded that projection in 1991 and has maintained those numbers through 2005. The viability threshold defined by the Plumas LRMP of maintaining 54 Spotted Owl Habitat Areas (SOHAs) has been accomplished since 1991. In addition, the 296

California spotted owl PACs currently delineated on the Plumas are widely distributed across the forest where suitable habitat is present and available.

The Forest calculated occupancy rate information from 1991 data on the 54 Spotted Owl Habitat Areas (SOHAs) being monitored under the forest plan at that time. The 1991 occupancy rates showed that owl pairs at the time occupied 74% of habitat areas, singles occupied 22%, and that 4% of the sites had no owls or were unoccupied. The Plumas National Forest supports 296 PACs. Based on monitoring data collected on the Forest, these PACs contain a range of 135 to 163 owl pairs, and 93 to 142 single owls (USDA 2007a). Occupancy rates of owl sites indicate a stable trend on the forest based on Plumas NF data from 1991 and PLAS data from 2005. This spotted owl population is well above the estimated number of owl pairs projected by the Forest LRMP during the 1st and 2nd decade (USDA 1988a, Chapter 4, page 4-14).

Bio-regional monitoring (including the Plumas Lassen Administrative Study (PLAS) spotted owl module, and the latest U.S. Fish & Wildlife Service listing determination indicates a stable to slightly upward population trend for the California spotted owl (Federal Register 50 CFR 17, Volume 71, Number 100, May 24, 2006). Plumas National Forest data indicates that spotted owls are widely distributed across the forest where suitable habitat is currently present (PNF 2006).

The five action alternatives avoid habitat modification within PACs/SOHAs. No changes in spotted owl PAC/HRCA/SOHA occupancy, or the spotted owl population on the PNF is expected to occur. With implementation of any action alternative, spotted owl habitat could be better protected from stand replacement fires (from the existing condition) for the next 10-20 years. The project-level habitat impacts will contribute to the current forest-wide trends of short term reductions for longer term protection of PACs, SOHAs and HRCAs. These alternatives would be accompanied by an administrative study within portions of the project, involving various cooperators, including Pacific Southwest Research Station, that would focus on key uncertainties associated with the proposed vegetation management actions and its impact to spotted owl behavior and population dynamics.

Environmental Consequences — Northern Goshawk

Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable goshawk nesting habitat including affected acres in the wildlife analysis area.

Effects Common to the Action Alternatives

The 94,502 acre wildlife analysis area encompasses 76,121 Plumas National Forest acres. This area was delineated in order to put habitat treatments within the context of the surrounding landscape. Based on the CWHR model, about 45,927 acres of the 76,121 Plumas National Forest (60 percent of the 76,121 acres) may be considered suitable goshawk nesting habitat (classes 4M, 4D, 5M, and 5D). An additional 14,448 acres (19 percent of the 76,121 acres) may be considered suitable foraging habitat (Sierra mixed conifer, ponderosa pine, red fir, and lodgepole pine in classes 3M, 3D, 4P, and 5P). Dunk and Keane (unpublished analyses) found that the probability of a stand being a nest site increased with increasing amounts of class 4D and 5D stands. In the Empire wildlife analysis area, 16 percent of the above nesting habitat is comprised of 5D, 10 percent of 5M, 25 percent of 4D, and 49 percent of 4M.

Protected Activity Centers (PACs). Surveys for goshawk were conducted in 2004 and 2005. In the proposed alternatives, all new and existing goshawk nest sites were excluded from treatment. No activities proposed in the Empire Project alternatives would occur in any goshawk PACs within the wildlife analysis area (USDA 2007, attachment 9). Project activities could occur within 0.25 mile from known nest sites in all but two of the designated PACs. For possible unknown goshawk nesting sites that do not occur in PACs, proposed activities could cause short-term displacement and disruption during the time equipment is present and underburning activities are taking place. If an active goshawk nest is found during project implementation, actions would be modified to avoid the stand that contains the nest, and a Limited Operating Period would be implemented within 0.25 mile of the active nest site. Implementation of the action alternatives during the nesting season around known nest sites could cause disturbance that may disrupt nesting activity and potentially lead to nest failure. Site-specific Limited Operating Periods designed to prevent disturbance to known goshawks can be found in appendix F of this FEIS.

Alternatives A, C, D, E, and F (Action Alternatives)

Direct/Indirect Effects — Northern Goshawk. Please refer to the spotted owl discussions for direct effects, which would apply to the northern goshawk. The goshawk would be similarly affected by changes to suitable habitat (CWHR classes 4M, 4D, 5M, and 5D) as a result of implementing fuel treatments, group selection harvests, and individual tree selection harvests as proposed in the action alternatives. The number of goshawk nesting habitat acres that would potentially be reduced by the alternatives is discussed below in the summary for each alternative. In terms of habitat changes to 4D and 5D (assuming higher probability of goshawk use of these types based on the findings of Dunk and Keane's unpublished analyses), 89 to 92 percent of CWHR 5D, and 92 to 95 percent of CWHR 4D, would be retained with the action alternatives.

All new roads that would be constructed in support of the Empire Project would be closed/decommissioned upon project completion. Thus, no long-term increase in human activities are expected as a result of the action alternatives. No roads would be constructed in PACs. As part of a strategic system of DFPZs, the Empire Project would help eliminate understory fuel buildup and may reduce the potential for high-severity wildfires, which have the potential to eliminate vast tracts of habitat.

Prey species (small mammals, birds) preferred by goshawks would respond to opening up forested stands with fuel treatments and group selection harvest units. Based on CWHR modeling, it is known that several bird species respond favorably to either opening up forested stands and/or openings, while some do not (USDA 1999, appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. Responses of prey species, including small mammal and passerine bird use of group openings, is one of the main objectives of the post-implementation monitoring that would be conducted by the Pacific Southwest Research Station through the Plumas-Lassen Administrative Study. This study could provide information regarding the response by these prey species to the DFPZs and group selections.

Cumulative Effects — Northern Goshawk. Please refer to the cumulative effects discussion above for the California spotted owl, as well as cumulative effects discussed in the BA/BE (USDA 2007).

Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the means by which land managers control them, have contributed, and may continue to contribute to loss of habitat for this species.

In 2004 the Dancehouse-Chandler fuel treatment projects were planned and implementation of the hand thinning began in the summer of 2004. These areas consisted of three separate parcels present in the wildland urban interface adjacent to the project area along Spanish Creek near Oakland Camp and the north end of American Valley. The Chandler Project consisted of 62 acres mechanical thinning, 10 acres of hand thinning, and 19.5 acres of a combination of mechanical and hand thinning within the RHCA. The Dancehouse Project consisted of 33 acres mechanical thinning and approximately 278 acres of hand thinning. Based on the treatment prescriptions within goshawk foraging habitat, the analysis indicated that neither the Dancehouse or Chandler projects would have a direct effect on goshawk individuals, PAC network, or the distributional range of the goshawk on the Plumas National Forest, or goshawk populations. CWHR type providing nesting habitat would remain nesting habitat, foraging habitat would remain foraging habitat, thus there would be no indirect or cumulative effect (BE/BA Chandler – Dancehouse Project March 26, 2004).

The 2006 Corridor Fuel Reduction Project is designed to reduce stand density by thinning from below, reducing ladder and canopy fuels. Analysis indicates that within this 100 acre project area, approximately 40 acres of SMC4D (composed primarily of trees 11-20” dbh) would be thinned to 40% canopy cover resulting in SMC4M. This would result in a total of 63 acres of SMC4M, which is the same amount of foraging acres available prior to treatment.

The Old Sloat Fuels Reduction project, discussed earlier as a foreseeable project on Beckwourth Ranger District, is designed to connect with the Empire project to improve fuel treatment continuity. The BA/BE developed for this project (USDA 2007) indicates that the proposed action would reduce nesting habitat quality on 125 acres and increase foraging habitat quality on 125 acres. No goshawk PACs would be treated, and species viability would not be compromised.

Table 3.30 provides a cumulative total of the amount of suitable goshawk nesting habitat that would be impacted by the fuel treatments and group selection and individual tree selection harvests implemented under the HFQLG Pilot Project on the Mount Hough Ranger District.

Table 3.30. Cumulative reductions in northern goshawk nesting habitat on the Mount Hough Ranger District.

	Past project Meadow Valley (acres)	Present Project Empire Project Analysis Area* (acres)					**Potential Cumulative Change**
Northern Goshawk Nesting Habitat	**Alternative C**	**Alternative A**	**Alternative C**	**Alternative D**	**Alternative E**	**Alternative F**	
	-4,282	-5,101	-5,354	-4,980	-1,576	0	-4,282 to 9,636

*Cumulative reduction in nesting habitat in analysis area would increase 125 acres due to reduction projected to occur in 4M, 4D with the Old Sloat Fuels project on Beckwourth RD.

Data sets from studies in the western United States (Woodbridge and Detrich 1994, Destefano et al. 1994; Reynolds et al. 1994; Reynolds and Joy 1998) report a range of crude densities from one territory per 2,123 acres to one territory per 4,003 acres; territory centers are roughly 1.9 to 2.3 miles apart. These crude densities include both suitable and unsuitable habitat within the study areas. The crude densities for goshawk territories (PACs) in the Empire wildlife analysis area are much lower than these figures: one territory for 7, 875 acres in the entire analysis area; one territory per 6,343 acres on National Forest acres in the wildlife analysis area; or one territory per 3,827 acres based on total suitable National Forest nesting habitat in analysis area. Territory centers range from dense (0.5 to 1 mile apart in Butterfly Valley) to scattered (4 to 5 miles apart). Based on the density and spacing of known goshawk territories, it appears that the crude density of goshawk territories in the Empire Project analysis area may be less than what has been reported in the literature. Densities may be a product of the past activities (timber sales, wildfires) that have occurred in the analysis area. The large blocks of unsuitable nesting habitat created by three large wildfires contribute to lower densities and increased spacing.

Based on table 3.30, the Empire Project would potentially contribute to a cumulative reduction in goshawk nesting habitat in the HFQLG Pilot project area. It is not anticipated that the cumulative habitat reduction would result in loss of occupancy and productivity of known goshawk PACs in the wildlife analysis area. This is based on the location of project activities in relation to known PACs, no habitat alteration in PACs, distribution of known PACs, and a minimum of 88 percent retention of available suitable nesting habitat distributed across the analysis area following project implementation.

Summary of Effects

There is little difference in the effects to goshawk habitat between Alternatives A, C, and D in regards to implementation of actions designed to create DFPZ’s. There are slight changes as a result of implementing group selection and ITS with biomass (USDA 2007, tables 26a, 26b). No changes in goshawk PAC occupancy, or the goshawk population on the PNF is expected to occur.

Alternative A (Proposed Action)

- There would be a potential decrease in goshawk nesting habitat by about 5,101 acres, leaving 88.8 percent of the existing suitable nesting habitat on Plumas National Forest acres within the wildlife analysis area.

- None of the actions proposed in the alternatives would occur in goshawk PACs.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative A would involve a level of risk to goshawk habitat in the short term and uncertainty about future goshawk activity; this level of risk is less than alternative C.

- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of goshawk habitat as a result of high-intensity wildfire. This alternative would reduce the risk of loss from wildfires for a minimum of three PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative B (No Action)

Direct/Indirect Effects. There would be no direct effects on the goshawk or existing goshawk habitat. No treatment activities that would cause disturbance to nesting or foraging birds.

The indirect effects of no action would include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread. This would result in potential loss of suitable goshawk nesting habitat and other important prey habitat attributes such as large trees and snags and down woody material.

Cumulative Effects. The no-action alternative would not provide for the long-term protection of goshawk habitat from stand replacement fire, and there would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted for the Sierra Nevada Forest Plan Amendment [USDA 2001a]).

With the current Plumas National Forest woodcutting program, the Empire Project analysis area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use in the areas used by goshawks, especially during the nesting season, could cause disturbance that would disrupt and preclude successful nesting.

- There would be no short-term reduction in goshawk habitat
- The lack of fuel treatment would leave habitat vulnerable to high-intensity wildfire, increasing the risk of large-scale habitat fragmentation, loss of PACs, and loss of goshawk habitat.
- Implementation of alternative B would result in little to no risk to goshawk habitat in the short term, and thus, future goshawk activity would be less uncertain.

Alternative C

- There would be a potential decrease in goshawk nesting habitat by about 5,354 acres, leaving 88.3 percent of the existing suitable nesting habitat on Plumas National Forest acres within the wildlife analysis area.

- None of the actions proposed in the alternatives would occur in goshawk PACs.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative C would result in the highest risk of all alternatives to goshawk habitat in the short term and greatest uncertainty about future goshawk activity.

- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of goshawk habitat as a result of high-intensity wildfire. This alternative would reduce the risk of loss from wildfires for a minimum of three PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative D (Preferred Alternative)

- There would be a potential decrease in goshawk nesting habitat by about 4,980 acres, leaving 89.1 percent of the existing suitable nesting habitat on Plumas National Forest acres within the wildlife analysis area.

- None of the actions proposed in the alternatives would occur in goshawk PACs.

- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternative D would result in a level of risk to goshawk habitat in the short term and uncertainty about future goshawk activity; this level of risk would be less than alternatives A and C.

- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of goshawk habitat as a result of high-intensity wildfire. This alternative would reduce the risk of loss from wildfires for a minimum of three PACs immediately adjacent to and upslope of the proposed fuel treatment units.

Alternative E

- There would be a potential decrease in goshawk nesting habitat by about 1,576 acres, leaving 96.5 percent of the existing suitable nesting habitat on Plumas National Forest acres within the wildlife analysis area.

- None of the actions proposed in the alternatives would occur in goshawk PACs.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50+ years in group selection areas. Implementation of alternative E would result in a level of risk to goshawk habitat in the short term and uncertainty about future goshawk activity; this level of risk would be less than alternatives A, C, and D.
- Implementation of fuels treatments could have a higher likelihood of crown fire events at wind speeds greater than 22 mph and would not be as effective for fire management to suppress, control, and contain wildfire than alternatives A, C, and D; thus, there would be more potential for increased large-scale habitat fragmentation, loss of PACs, and loss of goshawk habitat as a result of high-intensity wildfire than with the other action alternatives. This alternative would reduce the risk of loss from wildfires for a minimum of three PACs immediately adjacent to and upslope of the proposed fuel treatment units, but not as effectively as the other action alternatives

Alternative F

- There would not be a reduction in the amount of goshawk foraging or nesting habitat.
- None of the actions proposed in the alternatives would occur in goshawk PACs.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat, as fuel treatments would remove some structural components such as live trees, snags, and down logs within goshawk habitat. Implementation of alternative F would result in little to no risk to goshawk habitat in the short term, and thus, future goshawk activity would be less uncertain.
- Implementation of fuel treatments would be similar to effects on habitat as described in alternative E, but would be slightly less effective than alternative E because there would be less acres treated with biomass removal.

Determination. No Action. It is determined that the No Action Alternative will not affect the goshawk.

Determination. Action Alternatives: It is determined that the Empire Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the northern goshawk. This determination is based on 1) PAC avoidance; 2) retention of 88.3% to 96.5% of existing nesting habitat on National Forest within an 94,502 acre analysis area (Alternatives A, C, D, E), and 100% retention with Alternative F; and 3) creation of a network of fuel reduction areas designed to reduce the loss of habitat due to wildfire.

As a **Managemnent Indicator Species,** the Plumas NF LRMP (as amended by the SNFPA) requires goshawk forest-scale habitat monitoring of habitat trends in network Territories (PACs) and status and change monitoring (USDA 2001a p. E-51). The habitat and population status and trend data for goshawk is summarized below. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Effects to some goshawk nesting habitat can been related to the amount of CHWR size classes 5M, 5D and 6 that have been tracked across the HFQLG Pilot Project, which includes the Plumas, Lassen and Sierraville District of the Tahoe. Reductions are documented and a cumulative total is tracked to make sure that no greater than a 10% reduction occurs over the life of the Pilot Project (1999 to 2009). There are currently 186,394 acres classified as 5M, 5D and 6 in the pilot project area. To date habitat suitability on 3,282 acres has or will have been reduced (includes the projected acres of reduction for the Empire Project, based on projects with a signed decision). These acres total approximately 1.7% of the acres in 5M, 5D and 6 within the Pilot Project.

Most of the projects affecting the goshawk on the Plumas have been HFQLG projects, so the amount of 5M, 5D, and 6 affected by HFQLG appears to be a good indicator of habitat trend. The 1.7% of 5M, 5D and 6 habitat affected to date is relatively low compared to the overall amount of suitable habitat available across the pilot area. Thus across the HFQLG area there has been a slight decrease in habitat since 2000.

Additional goshawk nesting habitat (4M, 4D) has been tracked at the project level and at the RD level. This tracking of nesting habitat is displayed in the Empire BA/BE, Table 33 page 131. The cumulative reductions in total nesting habitat as a result of implementing HFQLG projects on Mt. Hough Ranger District range from 6,087 acres (cumulative with Alternative E of Empire) to 9,865 acres (cumulative with Alternative C of Empire).

Population Status and Trend. The combination of historic information and more recent inventory and monitoring data, indicate that the northern goshawk populations in the Sierra Nevada including the Plumas NF are relatively secure with the increase in occupancy of previously unoccupied sites indicating potentially increasing populations at the forest scale (PNF 2006, USDA 2007a).

The five action alternatives avoid habitat modification within PACs. No changes in goshawk PAC occupancy, distribution or the goshawk population on the PNF is expected to occur. With implementation of an action alternative, goshawk habitat could be better protected from stand replacement fires (from the existing condition) for the next 10-20 years. The project-level habitat impacts will contribute to the current forest-wide trends of short term reductions for longer term protection of PACs and goshawk habitat.

Environmental Consequences — Mesocarnivores (Marten & Fisher)

Acres of suitable habitat and habitat connectivity are the indicator measures used to show the effects of the proposed action and alternatives on changes of availability of suitable Pacific fisher and American marten habitat.

Effects Common to the Action Alternatives

The 94,502 acre wildlife analysis area encompasses 76,121 National Forest acres. This area was delineated in order to put habitat treatments within the context of the surrounding landscape. Based on the VESTRA mapping, about 18,750 (25 percent of the 76,121 acres) in the wildlife analysis area may be considered suitable denning habitat for the Pacific fisher (Sierra mixed conifer, white fir, montane hardwood, ponderosa pine, and red fir classes 4D and 5D), and about 27,177 acres (36 percent of the 76,121 acres) may be considered suitable foraging habitat (classes 4M and 5M) (refer to table 3.24). About 18,554 acres (25 percent) in the wildlife analysis area may be considered suitable denning and resting habitat for marten (Sierra mixed conifer, white fir, and red fir classes 4D and 5D), and about 26,515 acres (35 percent) may be considered suitable foraging habitat (Sierra mixed conifer, white fir, and red fir classes 4M and 5M) (refer to table 3.25).

Alternatives A, C, D, E, and F (Action Alternatives)

Direct/Indirect Effects — Mesocarnivores. Please refer to the direct effects discussion for the spotted owl for changes to suitable habitat (CWHR classes 4M, 4D, 5M, and 5D) as a result of implementing fuels treatments, group selection harvests, and individual tree selection harvests under each action alternative. The proposed treatments occur at all elevations across the analysis area, from a low of 3100 feet up to 7,711 feet. The number of denning/foraging habitat acres that could be reduced by each alternative is discussed below for each alternative.

There are no known fisher or marten den sites located within the project or on the Plumas NF. For fisher and marten habitat, based on figures in BA/BE tables 18a and b and 26a and b, alternative A would reduce CWHR 4D and 5D (denning habitat) habitat within the analysis area on 1,596 acres and reduce 4M and 5M (foraging habitat) quality on 3,506 acres. Alternative C would reduce 4D and 5D habitat on 1,690 acres and reduce 4M and 5M quality on 3,664 acres. Alternative D would reduce 4D and 5D habitat on 1,581 acres and reduce 4M and 5M quality on 3,398 acres. Alternative E would reduce 4D and 5D habitat on 1,581 acres, with essentially no change in 4M and 5M. Alternative F converts about 1133 acres of denning habitat to foraging habitat, by opening up 4D and 5D to 4M and 5M.

Approximately 3 miles of new National Forest System roads would be constructed; these would be closed at completion of the project. Thus, no long-term increases in human activities are expected as a result of this action. Approximately 48.3 to 113 miles of roads are proposed for reconstruction (brushing, blading). There would be approximately 6 miles of temporary roads constructed, which would be decommissioned upon completion of the project. The action alternatives call for the decommissioning of 12 to 15.6 miles of existing roads, and closing an additional 11.1 to 17.1 miles of existing road. This should reduce human activities (such as snag removal and log removal through woodcutting) that often lead to decreased habitat capability (habitat loss, disturbance) for mesocarnivores. Open road density in the wildlife analysis area would decline under all action alternatives from the existing 2.4 miles per square mile to about 2.2 miles per square mile, which would still provide for low habitat capability for forest mesocarnivores. With implementation of the proposed strategic system of DFPZs, the Empire Project would help eliminate understory fuel buildup and may reduce the potential for high-severity wildfires, which have a potential to eliminate vast tracts of habitat for the marten and fisher.

The increased diversity and edges created by groups within forested stands may provide increased foraging opportunities for martens. Responses of prey species' (small mammals, birds) use of group openings is one of the main objectives of the post-implementation monitoring that would be conducted by the Pacific Southwest Research Station through the Plumas-Lassen Administrative Study. This study could provide information regarding the response by these prey species to the DFPZs and group selection harvesting.

Cumulative Effects — Mesocarnivores. Please refer to the cumulative effects discussion above for the California spotted owl, as well as cumulative effects discussed in the BA/BE (USDA 2007a). Cumulative effects on forest mesocarnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the means by which land managers control them, have contributed, and may continue to contribute to loss of habitat for these species.

The action alternatives would not increase any large scale, high contrast fragmentation above existing levels (the existing brushfields and plantations present as a result of three large wildfires are an example of large scale, high contrast fragmentation) . With implementation of Alternatives A and C, a reduction in forest interior habitat quality would occur at the stand level within several planning areas (density of group units per alternative is discussed elsewhere in this document). The cumulative effect of recent private land clearcuts, older National Forest plantations, the large brushfields created by past wildfires, together with implementation of groups at high density would result in increased "patchwork" of open habitat and young age class vegetation between mature forested stands within the analysis area. This would increase edge effects and possibly increase potential risks to forest interior species movement and use in the wildlife analysis area. These risks include avoidance of particular areas, barrier effects, and altered movements. Thus the Empire Project would act cumulatively with past actions to incrementally reduce the connectivity of habitat within the analysis area although connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high intensity fire. Connectivity of dense forest habitat (M and D stands in size class 3, 4 and 5) is displayed in attachment 10 in the BA/BE (USDA 2007). No barriers to species movements across the wildlife analysis area are created. Habitat connectivity is maintained across the Forest north to south from Middle Fork Feather River to Grizzly Ridge and on to Mt. Jura.

The greatest concern for the Pacific fisher in the Sierra Nevada range is the risk of further fragmentation due to large stand-replacing fire (USDA 2004, p. 244). The design features of the proposed fuel treatments would retain habitat elements within the range of those used by fishers for foraging and dispersal. Also, the design features would likely not create large barriers to further expansion and connectivity for fishers (ibid. p. 243). The DFPZs would be created to reduce the potential for large stand-replacing fires.

Table 3.31 incorporates CWHR vegetation and GIS modeling, which indicate that action alternatives A, C, and D would break up larger blocks of contiguous habitat (greater than 250 acres in size) and create smaller habitat blocks (25 to 250 acres), as well as create larger blocks, but with a subsequent reduction in the average block size. Changes in block size per alternative is based on (1) opening up and simplifying stand structure and forest canopy cover with Defensible Fuel Profile Zones, and (2) group density exceeding 11.4 percent, which would reduce forest interior quality between groups in the planning areas. Alternatives D and E, with group density at 11.4 percent or less, would increase the risk of reducing forest interior species movement and use in the planning areas but at potentially less risk than the other alternatives that propose group selection.

Table 3.31. Pacific fisher habitat blocks (contiguous fisher habitat and CWHR classes 4M, 4D, 5M, and 5D) by alternative*.

Alternative	25- to 125-acre Habitat Block			125- to 250-acre Habitat Block			≥250-acre Habitat Block		
	No. Habitat Blocks	Size of Block (acres)	Size Range of Blocks (acres)	No. Habitat Blocks	Size of Block (acres)	Size Range of Blocks (acres)	No. Habitat Blocks	Size of Block (acres)	Size Range of Blocks (acres)
A	40	56	27–123	9	197	131–232	20	1,762	264–11,416
B	35	56	27–123	7	187	131–231	18	2,314	279–27,212
C	40	61	28–123	8	192	131–232	24	1,190	264–4,388
D	39	57	27–123	6	189	131–231	22	1,713	264–15,047
E	35	56	27–123	7	187	131–231	18	2,314	279–27,212
F	35	56	27–123	7	187	131–231	18	2,314	279–27,212

Note: Alternative B reflects existing condition

***Analysis based on fishers detected more frequently in contiguous forest stands over 247 acres and 126-247 acres than in smaller stands (as reported in *Federal Register*, April 8, 2004, Vol. 69, No. 68).**

Of the action alternatives, alternatives E and F have the potential to provide the most contiguous acres of habitat and provide the largest average size habitat block than the other alternatives. Alternatives A, C, and D have the potential to isolate large blocks of suitable habitat, with alternative C providing the smallest average size block in stands greater than 250 acres than all alternatives (the risk of degrading fisher habitat block size would increase over other alternatives). The maps in attachment 11 of the BA/BE depict the CWHR classes 4M to 5D (suitable fisher habitat) continuity across the wildlife analysis area. The maps show a worst case, appearing as if all habitats have been removed; however, the forest habitat is still in place, just with a more open canopy which reduces quality.

It does not appear that fishers inhabit the HFQLG Pilot Project area. If the fisher were reintroduced into northern California, it would probably be several years after reintroduction before available habitat would become fully occupied (ibid. p. 243). Based on the home range and stand size reported in the April 8, 2004, *Federal Register*, it appears as if the Empire wildlife analysis area would support large blocks of contiguous suitable habitat that could support fisher in the future, both in terms of contiguous habitat and stands over 125 acres in size (USDA 2007, table 3.21, attachment 11). Based on studies of home range sizes referenced above (*Federal Register,* April 8, 2004), estimates of potentially suitable and contiguous habitat, that must be present before an area can sustain a population of fishers, range from 31,600 acres in California; 39,780 acres in the northeastern United

States; and 64,000 acres in British Columbia. Based on table 3.31, it appears as if the Empire project would fall short of this acreage figure under existing conditions. Thus, the Empire wildlife analysis area may not support habitat attributes needed to contribute to the potential for recovery of the species in this area of the Plumas National Forest.

Zielinski et al (2005) identified candidate conservation areas for fishers using fisher and marten suitability models. The northern portion of the Empire wildlife analysis area falls into an area the model predicted to have a high potential for conservation and reintroduction of fisher. This area is dominated by the private land in and around Indian Valley, which is not fisher habitat. As Zielinski points out, the areas predicted in the model need additional on-the-ground habitat suitability evaluation, including implications of ownership, to potential conservation activities. Portions of the area predicted to be a candidate area for fisher reintroduction would be treated with the Empire project. Project actions would reduce the risk of stand replacement fire from reaching habitat present between Indian Valley and Arlington Ridge. Realistically, based on the location, known habitat, land ownership and overall unsuitability for fisher reintroduction of this candidate site, further evaluation of the model is warranted.

As part of a strategic system of defensible fuel profile zones, this project will help reduce understory fuel buildup and reduce the potential for high-severity wildfires, which have a great potential to eliminate vast tracts of habitat for marten and fisher. Fire history, as well as the large parcels of burned over areas within the Empire Project, indicates the area is prone to large stand-replacing fires. Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control, and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation, and loss of marten and fisher habitat as a result of high intensity wildfire. Action alternatives would decrease the risk of habitat connectivity loss due to wildfire in the upper elevational zones along Grizzly Ridge. Placement of strategic fuel reduction zones to reduce the threat of fire is a measure that can protect marten habitat availability, protect large structural elements within habitats, retain larger contiguous habitat blocks and provide connectivity.

Based on the direct/indirect effects, implementation of all action alternatives would contribute to cumulative effects on mesocarnivores and mesocarnivore habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas under Alternatives A, C and D. With Alternative E, there would be a cumulative reduction in habitat for the next 50+ years in group selection areas. Implementation of Alternative C would result in the highest risk of all alternatives to mesocarnivore habitat in the short term and greatest uncertainty about future mesocarnivore activity. Implementation of Alternative E would result in a level of risk to mesocarnivore habitat in the short term and uncertainty about future mesocarnivore activity; this level of risk would be less than Alternatives A, C, and D. Implementation of Alternative F would result in little to no risk to mesocarnivore habitat in the short term, and thus, future mesocarnivore activity would be less uncertain Based on known detections of marten on the PNF, no changes in marten occupancy or populations on the PNF would occur.

Alternative B (No Action)

Direct/Indirect Effects — Mesocarnivores. There would be no direct effects on forest mesocarnivores or their habitat because no activities would occur that would cause disturbance to denning, resting, dispersing, or foraging animals. There are no known den sites located within the project or on the Plumas NF for fisher or marten.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn. This could lead to increased rates of spread, resulting in potential loss of suitable forest habitat for mesocarnivores and other important prey habitat attributes such as large trees and snags and down woody material.

With the current Plumas National Forest woodcutting program, the entire Empire Project analysis area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use in any areas used by marten, especially during the denning season, could cause disturbance that would disrupt and preclude successful denning.

Cumulative Effects — Mesocarnivores. The no-action alternative would not provide for the long-term protection of forest mesocarnivore habitat from stand replacement fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on the analysis conducted for the Sierra Nevada Forest Plan Amendment (USDA 2001a). The cumulative effect of recent private land clearcuts, older National Forest plantations, the large brushfields created by past wildfires together with the potential for large scale high intensity wildfire, could result in additional large scale habitat fragmentation and reduced connectivity. Large-scale habitat fragmentation created as a result of wildfire could further reduce the potential for the Empire wildlife analysis area to contribute to fisher reintroduction. Because of the probability of stand replacing fires, maintaining existing conditions over the long term presents a high degree of risk and uncertainty of fisher in the Sierra Nevada (USDA 2004, pg. 245).

Determination. No Action. It is determined that the No Action Alternative will not affect the American marten, Pacific fisher, California wolverine, and Sierra Nevada red fox.

Determination. Action Alternatives: It is determined that the Empire Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the American marten, Pacific fisher, California wolverine, and Sierra Nevada red fox.

As a **Managemnent Indicator Species**, the Plumas NF LRMP (as amended by the SNFPA) requires forest-scale changes in habitat capability monitoring and status and change of geographic distribution monitoring at the Sierra Nevada scale for marten (USDA 2001a, Page E-56). The habitat and population status and trend data for the marten is summarized below. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Effects to old forest habitat considered marten denning and resting habitat (CHWR Classes 5M, 5D and 6) have been tracked across the HFQLG Pilot Project, which includes the Plumas. Reductions are documented and a cumulative total is tracked to make sure no greater than a 10% reduction occurs over the life of the Pilot Project. There are currently 186,394 acres of 5M, 5D and 6 in the project area. To date habitat suitability on 3,282 acres has or will have been reduced (includes the projected acres of reduction for the Empire Project, based on projects with a signed decision). These acres total approximately 1.7% of the acres in 5M, 5D and 6 within the Pilot Project. These effects to old forest habitat (i.e. 1.7%) include mature red fir habitat that is preferred by the marten in CWHR Classes 5M, 5D and 6. Based on the small acre percentage of marten habitat affected by projects across the HFQLG Pilot Project, including within the Forest carnivore network, and that the percentage on the Plumas of affected denning and resting habitat is less than the 1.7% currently documented, habitat trends for the marten are considered stable on the Plumas National Forest (PNF 2006).

Cumulative impacts to the forest carnivore network, in terms of acres treated by various silvicultural prescriptions has been tracked and is displayed in the Empire BA/BE, Table 29 page 118. The cumulative treated acres within the forest carnivore network dating back to the McFarland Sale (1995-96) on Mt. Hough Ranger District range from 2,425 to 2607 acres (includes acres treated with Empire). These acres amount to <1% of the total forest carnivore network.

Population Status and Trend. The Global conservation status of marten is “G5-Secure” (“demonstrably widespread, abundant, and secure”) and the United States National conservation status is “N5” (“secure – common, widespread, and abundant in the nation) (NatureServe 2005). The Global Short-Term Trend is Stable (unchanged or within plus or minus 10% fluctuation in population, range, area occupied, and/or number or condition of occurrences) (Ibid).

Geographic distribution monitoring for the marten is also occurring at the bio-regional scale consistent with direction from the Sierra Nevada Forest Plan Amendment. Status and trend monitoring for the marten began in 2002. Bio-regional monitoring for the Marten occurs on all Forests throughout the Sierra Nevada (Ibid). Population monitoring involves conducting presence/absence surveys throughout the region to estimate the proportion of sites (primary sample units) annually occupied by marten, and detect declines over the proposed ten-year monitoring period.

During the past four field seasons, 708 primary sample units have been completed (with more than 4,500 individual survey stations and over 45,000 survey nights). During this time, marten were detected at 84 sites throughout the region, 28 of which occurred in wilderness areas. This bio-regional monitoring under the Sierra Nevada Forest Plan Amendment has not resulted in any new detections on the Plumas NF.

Carnivore surveys have been conducted on the Plumas NF. Approximately 50% of the Plumas National Forest has been systematically surveyed to protocol using track plates and camera stations (Plumas GIS database, PNF MIS Report). Figure 10 in the PNF MIS Report displays that all detections of marten from surveys exist in the Lakes Basin area located on the Beckwourth Ranger District.

Based on the monitoring data collected on the Plumas, as required by Appendix E (USDA 2001a) and the Plumas LRMP, it appears marten are locally distributed in and around the Lakes Basin area of the forest. This distribution of martens has remained stable since development of the LRMP in 1988.

Based on Zielinski (2005), trends in marten detections in Plumas County, and by inference Plumas National Forest, from the early 1900's to the late 1900's are downward, primarily due to relatively small amounts of late seral/old-growth forest attributes. Concern about the status of marten also is a result of the possible deleterious effects of trapping (Zielinski & Kucera 1995). Trapping may have adversely affected marten populations and may have contributed to or hastened local extinctions (Ruggiero et al 1994). There has been no open trapping season for marten in California since 1954 (USDA 2001a).

Habitat reduction as a result of implementing alternatives mirrors that described for spotted owls and goshawks. Effects to the habitat trend on the draft Forest Carnivore network from the Empire project are expected to be minimal (<1%). Marten habitat could be better protected from stand replacement fires (from the existing condition) for the next 10-20 years with implementation of the proposed action. The project-level habitat impacts will contribute to the current forest-wide trends of short term habitat reductions for longer term protection of old forest habitat. Based on known detections of marten on the PNF, no changes in marten occupancy or distribution on the PNF would occur.

Environmental Consequences — Forest Interior Habitat

The density of group selection harvest units and the risk of habitat loss in the planning areas are the indicator measures used to show effects on forest interior habitat.

The group selection treatments would result in the creation of forest openings and gaps 0.5 acre to 2 acres in size that would have (1) all conifers below 30 inches in diameter removed and all oaks/hardwoods retained, (2) two of the largest snags/acre retained, and (3) project-generated fuels treated with prescribed fire, but 10 to 15 tons per acre of the largest down logs greater than 12 inches in diameter would be retained where it exists. With any of the four action alternatives that propose group selection, an allowance would be made to retain up to two of the largest snags/acre within group selection units, unless removal would be necessary to ensure safety and operability.

Where 0.5- to 2-acre group selection harvests would be implemented, the CWHR classes 4M, 4D, 5M, and 5D would be replaced in each group with a small opening to support brush/seedling growth, while the surrounding conifer stands between the groups would have linear openings created for skid trails for removing sawlogs from the groups to designated landings. Existing landings would be used, as well as new landings created; Individual tree selection harvest could also occur within the forested stands between groups.

Using a Geographic Information System display of groups laid out in planning areas 10G and 24G it was apparent that groups created a dense mix of small openings sufficient to cause some concern regarding the integrity of forest interior habitat. The placement of group selection units would increase the edge-to-interior ratio; in other words, the stand would no longer offer continuous forest cover that provides interior habitat. Instead, it would be a stand of multiple edges, beneficial to species that prefer edges to the detriment of forest interior species (Harris 1984; Forest Fragmentation website), specifically the spotted owl and American marten. The remaining forested patches between the groups would appear to be nothing more than corridors between the gaps. The group selection units at densities greater than 11 percent would not appear to be mimicking scattered gaps within the forested stands because interspersion (loss of continuity) and juxtaposition (side-by-side placement) of groups would increase the contrast of the created edges. Edge effects of these induced ecotones (transitional habitats), on both the microclimate and on wildlife, would extend into the forested patches beyond what is actually created by the group (Harris 1984; Hunter 1990; Forest Fragmentation website). Some studies indicate changes occur in the microclimate of a forest interior at about 525 feet from an edge (in Verner et al. 1992). Furthermore, these remnant corridors would then be subjected to skid trails and individual tree selection, further impacting the amount of continuous forest cover. The combination of dense group openings along with individual tree selection, skid trails, landings, and in some cases biomass removal, would create a forest that may not be suitable for forest interior habitat species. Suitability not only refers to the habitat attributes present, but also includes behavioral attributes of species, such as avoidance of particular areas, creation of barriers and altered movements.

It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by old-forest species. It is reported that martens (an old forest species) have not been found in landscapes with greater than 25 percent of the area in openings, even where suitable habitat (dense forested habitat) connectivity exists (USDA 2001a). Conversely, it is reported that small open areas and regenerating stands are used by marten as foraging habitat, but are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forested stands meeting requirements for denning and resting habitat (Ibid). It is suggested that small dispersed tree harvest units within a forested matrix should have less impact on marten populations than large continuous clearcuts and, in some instances may prove beneficial (Ibid). Thus there is some undefined range or threshold of small openings within forested matrix that will allow continued habitat use by this carnivore.

As mentioned earlier, the initial layout of groups under alternative A, then simulated for alternative C, created a dense mix of small openings in forested stands sufficient to cause some uncertainty as to potential impacts on forest interior species, specifically spotted owl and marten. Alternative D would implement groups within planning areas at 11.4 percent density or less. Placement of groups at 11.4 percent density was chosen due to the assumptions, modeling and group simulations, and the corresponding analysis of effects that were discussed in the HFQLG FEIS, which allowed for planning group treatments at 20-year intervals (USDA 1999, appendix D, page 3-75 states that treatment intensity of groups would be limited to no more than 11.4 percent of the surface area for the first 10 years). Treatments were evaluated that at greater than 11.4 percent density, within stand fragmentation (large patch of habitat broken down into many smaller patches of open habitat, resulting in a loss in the amount of quality forested habitat) could occur with this planning effort. Groups placed at densities higher than 11.4 percent are analyzed as providing more risk and uncertainty associated with residual habitat use, although groups at or below 11.4 percent increase risk and uncertainty but at less magnitude than alternatives implementing higher density of groups. At a density less than 11.4 percent, it appears that groups could be more spread out such that the residual forest would provide more forest interior habitat across the stands, leaving approximately 88 percent of forest stand intact.

Alternative A would create fewer groups (1,347 acres) across 14,054 available acres of planning areas in the Empire Project area; Alternative C would create 1,600 acres of groups across 12,445 acres; and alternatives D and E would create fewer acres of groups (1,226 acres) across 11,686. Because of this, the groups would be more dispersed across the landscape under alternatives D and E than alternatives A and C, with groups more clumped in the landscape under alternative C. In terms of stand fragmentation caused by the dense placement of groups, table 3.32 displays those planning areas where it is suspected that edge effects created by groups would potentially create unsuitable forest interior habitat.

Table 3.32. Planning areas / groups increasing edge effects, reducing forest interior habitat, and not considered to be providing continuous forest cover.

Planning Area Number	Acres in Planning Area[a]	Alternative A Acres in Groups (percent)	Alternative C Acres in Groups (percent)	Alternatives D and E Acres in Groups (percent)	Alternative F Acres in Groups (percent)
4G	366	14	23	11.4	0
5G	652	8	15	11.4	0
7G	77	16	19	0	0
10G	368	12	12	11.4	0
13G	355	11	17	11.4	0
14G	2,048	11	13	11.4	0
15G	177	12	10	11.4	0
18G	517	10	16	11.4	0
19G	2,060	11	18	11.4	0
20G	65	15	0	0	0
24G	532	17	18	11.4	0
Total acres of planning areas affected by group density potentially not providing continuous forest cover		1,585 acres Moderate risk to maintaining forest interior quality	6,975 acres Highest risk to maintaining forest interior quality	<1,585[b] Low risk to maintaining forest interior quality	0 No risk to maintaining forest interior quality

Notes:

a. The acres in the planning areas that contain CWHR classes 4 and 5, with moderate and dense canopy cover, minus Riparian Habitat Conservation Areas, rock outcrops, and clearcuts.

b. Group placement (clumping) would create edge between groups; overall, would provide more forest interior habitat than alternatives A and C. Edge effects (microclimate changes) will still occur, but at lesser amounts than A & C.

The greater the number (density) of group selection units (groups) in a planning area, the smaller the amount of forest interior habitat provided by that planning area. All alternatives that would implement group selection would create openings in the forest, resulting in conditions that could reduce habitat quality and use by both spotted owls and martens. This could then increase the risk and uncertainty to populations associated with habitat alteration.

Private land logging activity within the analysis area has been discussed earlier. Approximately 822 of the 1,289 acres of clearcut harvest activity (64 percent) on private land has occurred since 2001. This past clearcutting has contributed to habitat fragmentation and reduced forest interior habitat within the southern end of the wildlife analysis area. The location and dense clumping of these existing clearcuts appear to be creating localized barriers to movement for forest interior species, as the density of clearcuts provide thin forested corridors between existing clearcuts. Past clearcuts on

National Forest are older than 13 years and are dominated by brush and sapling and pole size (4-10' dbh) conifer trees. The cumulative effect of recent private land clearcuts, older National Forest plantations, the large brushfields created by past wildfires, together with implementation of groups at high density would result in increased "patchwork" of open habitat and young age class vegetation between mature forested stands within the analysis area. This would increase edge effects and possibly increase potential risks of forest interior species movement and use in the wildlife analysis area. Thus the Empire Project would act cumulatively with past actions to further reduce the connectivity of habitat within the analysis area although connectivity would remain (USDA 2007, attachments 10, 11) and is expected to improve over time as conifer cover is restored through natural processes and better protected from high intensity fire.

Alternative C would support the greatest density of group openings, and individual tree selection between groups would result in approximately 6,975 acres of forest supporting more edge habitat than forest interior habitat. This would also decrease habitat connectivity across the wildlife analysis area, potentially creating barriers to movement and isolating large blocks of suitable habitat. Therefore, the cumulative effects of this alternative could increase the risk of reducing forest interior species movement and use in the planning areas, as well as the wildlife analysis area.

The cumulative effects of Alternative A, with 1,585 acres of forest supporting more edge habitat than forest interior habitat, could increase the risk of reducing species movements and use in the planning areas but at much less risk than alternative C. Alternatives D and E, with group density at 11.4 percent or less, could increase the risk of reducing forest interior species movement and use in the planning areas but at much less risk than the other alternatives that propose group selection. It appears that the cumulative effects of alternatives A, D, & E would maintain habitat connectivity across the wildlife analysis area; they would not create barriers to movement or isolate large blocks of suitable habitat. Connectivity of dense forest habitat (M and D stands in size class 3, 4, and 5) is shown in Attachement 10 in the BA/BE; attachment 11 of the BA/BE displays the CWHR 4M, 4D, 5M 5D continuity across the wildlife analysis area. Habitat connectivity is maintained across the Forest north to south from the Middle Fork Feather River to Grizzly Ridge and on to Mt. Jura. No potential barriers to movements across this large landscape are created with these three alternatives.

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Environmental Consequences – Non-TES Management Indicator Species

The Plumas NF LRMP (USDA 1988a, Chapter 5) and Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (USDA 2001a), as adopted by the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004a), identify forest and bioregional scale habitat and population monitoring direction for the Plumas NF Management indicator Species (MIS). Forest-scale habitat monitoring direction is identified in the Monitoring Plan of the Plumas NF LRMP (USDA 1988a, Chapter 5). For those Plumas NF MIS (USDA 1988a, Appendix G) that are listed in Appendix E of the SNFPA FEIS (USDA 2001a), population monitoring direction is described in Appendix E. For all other Plumas NF MIS, population monitoring direction is described in the LRMP Monitoring Plan (USDA 1988a, Chapter 5). Habitat and population monitoring results for Plumas NF's MIS are described in the Plumas National Forest Management Indicator Species Report (PNF 2006) and are summarized below for the non-TES MIS being analyzed for the Empire Project.

Mule Deer

Consistent with LRMP direction, mule deer population status and trend are tracked and monitored in cooperation with the California Department of Fish and Game (CDFG), the agency responsible for deer herd management within the State of California. The Plumas NF works closely with CDFG to periodically review deer population status on the forest. Population distribution monitoring for mule deer is conducted at a variety of scales: (1) statewide, hunting zone, and herd population monitoring is managed by CDFG using a variety of methods (CDFG 2004) and (2) forest-level presence data are collected through tracking actual sightings of deer and through documenting sign occurrence data, including pellet groups (scat), tracks, antlers, tree rubs, and beds. The Plumas NF MIS Report (PNF 2006) provides information about the methodology for collecting deer data and the results relative to monitoring population distribution trends for mule deer.

Action Alternatives (Alternatives A, C-F). The direct/indirect and cumulative effects of all alternatives are discussed at length in the Empire MIS Report (USDA 2007a). Under all action alternatives (A,C,D,E,F), deer foraging habitat would increase, and populations would likewise tend to increase for the following reasons:

- More open forest habitat would be created, allowing more sunlight and moisture to reach the forest floor, thus creating more forage and brush cover and increasing the forage-to-cover ratio of 33:67 to around 42:58 with four of the action alternatives. A very slight increase would occur with alternative F but not much above existing conditions. The post-project forage:cover ratio would persist for several years and slowly change as brush quality for forage declines due to increased shade from developing conifers in fuel treatment areas and increased conifer growth in group selection units. It is predicted that in 12 to 15 years, the amount of forage would again decline. With reforestation, conifers would dominate the brush in group openings anywhere from 15 to 50 years, depending on site and aspect.

- Four of the five action alternatives create 1,226 to 1,600 acres of gaps and openings through group selection harvest method. Retention of black oaks within groups could contribute to small patches of oak dominated openings for 15-50+ years. After the conifers start to dominate, black oaks should be of a large size class, contributing to higher production of acorns available for deer.

- Within the Project Area, winter range could be treated with approximately 2,850 acres of fuel treatment (1580 burn only, 1272 acres thinning) and up to 219 acres of group selection. Approximately 3,670 acres of fuel treatments including up to 500 acres of burn only and up to 1,381 acres of group selection could occur within Summer range (table 3.33). No acres would be treated with Alternative B.

- Betweeen 360 acres (alternatives D, E, and F) and up to 1,580 acres (alternatives A and C) of fuel treatment using prescribed fire are proposed in old, decadent brushfields that are located within mule deer winter range, which would result in new, highly palatable, nutritious forage for deer. Approximately 50 to 450 acres of fuel treatment on summer range would be burn only. Using prescribed fire to treat brush fields would reduce unidentified limiting factor for California deer herds (CDFG 1998) because old decadent, unpalatable brush would be rejuvenated to provide accessible and nutritious forage.

- Road closure and decommissioning would slightly increase habitat effectiveness, potentially reducing roadkill, hunting mortality, illegal kill, and harassment of deer on winter range. The effects would be similar for all action alternatives.

Table 3.33. Acres treated by Alternative in Summer and Winter Range for the Sloat Deer Herd

Range	Alt A Acres		Alt. C Acres		Alt D Acres		Alt E Acres		Alt F Acres	
	DFPZ Thin	Group Selection	DFPZ Thin	Group Selection	DFPZ Thin	Group Selection	DFPZ Thin	Group Selection	DFPZ Thin	Group Selection
Winter	1272	213	1272	219	1272	140	1272	140	1272	0
Summer	2100	1134	2100	1381	2100	1086	2100	1086	2100	0

Some negative effects could occur during project implementation (in 1 to 8 years) because of the following:

- There would potentially be increased mortality as a result of increased traffic along all roads during project implementation. Treatment activities could disrupt fawning activity that would be occurring between June and August. This disruption could include direct mortality to hiding fawns, as well as displacement of fawns and does, which could increase fawn mortality through predation. There may be disturbances to individuals that may be foraging in habitat within or adjacent to units proposed for treatment; this would result in animals moving out of the area during treatment activities

The Plumas NF LRMP (as amended by the SNFPA) requires forest-scale habitat monitoring and distribution population monitoring for the mule deer. The habitat and population status and trend data for mule deer is summarized below. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is incorporated by reference.

Habitat Status and Trend. Deer habitat utility scores were calculated based upon CWHR models (Appendix B, SNFPA 2001) for the 2.3 million acres of mule deer habitat in the Sierra Nevada. These scores predict the changes in relative utility of habitats for deer fawning, foraging, cover, and winter range under implementation of management actions. This model is limited in that a number of structural and landscape features important to deer are not well evaluated. These features include the number and species of shrubs, shrub foliage volume, and forest openings. The model is also not able to evaluate spatial distribution of habitat elements, such as level of continuity and presence and design of migration corridors. The SNFPA EIS displayed that mule deer habitat utility declines under all alternatives, including implementation of the Standards and Guidelines outlined in the ROD (FEIS volume 3, part 4.2 page 26). This decline was based on the assumption that practices that open up canopies through mechanical treatments, like thinning, biomass, and salvage logging within green stands, do not generate dense understories of shrubs, forbs and grasses that provide deer foraging habitat. Current direction under the SNFPA emphasizes mechanical treatments in order to insure minimizing potential changes to canopy cover.

With the analysis of S2 in the SNFPA FSEIS in 2004, there was no projected difference in deer habitat from what the 2001 SNFPA analysis disclosed. Overall, deer habitat utility would be expected to decline under the Sierra Nevada Forest Plan Amendment by –6.6% over a five-decade period (USDA 2001a). Mule deer are a common species which still occupy their historic range in the Sierra Nevada, it is unlikely that the small decline in habitat utility values estimated within the plan amendment would be measurable or discernable in mule deer population trends on the Plumas National Forest. It is also highly unlikely that this projected decline in habitat utility would be sufficient to result in the loss of viable, well-distributed populations (USDA 2001a).

Habitat capability for mule deer was evaluated at the forest scale for the Plumas NF using the CWHR model as outlined in Appendix A of the PNF MIS Report. Based on CWHR data, the Plumas NF currently supports 211,415 acres of high and moderate capability foraging habitat. The Empire Project is projected to increase the amount of high and moderate capability foraging habitat by up to 5,004 acres (USDA 2007a, table 7).

Based on the availability and abundance of habitat for mule deer across the Plumas, the trend for available mule deer habitat is considered stable.

Population Status and Trend. The PNF MIS Report (PNF 2006) provides background information on the status, population estimates and trends of deer populations within the State as well as within the individual Deer Assessment Units (DAUs) and deer herds located on the Plumas NF. The Sierra All Species Inventory (Appendix R, SNFPA 2001) assigns mule deer a moderate vulnerability rating for the Sierra Nevada. This rating is based upon three factors: (1) the species is ranked as "common," with a population that exceeds 10,000 individuals, (refer to population estimates below); 2) the population trend is unknown but suspected to be decreasing; and 3) the range of mule deer in the Sierra Nevada is stable or increasing.

California is divided into 11 Deer Assessment Units (DAUs) for purposes of analysis. The Empire project is located within two DAUs. The majority of the project is within what is identified as the Northeast Sierra Zone, which was designated DAU 3 (CDFG 1998) but is now identified as DAU 10 (CDFG 2003). Although the designation changed, the boundaries and the deer hunting zones for DAU 10 did not change. The Empire area west of Highway 70/89 is located within DAU 5, identified as the Central Sierra DAU.

Current trends and population numbers are taken from the Environmental Document for Deer Hunting, produced by the California Department of Fish & Game, April 2003. Based on monitoring data gathered by CDFG, deer populations appear to be increasing in DAU 5, the Central Sierra Nevada (hunting zones D3-D7). Deer populations are considered stable in DAU 10. Eastside deer populations (DAU 9, 10) occupying great basin habitats experienced significant declines during 1990-1996. However these populations appear to have stabilized based on recent trend estimates (CDFG 2003).

Deer populations within each DAU are derived from deer population data reported from each hunting zone. Within DAU 5, the hunting zone present within a small portion of the Empire analysis area west of highway 70/89 is Hunt Zone D-3. The 2002 population status in D-3 was approximately 21,300 mule deer. The majority of the Empire analysis area is composed of Hunting Zone X6a, which is within DAU 10. The 2002 population status in X6a was approximately 2,490 mule deer. The Plumas LRMP (USDA Forest Service, 1988a), as amended, provides as an objective a deer population goal of approximately 24,000 deer across the Forest.

The current population estimate for the deer hunting zone which is occupied by the Sloat Deer herd is approximately 2,490 deer (CDFG 2003). Population monitoring using annual tracking of deer tags in coordination with DFG, indicates a slight increase in deer numbers in this area from 2003 to 2005. The Doyle Deer Herd is east of the Sloat Herd also in DAU 10. Annual population monitoring has been conducted by CDFG on the Doyle Deer Herd from 1997 to 2005. The population trend for the Doyle Deer Herd appears to be stable (PNF 2006, figure 1). These trends in the Doyle Herd are reflective of trends in DAU 10 and are consistent with California Department of Fish & Game's determination that the total mule deer population on the Plumas NF is stable (J. Lidberg, personal communication).

Forest-wide deer population distribution is stable. Selection of an Action Alternative (Alternatives A, C-F) of the Empire Project would result in a slight increase in forest-wide foraging habitat for deer

(5,004 acres with Alternative C, which is a 2.3% increase in high and moderate capability foraging habitat forestwide). Based on the direct, indirect and cumulative effects of the action alternatives, the carrying capacity on the Forest would be minimally improved and deer numbers would respond to the habitat changes such that there would be a localized upward trend in the Sloat deer herd population for the next 10-20 years. Improving carrying capacity on National Forest land would contribute to moving the population toward its herd population goal, as well as contributing to the LRMP Forest goal of 24,000 deer on Plumas National Forest land. Based on this small scale increase, the project-level habitat impacts will contribute to existing stable forest-wide population distribution trend.

No Action (Alternative B). With the no action alternative, not treating existing fuels through thinning, fuels treatment and DFPZ implementation would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. Given the realized 7- to 12-year fire-return interval for this area ("Fire, Fuels, and Air Quality Report" 2007) it is likely that National Forest system lands would burn. The existing fuel loads within the area could produce a very hot fire, which could kill re-sprouting species of shrubs, potentially create monocultures, provide a medium for noxious, invasive weeds, and burn minerals from the soil, leading to soil erosion and lower productivity. Based on the past fire patterns on this predominately south to southwest aspect of the project area, wildfires in this area would burn intensively, creating larger, monotypic foraging areas with little mosaic forested cover within this foraging habitat.

Under the no-action alternative, continuing conifer competition with oaks would eventually reduce the number of acorn-producing oaks in the mixed conifer sites, and intense wildfires would be more likely to occur and destroy oaks and eliminate cover. Black oak recruitment into the larger size classes would not be improved if no vegetative manipulation were conducted to release oaks from conifer competition.

There would be no reduction in the open road density within the analysis area with the no action alternative.

The No Action alternative would do nothing to reduce the identified possible limiting habitat factors for California deer herds: loss of brush fields, lack of prescribed fire, overstocked conifer stands, increased road densities (CDFG 1998). The cumulative effects of no action could fall in line with the analysis conducted for the SNFPA (described above) and contribute to the decline of mule deer within the project area, the Plumas NF, and the Sierra Nevada range. In the short term, forested stands would not be opened-up through thinning and underburning, thus very little regeneration of foraging habitat would occur. On the other hand, no action could result in potential larger and more intense wildfires, which, depending on weather conditions and fuel loadings, could either, increase or decrease the productivity of foraging habitat.

Based on the direct, indirect and cumulative effects of the no action alternative, it is suspected that deer numbers would respond slightly to the habitat changes created on private land, such that there would be some upward trend in the Sloat deer herd population for the next 10-20 years. The carrying capacity on National Forest land would not be improved, thus there would be a stable to downward trend in deer numbers on National Forest, thus not contributing to the LRMP Forest goal of 24,000 deer on Plumas National Forest land. With the increased potential for a stand destroying wildfire, 1) a high intensity wildfire could reduce productivity of deer range for a long period of time, resulting in a long term reduction in carrying capacity, or 2) depending on fire intensity, decadent brush and closed forest could be converted to potentially improved deer habitat and carrying capacity could be improved above current levels.

Golden Eagle

Habitat monitoring direction is being met by the Plumas NF through monitoring of changes/trends in habitat within a 1-mile radius of designated or known golden eagle nest sites. These changes are monitored and tracked at the Forest level when project level actions result in a habitat change. The habitat within the 1-mile radius of designated or known golden eagle nest sites meets the definition for the “designated area” under the habitat-monitoring column in Chapter 5 of the LRMP (1988a). This one-mile designated area allows for tracking measurable changes in nesting and foraging habitat within the vicinity of nest sites. For project level analysis of habitat trends, the habitat indicators that will be tracked include: changes in acres of habitat within the 1 mile radius of designated or known golden eagle nest sites, if such a nest site falls within the respective analysis area for a given project.

The population monitoring direction for golden eagle comes from Appendix E. This direction is being met by the Plumas at the forest scale through monitoring of the nine known golden eagle sites on the Forest. Monitoring documents occupancy of nest sites and involves direct counts of adults and young. Sample locations for distribution monitoring are the nine known sites on the Plumas, six on the Mt. Hough District and three on the Beckwourth District. Golden eagles typically return to established nest sites if the nest and or nest tree are still present. Project level field surveys are conducted for all HFQLG projects. Suspected and new nest sites are identified during these field surveys and follow-up monitoring is conducted to verify golden eagle use.

Action Alternatives. The direct/indirect and cumulative effects of all alternatives are discussed in the Empire MIS Report (USDA 2007a). No known golden eagle territories are present in the Empire analysis area, so there would be no direct effect on habitat within a one-mile radius of any eagle nest site and no effect on the known population of golden eagles on the Plumas National Forest. No trees greater than 30 inches dbh would be cut, and the largest snags would be retained. Therefore, large perches and potential large nest trees would be present across the landscape at pre-treatment densities. Habitat suitability may increase slightly because

- there would be a greater number of open forest stands as a result of fuel treatments, and
- there would be more forested edges as a result of group selection harvest; this could result in prey species becoming more abundant.

Based on the direct/indirect effects, implementation of the action alternatives would contribute to a cumulative increase in open forest habitat, improving the grass/forb/brush mix resulting in increased habitat favorable to an open habitat foraging species such as the golden eagle. The direct, indirect and cumulative effects of the proposed action and action alternatives would not result in any change in population trends to meet the identified Plumas LRMP goal of attaining 20 nesting pairs.

No Action Alternatives (Alternative B). Under the no-action alternative, fires would be increasingly larger and more intense, which would create large habitat parcels of early successional foraging habitat for golden eagle than what currently exists or would be created by the action alternatives. Wildfires would create more open foraging habitat than any of the action alternatives. The direct, indirect and cumulative effects of the no action alternative would not result in any change in population trends to meet the identified Plumas LRMP goal of attaining 20 nesting pairs.

The Plumas NF LRMP (as amended by the SNFPA) requires forest-scale habitat monitoring and trends in designated areas and distribution population monitoring for the golden eagle. The sections below summarize the habitat and population status and trend data for the golden eagle. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Of the nine known/historic nesting territories on the Forest, foraging habitat within a 1-mile radius of each site was delineated as the designated area for monitoring habitat trends at the Forest scale (PNF 2006, table 3-B). Foraging Habitat within these designated areas has remained stable with the implementation of standard and guidelines for the golden eagle under the LRMP, plus the retention standard applied to projects for trees >30” dbh under the HFQLG Pilot Project. The habitat trend for the golden eagle is considered stable on the Plumas NF (PNF 2006).

Population Status and Trend. The PNF MIS Report (PNF 2006) provides background information on the status, population estimates and trends of golden eagle populations located on the Plumas NF. The Plumas National Forest has had as many as 9 known golden eagle nesting territories. The Forest LRMP estimated a potential for the Plumas to supply habitat for approximately 20 nesting pairs. Based on past golden eagle numbers and ongoing monitoring of sites, it appears there is a downward population distribution trend for golden eagles on the Plumas NF, and currently consists of limited sightings of eagles at the known territories.

Forest-wide golden eagle population distribution appears to be downward, possibly due to the recovery of large expanses of open transitory foraging habitat created as a result of wildfire.

Implementation of any of the Action Alternatives (Alternatives A, C-F) of the Empire Project would result in a slight increase in forest-wide open habitat for foraging and open-forested habitat for nesting and foraging. Open foraging habitat would not be in large expanses but in small parcels scattered across the landscape and contribute little foraging value for golden eagles.

As discussed above, project-level impacts to golden eagle habitat are likely to be beneficial. However, because these impacts will be very minor, project level habitat impacts will not alter or contribute to existing forest-wide population or habitat trends.

Prairie falcon

Nesting habitat (cliffs, rock outcrops, etc.) are typically not affected by forest management practices, therefore foraging habitat, which includes open habitats such as grass/forb, shrub, and early successional habitat, will be monitored for this species. The habitat monitoring is being met by the Plumas NF through monitoring of changes/trends in foraging habitat within a 1-mile radius of known prairie falcon nest sites. These changes are monitored and tracked at the Forest level when project level actions result in a habitat change. The habitat within the 1-mile radius of known prairie falcon nest sites meets the definition for the "designated area" under the habitat-monitoring column in Chapter 5 of the LRMP (1988a). This one-mile designated area allows for tracking measurable changes in nesting and foraging habitat within the vicinity of nest sites. For project level analysis of habitat trends, the habitat indicators that will be tracked include: changes in acres of foraging habitat within the 1 mile radius of designated or known prairie falcon nest sites, if such a site falls within the respective analysis area for a given project. Foraging habitat is defined as early successional, open stage (CWHR 1, 2 3P, 4P) habitat.

The population monitoring direction comes from Appendix E (USDA 2001a). This direction is being met by the Plumas at the forest scale through monitoring of the six known prairie falcon sites on the Forest. The sample locations for distribution monitoring are the six known sites on the Plumas, one on the Mt. Hough District and five on the Beckwourth District. Prairie falcons typically return to established rock cliffs providing nest sites. Project level field surveys are conducted for all HFQLG projects. Suspected cliff and rock outcrops are surveyed for potential sign (ledges, rock cavity formations "whitewash") and follow-up monitoring is conducted to verify use.

All Alternatives. The direct/indirect and cumulative effects of all alternatives are discussed in the Empire MIS Report (USDA 2007a). There are no known prairie falcon territories in the project area and no records of prairie falcon sightings in or adjacent to the Empire wildlife analysis area, which generally lacks suitable cliff nesting habitat. There is also no cliff habitat suitable for nesting adjacent to the project area. Because there is no known or expected nesting activity in the project area and no suitable nesting habitat, project activities would not affect prairie falcons directly. There would be no direct effect on habitat within a one-mile radius of any falcon nest site and no effect on the known population of priaire falcons on the Plumas National Forest. Slight increases in foraging habitat would occur, similar to what was described above for the golden eagle. The Empire Project would not contribute to cumulative effects because there would be no direct or indirect effects on the prairie falcon or its habitat.

No Action Alternative (Alternative B). Under the no-action alternative, fires would be increasingly larger and more intense, which would create large habitat parcels of early successional foraging habitat for priaire falcon than what currently exists or would be created by the action alternatives. Wildfires would create more open foraging habitat than any of the action alternatives. The direct, indirect and cumulative effects of the no action alternative would not result in any change in population trends on the Plumas NF.

The Plumas NF LRMP (as amended by the SNFPA) requires forest-scale habitat monitoring and trends in designated areas and distribution population monitoring for the prairie falcon. The sections below summarize the habitat and population status and trend data for the prairie falcon. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Of the six known nesting territories on the Forest, habitat within a 1-mile radius of each site was delineated as the designated area for monitoring habitat trends at the Forest scale (PNF 2006, Table 3-C). Based on this table, and the habitat status within these territories, the habitat trend for the prairie falcon is considered stable on the Plumas NF, due to the fact that forest management activities do not impact cliff, cave, talus or rock outcrops and to date, no changes to prairie falcon habitat within 1 mile radius of known nest sites has occurred across the forest.

Population Status and Trend. The PNF MIS Report (PNF 2006) provides background information on the status, population estimates and trends of prairie falcon populations located on the Plumas NF. The Plumas NF currently has six prairie falcon nesting eyries on the Forest. Forest Plan monitoring from 1989 to 1992 showed 11 falcons in 1989 and 1990, 15 in 1991.   The current estimated population is 12 based on the 6 nesting territories on the Forest. The population trend is considered stable to downward based on the decrease in number of limited sightings at the six nesting territories.

The Action Alternatives (Alternatives A, C-F) of the Empire Project would result in a slight increase in forest-wide open habitat for foraging. Open foraging habitat would not be in large expanses but in small parcels scattered across the landscape.The proposed action would have no effect on known prairie falcon nest sites or foraging habitat in those vicinities. There would be an increase in open forested habitat which could improve habitat suitability in those areas. As discussed above, project-level impacts to prairie falcon habitat are likely to be beneficial. However, because these impacts will be very minor, project level habitat impacts will not alter or contribute to existing forest-wide population trends.

Trout Group

The habitat monitoring direction is being met through conducting Stream Condition Inventories as part of the HFQLG monitoring program. Selected streams are being monitored for habitat quality through inventories for reference stream conditions, pre-treatment stream conditions and post treatment stream conditions across the HFQLG pilot project area, which includes the Plumas NF. Habitat quantity is being monitored and tracked through the miles of fish bearing and non-fish bearing streams, and miles of perennial, intermittent and ephemeral streams.

Population monitoring direction comes from Appendix E (USDA 2001a). This monitoring on the Plumas NF is being met through in-stream monitoring at selected sample locations on the Forest. Twenty fish bearing stream reaches are selected to monitor for species occurrence and distribution across the forest. Population information from the Department of Water Resources, California Department of Fish & Game, and other partners may be used to meet this monitoring direction.

Action Alternatives. The direct/indirect and cumulative effects of all alternatives are discussed in the Empire MIS Report (USDA 2007a). Implementation of any of the action alternatives would not result in a significant increase in sediment delivery to aquatic habitats and may even help reduce sediment transport. Through the design of the action alternatives, and by implementation of Standard Management Requirements (SMRs) for soils and streamside management, ground disturbance activities would be minimized. However, fuels reduction harvesting in the Riparian Habitat Conservation Areas (RHCAs) could decrease wood available for ground cover and sediment traps in those RHCAs.

The Scientific Advisory Team guidelines and Best Management Practices would be followed. Implementation of Best Management Practices designed to minimize upslope erosion should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats. Based on the “Cumulative Watershed Effects Analysis for the Empire Project” (Moghaddas 2007d), there would be no measurable downstream effects on beneficial uses due to sediment from the proposed project, thus no indirect effects on MIS fish species would occur downstream.

Fuels reduction harvesting in RHCAs and on upland slopes would lower the risk of future wildfire and reduce the probability that retained snags, woody debris, and live vegetation in the RHCAs would be consumed by future fire. Fuels reduction harvesting of some trees in the RHCAs would reduce fuel loading and the potential for a stand-replacing fire.

Trout distribution in Tollgate, Pine, and Squirrel creeks would be improved with the replacement of three culverts to allow for upstream fish passage, resulting in increased trout distribution and, potentially, increased numbers in these three creeks.

Many of the creeks within the area are subjected to mining activities, especially up Squirrel Creek. There are 70 mining claimants and 45 placer mining claims along the creeks. The time frame for dredging season is from the third week of May thru October 15 each year. Dredging must be in compliance with State regulations under a permit issued by the California Department of Fish & Game. Periodic increases in short duration, low volume sediment delivery created by dredging is expected, but overall impacts to trout habitat and species distribution is minimal and short term.

No Action. Under the no-action alternative, wildfire size and intensity would continue to increase, which could cause substantial increases in runoff from hydrophobic soils and increased sedimentation and introduction of ash into streams inhabited by trout. Culverts would not be replaced, thus trout distribution would not be increased in three creeks.

The Plumas NF LRMP (as amended by the SNFPA) requires forest-scale habitat monitoring of quantity and quality of habitat and distribution population monitoring for the trout group. The sections below summarize the habitat and population status and trend data for the trout group. This information is drawn from the detailed information on habitat and population trends in the Plumas National Forest MIS Report (PNF 2006), which is hereby incorporated by reference.

Habitat Status and Trend. Trout habitat on the Plumas National Forest (PNF) consists of approximately 1,000 miles of streams, including 658 miles of perennial streams and 341 miles of intermittent streams. Trout also utilize 64 lakes, reservoirs and ponds within and bordering the PNF, with an aggregate surface area of about 14,200 acres. Trout habitat on the Plumas is considered abundant and well distributed across the Forest, and has remained constant since development of the Forest Plan. Habitat trends for trout on the PNF are stable at this time. The Empire analysis area supports about 54 miles of trout habitat (5.4 percent forest total) and one lake for 12 acres (<1 percent forest total).

Population Status and Trend. Trout population distribution data were taken from seven streams on the Plumas National Forest from standing stock surveys conducted by the Department of Water Resources from 1988 to 2004. This timeframe runs from adoption of the Forest Plan, 1988, and serves to indicate a trend in trout distribution over this 16-year period. Population estimates (number of trout per station) for all seven streams averaged by year indicates an increasing population trend for the trout group on the Plumas NF (PNF 2006).

Forest-wide trout distribution is stable to increasing. The Action Alternatives (Alternatives A, C-F) of the Empire Project would result in an improvement to the MIS trout. Culvert replacement will also increase habitat use and trout distribution in Tollgate, Pine and Squirrel creeks, contributing to increased habitat available. Therefore project level habitat impacts could contribute to maintaining existing forest-wide population trends.

Environmental Consequences – Neotropical Migratory Birds

Alternatives A, C, D, E, and F (Action Alternatives)

Direct, Indirect, and Cumulative — Neotropical Migratory Birds. Actions that open up forest stands through thinning, such as with the proposed fuels treatment thinning prescriptions, would result in projected increases in habitat trends for several selected Neotropical migratory bird species (warbling vireo, chipping sparrow, lazuli bunting, white-crowned sparrow, western bluebird, common nighthawk, and common poorwill). These species respond favorably to the opening up of forest canopy, allowing for increased understory plant diversity. Swainson's thrush appears to be adversely affected by thinning actions that convert closed forested stands to open forested stands. The olive-sided flycatcher and evening grosbeak also appear to have a projected decrease in habitat suitability. Alternatives E and F would create a fewer number of open stands across the wildlife analysis area and subsequently maintain more habitat for Swainson's thrush, olive-sided flycatcher, and evening grosbeak.

Actions that create openings in the forested landscape with group selection harvests could result in declines in species habitat trends for osprey, Swainson's thrush, warbling vireo, yellow warbler, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon. There are three species (white-crowned sparrow, lazuli bunting, and common nighthawk) that have a projected increase in habitat suitability. They respond favorably to habitat that contains small gaps in the forest landscape. Groups would be more dispersed across the landscape with alternatives D and E than with alternatives A and C, and the groups would be more densely clumped in the landscape with alternative C. Stand fragmentation caused by high density placement of groups would increase edge effects created by the groups, reducing effective forest interior habitat and potentially creating unsuitable forest interior habitat in the Empire wildlife analysis area for certain Neotropical migrants. Neotropical migrants that favor forest interior habitat (Swainson's thrush, western wood-peewee, evening grosbeak, red crossbill, and band-tailed pigeon) would have reduced habitat capability with the action alternatives that propose group selection harvests. Alternatives D and E would, overall, provide more interior forest between groups than alternatives A and C. There would be no change in the amount of forest interior habitat with alternative F.

The cumulative actions of the past may have benefited species that prefer early successional, as well as more open habitats. Species that prefer shrub habitat benefited as shrub habitats increased with wildfire and even-aged regeneration management actions, while species preferring closed canopies likely declined in numbers. With fire suppression and minimal vegetation management in the project area, together with natural succession, species preferring closed canopies may have rebounded as canopy covers filled in; conversely, as shrub habitat declines through conifer development, species preferring shrub habitats may have declined. Large blocks of early seral mixed-conifer (SMC2) and montane chapparal created by the Clear Creek, Bell, Oak, Cashman, and Greenhorn wildfires continue to provide suitable habitat for species preferring shrub habitats.

The cumulative effect of recent regeneration harvest on private land together with Empire Project group selection harvests and fuel treatments would overall improve habitat conditions for birds that prefer openings and open-canopied habitat across the landscape. Based on the CWHR model, Swainson’s thrush, evening grosbeak, and red crossbill would have decreased habitat suitability. If DFPZ treatments remove shrubs and are managed to minimize shrub regeneration through maintenance activities, it would be expected that the benefits of creating an open forest with a shrub understory component would be minimized and that there would be a decline in shrub nesting species (USDA 2006). Allowing group selection treatments to naturally regenerate would ensure that shrub habitat would remain on the landscape longer than with intensive regeneration efforts.

Increasing the amount of open forest, as well as small openings and increased edge, may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence in the National Forest portion of the wildlife analysis area has been documented, although they are present on private land in American Valley. There is no active livestock grazing on National Forest land in the wildlife analysis area. Facilities that often are associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are not present. There is some risk that brood parasitism could increase above existing levels in the Empire Project analysis area because cowbirds are present in American Valley and because they respond to increased open habitat and edges.

In addition to habitat modification and its affect on Neotropical migratory birds, direct effects on nesting birds (including young birds that cannot yet fly) would occur as a result of tree removal, mastication, and prescribed burning. It is recognized that the proposed Empire Project, if implemented during the breeding season (April-September), could directly impact nesting birds. This would affect individual birds. Conservation measures for landbirds, such as snag/down woody retention, use of LOP’s for TES species, avoidance of riparian vegetation, retention of trees greater than 30 inches, which are incorporated into project design, as well as large tracts of forested land not treated with proposed management actions, would alleviate the overall effect on Neotropical migratory bird populations within the Ananlysis Area.

Alternative B (No Action)

Direct, Indirect, and Cumulative Effects — Neotropical Migratory Birds. There would be no direct effect on Neotropical migratory birds under this alternative.

Logically it could be inferred that with the no action alternative, shrub communities and plantations would continue to trend towards conifer communities, and the conifer communities would trend towards denser canopy cover with a declining shrub understory. These trends would favor closed canopy bird species and not favor open canopy and shrub species. In reality the effects of the no-action alternative include the potential for future wildfire and its impact on habitat maintenance and development. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burned. Given the realized 7- to 12-year fire-return interval for this area ("Fire, Fuels, and Air Quality Report" 2007d), it is likely that National Forest System lands would burn again, resulting in the loss of the largest trees and snags, an increase in large-scale fragmentation of forested landscapes, loss of large riparian structures, and simplification of habitat diversity.

Some Neotropical migratory birds use early successional habitats that develop after a wildfire (USDA 2004). These early successional habitats would be at a much larger, homogenous pattern across landscapes as a result of wildfire. The cumulative effect of recent regeneration harvest on private land together with no fuel treatments (No Action) would overall increase the amount, as well as improve, habitat conditions for birds that prefer early successional and open-canopied habitat across the landscape, primarily due to increased habitat as a result of wildfire. Birds preferring closed canopy conifer habitats would most likely incur more acres of habitat loss, including reduced size of habitat patches.

Snags/Down Woody material

The past silvicultural and timber sale actions on both National Forest and private land described under the cumulative effects of spotted owl section in this EIS, has contributed to a decline in snag and down log abundance across the wildlife analysis area. As part of the Forest Inventory Analysis (FIA) conducted within the Empire area in 1996, all snags >15" dbh and 20 feet tall were counted, recorded and stratified by CWHR type. Data collected indicated that overall snag densities averaged 2.7 snags/acre in CWHR types 4M, 4D, 5M, nd 5D. In the ten years since this inventory, it is suspected, based on field reviews, that snag recruitment through normal mortality has increased the abundance of snags and down logs on National Forest land since the mid 1990's due to the lack of harvest activity that has occurred within the Empire analysis area.

Past projects conducted within the analysis area in 2004 (Dancehouse-Chandler) called for the retention between two to four of the largest snags/acre, and 10-15 tons/acre down wood in the largest logs available.

Proposed vegetation treatments are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. Fuels reduction should create conditions that would lessen the risk for future stand replacement fires, thus providing the opportunity to retain structural elements likes snags for a longer period of time.

All action alternatives include road construction, decommissioning, closure and reconstruction (see mule deer above). Closing roads would reduce potential availability of snags for becoming hazard trees (subject to removal) or being available for firewood. Alternative A, closes and decommissions more roads than C, D, E, and F.

Hazard tree removal on NFS lands along roads has been an ongoing, and continuing action. This includes the ongoing Tramway Hazard Tree removal project currently being conducted on the Beckwourth RD within a small portion of the Empire analysis area. For this and future projects, all snags that present hazards to road traffic, regardless of size, are being, or will be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the analysis area.

With the current Plumas National Forest woodcutting program, the entire project area, with the exception of Butterfly Valley Botanical Area, would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within areas used by cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young.

Recent clearcuts that have been implemented on private ground within the analysis area support very few snags (less than one per acre). Within biomass thinning operations on private ground, wildlife trees, including some snags have been designated for retention, but at less than two per acre (personal observation).

Based on the above past and ongoing activities, in combination with the direct/indirect effects of the Empire Project, implementation of the action alternatives would contribute to an increase in open forest habitat and a decrease in the existing snag densities and future down log densities within treated areas. Thus the cumulative effects in the Empire Wildlife Analysis would be a decrease in snag and down log numbers, with snags in the project area being retained somewhere between two and six per acre within treated areas, and at least this density within the remainder of the non-burned untreated National Forest acres within the analysis area.

It is suspected that the direct, indirect and cumulative effects of the proposed action and action alternatives would have some short term decreases in snag numbers due to snag removal. It is anticipated that the longer term impacts would result in snag and down wood densities rebounding to pre-project levels as the risk to wildfire is reduced, the forest canopy cover closes in, roads are closed, mature oaks that are retained and released with management actions attain some decadence, and snag recruitment continues across the landscape.

No Action. Under the no-action alternative, the only snags that would be removed would be those removed by the public with the personal use firewood program and those removed as hazard trees around existing facilities, including roads. Hazard tree removal on NFS lands along roads has been an ongoing, and continuing action. All snags that present hazards to road traffic, regardless of size, are being, or will be, removed. Removal of these snags would have a negative effect on individual animals that use snags.

With the current Plumas National Forest woodcutting program, the entire project area, with the exception of Butterfly Valley Botanical Area, would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within areas used by cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young. No roads would be closed or decommissioned with this alternative, allowing for continued access for woodcutting and hazard tree removal, resulting in loss of snags. Woodcutting and hazard removal remove decadence from the landscape, but overall snag numbers are likely to increase over time due to natural recruitment. Stand-replacing fire is ever more likely to occur and cause the premature loss of the largest snags now present, create an abundance of snags for short-term use, and reduce the long-term availability of forest and snag habitat in those large blocks that incurred the wildfire.

It is suspected that the direct, indirect and cumulative effects of the no action alternative would maintain snag/ down wood densities in the short term. With increased risk of wildfire, there could be a short term flush of snags as a result of stand destroying fires that would benefit both nesting and foraging for some species. These snags would fall and not be available in the long term, and no replacement snags would be available for 50+ years. The longer term impacts would result in potentially lower snag numbers than currently exist because of the potential for large stand destroying fire which removes large blocks of habitat, reducing the availability of snags and snag recruitment, potentially reducing the carrying capacity of the area to support cavity nesting species.

Current population trends for certain woodpeckers were identified in section 3.2.3 of the *Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* (synthesized population trends were extracted from published literature and reports where it was available): stable (hairy woodpecker, northern flicker), possibly decreasing to decreasing (pileated woodpecker, red-breasted sapsucker) and possibly increasing (white-headed woodpecker). Under all action alternatives, there could be slight changes to woodpecker habitat suitability. Suitability would decline for pileated and white-headed woodpecker, while the rest of the woodpecker species would have slight increases or no changes in habitat suitability.

WATERSHED AND SOIL RESOURCES

Summary of Effects

Alternative A (Proposed Action)

- By following the standards contained in the *Plumas National Forest Land and Resource Management Plan* (Forest Plan), there would be a low risk that soil productivity would be impaired. Alternative A would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. Impacts on soil resources would be less than alternative C, similar to alternative D, and greater than alternatives B, E, and F.

- The cumulative equivalent roaded acres (ERA) values would not exceed the Threshold of Concern (TOC) in any subwatershed.

- Large equivalent roaded acre (ERA) increases would place four subwatersheds at higher risk of cumulative effects. Low to moderate increases in three other subwatersheds would raise the disturbance levels to a higher risk of cumulative effects. However, these seven subwatersheds would not exceed the TOC.

- The enhanced ability of fire management to suppress, control, and contain fires that impact or start in fuel treatment units under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

- Decommissioning 15.6 miles of roads would result in long-term benefits to watershed resources by reducing sediment sources.

Alternative B (No Action)

- The lack of fuel treatment in alternative B would leave soil productivity and watershed values vulnerable to the damaging effects of future severe wildfires.

- No road decommissioning would occur, so associated long-term beneficial watershed effects would not be realized.

Alternative C

- By following the standards contained in the *Plumas National Forest Land and Resource Management Plan* (Forest Plan), there would be a low risk that soil productivity would be impaired. Impacts on soil resources would be greater than all other action alternatives. Alternative C would have the greatest amount of mechanical treatments, so there would be the greatest amount of ground disturbance from equipment, skid trails, and landings.

- The cumulative ERA values would not exceed the TOC in any subwatershed.

- Large ERA increases would place four subwatersheds at higher risk of cumulative effects. Low to moderate increases in three other subwatersheds would raise the disturbance levels to a higher risk of cumulative effects. However, these seven subwatersheds would not exceed the TOC.

- The enhanced ability of fire management to suppress, control, and contain fires that impact or start in fuel treatment units under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

- Decommissioning 12 miles of roads would result in long-term benefits to watershed resources by reducing sediment sources.

Alternative D (Preferred Alternative)

- By following the standards contained in the *Plumas National Forest Land and Resource Management Plan* (Forest Plan), there would be a low risk that soil productivity would be impaired. Alternative D would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. Impacts on soil resources would be less than alternative C, similar to alternative A, and greater than alternatives B, E, and F.

- The cumulative ERA values would not exceed the TOC in any subwatershed.

- Large ERA increases would place three subwatersheds at higher risk of cumulative effects. Low to moderate increases in two other subwatersheds would raise the disturbance levels to a higher risk of cumulative effects. However, these five subwatersheds would not exceed the TOC.

- The enhanced ability of fire management to suppress, control, and contain fires that impact or start in fuel treatment units under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

- Decommissioning 12 miles of roads would result in long-term benefits to watershed resources by reducing sediment sources.

Alternative E

- By following the standards contained in the *Plumas National Forest Land and Resource Management Plan* (Forest Plan), there would be a low risk that soil productivity would be impaired. Alternative E would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. Impacts on soil resources would be less than alternatives A, C, and D, and greater than alternatives B and F.

- The cumulative ERA values would not exceed the TOC in any subwatershed.

- Large ERA increases would place three subwatersheds at higher risk of cumulative effects. Low to moderate increases in one other subwatershed would raise the disturbance levels to a higher risk of cumulative effects. However, these four subwatersheds would not exceed the TOC.

- The enhanced ability of fire management to suppress, control, and contain fires that impact or start in fuel treatment units under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

- Decommissioning 12 miles of roads would result in long-term benefits to watershed resources by reducing sediment sources.

Alternative F

- By following the standards contained in the *Plumas National Forest Land and Resource Management Plan* (Forest Plan), there would be a low risk that soil productivity would be impaired. There would be no individual tree selection or group selection in alternative F, so there would be a reduced amount of mechanical treatments, resulting in less ground disturbance from equipment, skid trails, and landings. Impacts on soil resources would be less than alternatives A, C, D, and E, and greater than alternative B.

- The cumulative ERA values would not exceed the TOC in any subwatershed.

- Activities would not place any subwatersheds at higher risk of cumulative effects.

- The enhanced ability of fire management to suppress, control, and contain fires that impact or start in fuel treatment units under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

- Decommissioning 12 miles of roads would result in long-term benefits to watershed resources by reducing sediment sources.

Applicable Soil Quality Standards

Direction for the maintenance of soil productivity is found in the Plumas Forest Plan (USDA Forest Service 1988a), as amended by the 2004 Record of Decision for the Sierra Nevada Forest Plan Amendment (SNFPA). Guidance for analyzing, describing and reporting on key soil quality factors is given in the Soil Management Handbook (FSH 2509.18) and the Region 5 handbook supplement (USDA Forest Service 1995). Guidance provided by the Region 5 handbook supplement was utilized for analyzing current soil condition and to evaluate the expected effects of the proposed activities in this project on the soil resource.

Soil Compaction — Landing and Skid Trail Density

In most cases, soil compaction is caused by mechanical equipment, which operates on landings and skid trails to conduct fuel treatments and harvest activities. Soil compaction is a physical change in soil properties that results in a decrease in soil porosity and increases in soil bulk density and soil strength. Detrimental conditions occur when the established threshold values are exceeded and result in a reduced productive capacity over the planning horizon. The threshold for determining detrimental compaction is measured by the percent of the area or timber stand affected by skid trails and landings.

To avoid land base productivity loss due to soil compaction, the Plumas Forest Plan standards and guidelines state (USDA Forest Service 1988a, page 4-44):

"dedicate no more than 15% of timber stands to landings and permanent skid trails. Measurement will be along the travel way and shall not include the width of cut and fill slopes."

While the standard refers to "dedicated" skid trails and landings, no skid trails or landings have been dedicated on the Plumas National Forest. This means that no skid trails or landings are marked and mapped as permanent; however, old skid trails exist on the landscape from past activities.

The compaction threshold used in the Empire soil effects analysis is based on the need for measurable or observable soil conditions. The Empire project analysis uses a threshold of 15 percent. This means that if the cumulative amount of both existing and proposed landings and skid trails exceeds 15 percent of a timber stand unit, then soil productivity potential may be impaired. Based on research and technology, a 15 percent reduction in inherent soil productivity potential is used as a basis for setting the threshold value. Recent science (Powers et al. 1995) was also utilized when evaluating the expected effects of compaction and organic matter removal on soil productivity. Mitigation may be used to avoid or reduce detrimental impacts to soil productivity.

Surface Organic Matter — Large Woody Debris (LWD)

The applicable standards for LWD are in the Plumas Forest Plan (1988a) as amended by the SNFPA ROD (USDA Forest Service 2004a). The SNFPA ROD sets a forest-wide standard for the Plumas and other HFQLG Pilot Project areas for down woody material (p. 69):

"Determine down woody material retention levels on an individual project basis. Within Westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large down wood per acre. Within eastside vegetation types, generally retain an average of three large down logs per acre. Emphasize retention of wood that is in the earliest stages of decay. Consider the effects of follow-up prescribed fire in achieving desired retention levels of down wood levels."

The Region 5 handbook supplement also provides recommended thresholds and indicators for levels of large woody material (USDA Forest Service 1995). The handbook supplement recommends organic matter levels to prevent short- or long-term nutrient cycle deficits while at the same time managing wildfire risk potential. The handbook recommends a general level of five logs per acre with adjustments for the particular ecological type, which may take into consideration the fire history regime. To help meet fuel management objectives, levels can be adjusted to take advantage of the expected contributions from snags. This guidance from the handbook supplement is not part of the Forest Plan, however. The SNFPA ROD and the project design elements have provided the LWD standard for this project.

Surface Organic Matter — Fine Organic Matter

The Region 5 handbook supplement provides a set of recommended thresholds for surface fine organic matter (USDA Forest Service 1995). It is recommended that fine organic matter (plant litter, duff, and woody material less than three inches in diameter) occurs over at least 50 percent of the area.

Ground Cover

The Forest Plan provides a guide to determine effective ground cover (USDA Forest Service 1988a, page 4-44). Effective ground cover consists of material that impedes rain drop impact and overland flow, including organic residues, stumps, surface gravels, and live vegetation. The minimum cover is based on the erosion hazard rating (EHR), as follows: for EHRs of low, moderate, high, and very high, the minimum effective ground cover should be 40, 50, 60, and 70 percent cover, respectively.

Analysis Methods and Model Assumptions

The analysis methods and assumptions are fully described in section 4 of the Cumulative Watershed Effects and Soil Assessment report (USDA Forest Service 2007c). This information is summarized below.

Cumulative Watershed Effects Analysis

Geographic boundary. The geographic area examined for the cumulative watershed effects analysis consists of 26 subwatersheds, which encompass approximately 68,200 acres, or about 66 percent of the Empire Project area. Subwatersheds range in size from about 570 to 5,420 acres. The subwatersheds chosen for analysis consisted of those where planning areas or fuel treatments occupied one percent or more of the subwatershed area. The analysis subwatersheds drain to Indian Creek and Spanish Creek, which converge and drain to the North Fork Feather River, which drains to Lake Oroville.

Timeframe boundary. The assessment of past timber harvest activities was restricted to events within the last 30 years. High-intensity fire events were restricted to the last 20 years, and low or moderate intensity fires were restricted to the last 10 years. These values reflect the period of time required for site recovery following these types of activities and events. Beyond this time frame, vegetation has generally had ample opportunity to reestablish and develop adequate canopy cover to provide organic material to the soil. Together, canopy and litter cover provide physical protection against soil erosion. In addition, roots have reoccupied the soil mantle and most effects from compaction have been negated except along established travelways. These factors tend to moderate peak flows, and therefore diminish adverse effects on channel condition and water quality. A linear recovery coefficient was incorporated into the analysis to reduce the disturbance coefficients over the 10-, 20-, or 30-year recovery period. The effects of the proposed activities are similarly projected to extend between 10 and 30 years into the future, depending on the activity type. Figure 3.15 shows the disturbance model for a harvest activity.

Terminology

ERA. "Equivalent roaded acres" (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one "equivalent roaded acre" or ERA. Numeric coefficients are used to convert acres of timber harvest and other disturbance activities to ERAs. For example, 1 acre of underburning equals 0.05 ERA. In a given watershed, disturbances are often added together to determine a cumulative ERA for that watershed. This value is often expressed as a percentage of the threshold of concern (TOC).

TOC. The "threshold of concern" (TOC) is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects are high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the TOC is 12 percent of the watershed area, 100 percent of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface.

Understanding the ERA Model

The impacts of land management activities were evaluated on the basis of ERA, which serve as a "common currency" to describe impacts from a wide range of management activities. Within each analysis subwatershed, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to an area of road surface, resulting in a measure of ERA. Numeric disturbance coefficients were used to convert these management effects to equivalent road effects in terms of the pattern and timing of surface runoff. Coefficients vary by management activity, silvicultural prescription, site preparation methods, type of equipment utilized, and fireline intensity.

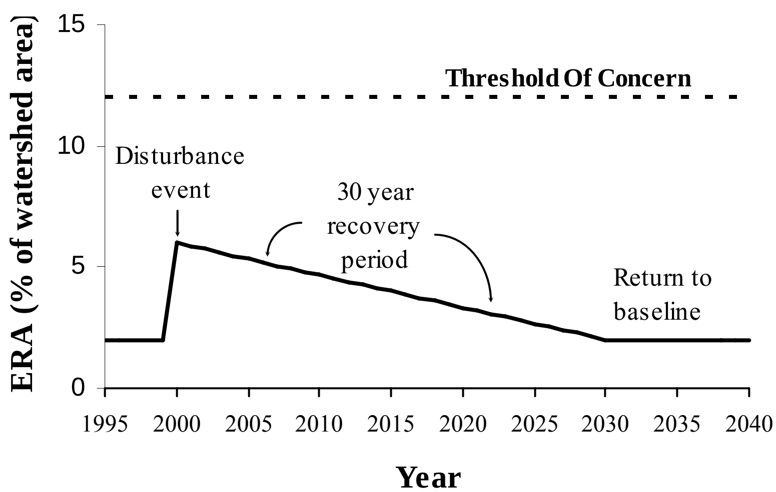


Figure **3.15.** Conceptual disturbance and recovery model for a harvest activity.

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. This value can serve as an index to describe impacts on downstream water quality. An increase in the road density of a watershed can result in greater impacts on water quality downstream.

Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the Threshold of Concern, or TOC. For this analysis, the TOC was assessed for each subwatershed in terms of the percent of the area in a hypothetically roaded condition. As disturbances approach the TOC, there is an increased probability that soil productivity and water quality values would be impaired. Above the TOC, water quality may be degraded to the point that the water is no longer available for established uses, such as municipal water supplies or irrigation, or no longer provides adequate habitat for fisheries. In addition, stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged.

As a guide to the cumulative watershed effects assessment, when planned activities within forest watersheds result in increases in equivalent roaded acres of 25 to 30 percent of the TOC, relatively small increases in peak flows are generally realized. Given that the ERA threshold for the subwatersheds in this analysis is 12 percent of the watershed area, this would likely result from an ERA increase of 3 to 4 percent of the watershed area. In watersheds where streams are stable and ERA values (watershed disturbances) are not approaching threshold, such increases generally do not stress the system. However, where increases in ERA approach 40 to 50 percent of the TOC (5 to 6 percent of the watershed area), stream channels are in poor condition, or ERA values are approaching the TOC, a closer look at the activities planned within the watershed is important.

Cumulative Watershed Effects Model Assumptions. In calculating the ERA contribution by the proposed harvest activities, all areas of treatment units were assumed to be treatable. For example, no compensations were made for rock outcrops, roaded areas, or slope limitations that would restrict harvest activities. In many cases, such site-specific information was not available. Fuel treatment units containing a combination of mastication and prescribed fire treatments were analyzed as though mastication would occur over the entire area. The location of individual treatments within these combination units was not specified, so the mastication coefficient was used because it was considered more disturbing than prescribed underburns. For fuel treatment units where prescriptions included aerial yarding, it was assumed that slopes in RHCAs would exclude equipment. Therefore, RHCAs in these areas were assumed to be treated with hand treatments and pile burning. Where prescribed fire was proposed within RHCAs, it was assumed that only half the acres in the equipment exclusion zone would burn because no active ignitions would occur in this area.

Soil Assessment

Geographic boundary. Soils were assessed at the fuel treatment unit and planning area scale. This was because effects on soil productivity are expected to be limited to the units in which the proposed treatments would occur. Due to the potential ground disturbance, units proposed for mechanical harvest treatment were given the highest priority for soil assessment. Soils-related information was collected in each of the 24 planning areas and 12 of the 28 fuel treatment units described in the proposed action.

Timeframe boundary. The soils analysis does not incorporate a time limit for considering past activities. The current soils condition reflects the cumulative effects of past activities, regardless of when they took place. For example, if multiple activities have occurred in a given treatment unit over the past 50 years, it is not necessarily possible to separate the effects of older treatments from more recent ones. As a result, it is not practical to set a time constraint on those effects. The future timeframe for the soils analysis must extend until the resource has recovered from the impact of the proposed activities. The persistence of soil effects into the future can vary widely. For example, ground cover may recover within one to two years following a treatment. Soil compaction, however, may last for decades. Thirty years was chosen as a future timeframe for soil effects. After this time, the degree and variability of soil conditions are expected to be similar to the no action alternative. Further description of the scope of the analysis, including maps of the subwatersheds and soil sampling units, are shown in section 2 of the Cumulative Watershed Effects and Soils Analysis report (USDA Forest Service 2007c).

Field Methods. Soil productivity measures were assessed in the proposed treatment units by the District Soil Scientist and a two-person field crew during the summer of 2004. Measures included surface organic matter, soil cover, and compacted soils. The fuel treatment units and planning area units were sampled using similar methods, which are fully described in the Cumulative Watershed Effects and Soil Assessment Report (USDA Forest Service 2007c). Treatment units were first stratified by proposed treatment activity. Ground-based operations were given highest priority for field survey. Units designated for prescribed burning, aerial yarding, or hand thinning treatments were given the lowest priority. These types of treatments, as proposed, are expected to cause relatively little soil disturbance and were not surveyed. The survey units were then stratified by maximum soil erosion hazard rating (USDA Forest Service 1988b). Within each erosion hazard class, each treatment was then stratified by soil type, and the survey transects in each erosion hazard class were distributed among the different soil types.

Twenty-five points were sampled per survey transect. At each point, the type of ground cover was determined. Cover categories included three depth classes of duff and litter, three size classes of woody debris, live vegetation, rock, or bare soil. If bare soil was encountered, an assessment was made to categorize the location as disturbed or undisturbed by management activities, showing evidence of erosion or deposition, or recently burned. To estimate the extent of compacted soils, an assessment was made to determine whether or not each sample point was located on a landing, or skid trail or road. Skid trails were identified by looking for evidence of past skidding, such as: a skid trail bed with cut and fill slope; a waterbarred equipment trail; a trail wide enough for a skidder, clear of vegetation, except brush or young trees with skinned or cat-faced trees along the edges of and facing the trail, and rutting in long, linear depressions resembling equipment tracks. These field data were used to estimate the percent cover of fine organic matter, large woody material, effective soil cover, and ground occupied by skid trails and landings.

Affected Environment

The "Empire Vegetation Management Project: Cumulative Watershed Effects and Soils Analysis" is located in the project record and is incorporated by reference.

Precipitation

The average annual precipitation varies from 40 to 50 inches in the lower elevations of the watershed analysis area, and between 50 and 70 inches along Indian Falls Ridge and Grizzly Peak (Pacific Regional Information System). Precipitation falls primarily as snow above 6,000 feet and as a mixture of snow and rain below that elevation. Precipitation distribution is characteristic of the Mediterranean climate, with most precipitation occurring between October and May. About half of the annual precipitation falls during December, January, and February. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

Stream Channels and Road Crossings

Stream channels in the watershed analysis area exhibit a range of types, including about 80 miles of perennial streams, 220 miles of intermittent streams, and 395 miles of ephemeral streams. Known trout fishery streams include tributaries of Taylor, Tollgate, Spanish, Cashman, Pine, Estray, and Greenhorn creeks. Unlike perennial or many intermittent streams, there was typically no riparian vegetation component associated with ephemeral streams. Existing and abandoned roads, skid trails, or historic ditches have disturbed or diverted many of the channels, and this has caused some channels to abruptly stop, change direction, or lose connectivity with the channel network. This is especially true of ephemeral stream types, the result of which is a limited function of these channels to transport water, wood, or sediment to lower reaches of the drainage network. An active irrigation ditch seasonally diverts water from Taylor Creek into Chandler Creek. Field surveys conducted for this project identified a number of springs, seeps, and seasonal wetlands that are a part of the drainage network. Most stream channels are in fair condition. Field surveys identified several downcut or degraded stream reaches. Road density in the analysis subwatersheds ranges from 0 mile to 7.1 miles of road per square mile but averages about 3 miles per square mile. The HFQLG Pilot Project rates road density as low – less than 1 mile per square mile; moderate – 2 to 3 miles per square mile; and high – greater than 3 miles of road per square mile of land. Most subwatersheds contain moderate to high road densities. For each mile of road, there are typically about four stream crossings. The locations where roads cross streams are a frequent source for sediment to enter streams. Road/stream crossing density ranges from less than one per square mile to more than 27 per square mile.

Beneficial Uses

Existing beneficial uses of surface waters in the Empire Project area are found in the Central Valley Region Water Quality Control Plan (California Regional Water Quality Control Board 2004). This area drains to the North Fork Feather River, for which existing beneficial uses include municipal and domestic supply, hydropower generation, recreation, freshwater habitat, habitat suitable for fish reproduction and early development, and wildlife habitat.

Watershed Sensitivity

Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in the *HFQLG Forest Recovery Act Final Environmental Impact Statement* (USDA Forest Service 1999). The sensitivity ratings were based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorm events, and on revegetation potential. The 12 HFQLG Pilot Project watersheds applicable to this project received moderate sensitivity ratings. Based on these ratings, each subwatershed analyzed in this assessment was considered to have moderate sensitivity and was assigned a TOC value of 12 percent of the subwatershed area.

Watershed Disturbance

Existing ERA values for the analysis subwatersheds currently range from 1 to 85 percent of the TOC (tables 3.34 and 3.35). The percent of TOC varies across subwatersheds due to the cumulative effects of past land management practices and natural disturbances such as wildfire. Figure 3.16 shows how the major land use activities contributed to the total ERA for each subwatershed. The transportation system typically accounts for about one to three percent of the area in a given subwatershed. Past harvest activities, whether public or private, have occurred in each subwatershed. Disturbance values are relatively low in subwatersheds in the Indian Falls Hydrological Unit Code (HUC) 6 area. In contrast, recent private harvests in the Estray Creek HUC6 area have caused subwatersheds there to closely approach the TOC. Past wildfires contributed only very minor additions to the ERA within each subwatershed, and so were not considered a major land use activity. In figure 3.16, disturbance attributed to wildfire has been included in the public harvest category. Past activities are further discussed in the section on environmental consequences, below.

Table 3.34. Equivalent roaded acres, presented as the percent of the Threshold of Concern for each alternative.

Analysis Subwatershed		ERA (% of Threshold of Concern)					
		Alternative A Proposed Action	Alternative B No Action	Alternative C	Alternative D	Alternative E	Alternative F
001	Dog Rock	38	33	38	38	38	38
002	Indian Falls Ridge south	8	1	8	8	8	8
006	Montgomery Creek	34	12	34	31	29	21
008	Butterfly Creek	58	42	58	58	55	54
009	Keddie Lodge	44	24	43	43	40	39
010	Spanish Creek Camp	68	50	68	68	68	68
011	Clear Creek	63	22	67	60	57	46
012	Keddie	37	31	40	37	37	30
013	Cashman Creek	73	19	79	70	64	46
014	Gilson Ck	26	17	27	26	26	23
015	Tollgate Ck	64	9	69	59	53	37
016	Big Blackhawk Creek	39	37	39	39	39	39
017	Opposite Oakland Camp	31	21	21	21	21	21
018	Berry Creek	56	17	58	55	52	42
019	Chandler Creek	57	32	53	54	51	45
020	Taylor Creek	81	28	81	78	73	50
021	Dry Taylor/Empire Ravine	54	34	53	53	51	39
024	Thompson Creek	41	36	43	41	41	36
025	Sockum Creek	43	28	41	42	41	37
026	Massack Creek	80	46	83	83	79	66
027	Upper Squirrel Creek	49	26	57	44	44	26
028	Mid Squirrel Creek	54	50	56	53	53	50
029	Pine Creek, Lower Squirrel Creek	64	55	63	62	61	59
030	Greenhorn Creek	91	85	89	85	85	85
032	Upper Estray Creek	53	42	49	49	47	47
033	Lee Summit West	94	61	93	89	84	84

Table 3.35. Risk of detrimental watershed effects in each analysis subwatershed under each action alternative.

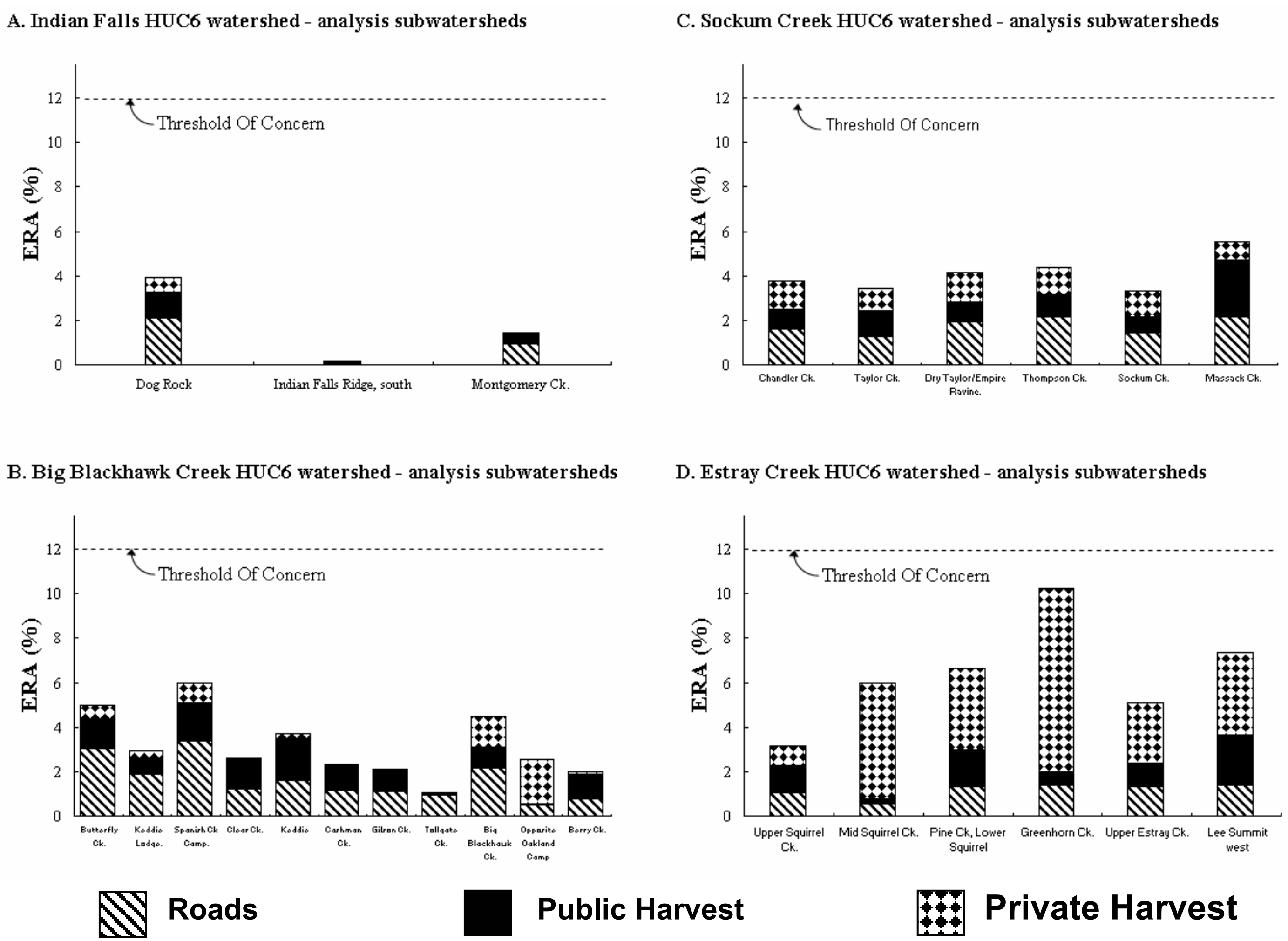
Analysis Subwatershed	Risk of Detrimental Watershed Effects[a,b]				
	Alternative A Proposed Action	Alternative C	Alternative D	Alternative E	Alternative F
001 Dog Rock	Lower	Lower	Lower	Lower	Lower
002 Indian Falls Ridge south	Lower	Lower	Lower	Lower	Lower
006 Montgomery Creek	Lower	Lower	Lower	Lower	Lower
008 Butterfly Creek	Lower	Lower	Lower	Lower	Lower
009 Keddie Lodge	Lower	Lower	Lower	Lower	Lower
010 Spanish Creek Camp	Moderate	Moderate	Moderate	Moderate	Moderate
011 Clear Creek	Higher	Higher	Higher	Higher	Lower
012 Keddie	Lower	Lower	Lower	Lower	Lower
013 Cashman Creek	Higher	Higher	Higher	Higher	Lower
014 Gilson Ck	Lower	Lower	Lower	Lower	Lower
015 Tollgate Ck	Higher	Higher	Moderate	Moderate	Lower
016 Big Blackhawk Creek	Lower	Lower	Lower	Lower	Lower
017 Opposite Oakland Camp	Lower	Lower	NA	NA	NA
018 Berry Creek	Moderate	Moderate	Moderate	Moderate	Lower
019 Chandler Creek	Lower	Lower	Lower	Lower	Lower
020 Taylor Creek	Higher	Higher	Higher	Higher	Lower
021 Dry Taylor/Empire Ravine	Lower	Lower	Lower	Lower	Lower
024 Thompson Creek	Lower	Lower	Lower	Lower	Na
025 Sockum Creek	Lower	Lower	Lower	Lower	Lower
026 Massack Creek	Higher	Higher	Higher	Higher	Moderate
027 Upper Squirrel Creek	Lower	Moderate	Lower	Lower	Lower
028 Mid Squirrel Creek	Lower	Lower	Lower	Lower	NA
029 Pine Creek, Lower Squirrel Creek	Moderate	Moderate	Moderate	Moderate	Lower
030 Greenhorn Creek	Higher	Higher	Moderate	Moderate	Moderate
032 Upper Estray Creek	Lower	Lower	Lower	Lower	Lower
033 Lee Summit West	Higher	Higher	Higher	Moderate	Moderate

Notes:

a. For cumulative ERA values < 60% of TOC, ERA increases were rated as lower, < 30% TOC; moderate, 30–50% TOC; higher, >50% TOC. For cumulative ERA values 60–85% of TOC, ERA increases were rated as moderate, <30% TOC; higher, >30% TOC; Cumulative ERA values >85% of TOC received higher risk ratings.

b. "NA" indicates that no treatment would occur in the specified subwatershed.

Figure 3.16. Alternative B (no action), the existing condition: equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC 6 watersheds are shown in A, B, C, and D, respectively.



Geology

The geologic formations underlying the watershed analysis area tend to occur in northwest-southeast bands (USDA Forest Service 1988b). As a result, soil types developed from these materials also tend to occur in northwest-southeast running bands. Metasedimentary parent material, such as schist, can be found at some high elevations along Indian Falls Ridge. Metavolcanic rock outcrops are prominent features along the ridge. Metavolcanic parent materials, including greenstone, typically dominate the southerly slope of Indian Falls Ridge. Sedimentary and metasedimentary parent materials, including schist and shale, dominate lower elevations on the south slope of Indian Falls Ridge. Parent materials in the southern portions of the watershed analysis area also include volcanic mudflow deposits and basalts.

Soils

While a variety of soils occur across the Empire project area, two soils occur on more than 70 percent of the total project acres. Soils of the Holland family are generally deep and well drained, with surface textures ranging from gravelly loam to gravelly clay loam. These are moderately productive soils, with a maximum erosion hazard rating (EHR) of moderate. The maximum EHR describes the risk of accelerated sheet and rill erosion if the soil had no soil cover. Holland soils are moderately susceptible to compaction. Soils of the Ultic Haploxeralf-Inville family complex are generally deep and well drained, with surface textures ranging from cobbly loam to very gravelly loam. The are low to moderately productive soils with maximum ERH of low to moderate. These soils are slightly to moderately susceptible to compaction (USDA Forest Service 1988b).

Existing soil condition was evaluated during field visits in the project area. Tables 3.36 and 3.37 display the survey results for fuel treatment units and planning areas, respectively. Currently, all of the fuel treatment units are at or below the compaction threshold, meaning that landings and skid trails occupy 15 percent or less of the unit. However, three of the planning areas exceed the compaction threshold. All sampled treatment units meet the Forest Plan standards for ground cover. All of the sampled units meet the recommended level of fine organic matter cover.

Standards and guidelines for down wood in the Empire Project are based on Forest Plan direction. These standards are to "generally retain an average over the treatment unit of 10-15 tons of large down wood per acre…Emphasize wood that is in the earliest stages of decay" (USDA Forest Service 2004a, page 69). This standard does not utilize a minimum diameter or length for down wood. Table 3-1 in the Forest Vegetation section displays the vegetation types in the Empire Project area. Within treatment units, the dominant coniferous forest types include Sierra mixed conifer and white fir forests. Together, these comprise 75 and 95 percent, respectively, of the fuel treatment units and planning areas. Using well-established photo series for quantifying natural forest residues (Blonski and Schramel 1981), down wood loadings in the treatment units are represented by the mixed conifer pine classifications 4-MP-4 and 5-MP-4 and white fire classifications 4-WF-4 and 5-WF-4. These types support 22 to 33 tons per acre of down wood greater than 9 inches in diameter. Woody debris was also indirectly evaluated on a unit by unit level as represented by fuel model (see Fire Fuels Specialist Report table F-3). The majority of forested areas in proposed treatment units are represented by a fuel model 10. Fuel model 10 is described as having heavy down material and "…greater quantities of 3-inch or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor" (Rothermel 1983) (See also Fire, Fuels, and Air Quality section on "Surface Fuels").

The Region 5 Supplement to the Soil Management Handbook (USDA Forest Service 1995) recommends that large woody material occurs as five well distributed logs per acre representing the range of decomposition classes. Desired logs would be at least 20 inches in diameter and ten feet long. These thresholds may be supplemented with local analyses. The historic median composite fire return interval within the Empire project area was 11 years (Moody et al. 2006). This frequency of fire would have likely consumed rotten woody debris, particularly on south facing slopes which compose most of the Empire project area. Large woody material was assessed on a percent cover basis, and recent research was used to interpret these cover data in terms of logs per acre. In published research examining woody debris in a mixed conifer northern Sierra forest (Stephens and Moghaddas 2005), about two percent cover of coarse woody debris corresponds to about 75 pieces of woody debris per acre, in all decay classes, greater than six inches in diameter. Among these, large woody debris greater than 18 inches in diameter averaged more than eight pieces per acre. Based on these findings, where large woody debris was observed in Empire units, it is likely that more than five logs per acre were present. It is anticipated that, over time, falling snags and blowdown will contribute to additional woody debris inputs.

Table 3.36. Results of the soil field surveys in fuel treatment units.[a]

Fuel Treatment Unit	Skid Trail and Landing Cover		Effective Ground Cover[b]				Fine Organic Matter Cover		Coarse Woody Material Cover	
			Moderate EHR[c]		High EHR					
1	2	(2)	87	(10)[c]	88	-	72	(9)	0.0	(0.0)
3	7	(4)	-	-	89	(6)	76	(3)	3.0	(3.8)
4	3	(3)	96	(7)	85	(2)	73	(6)	2.7	(2.1)
6	10	(3)	-	-	92	(0)	72	(0)	4.0	(0.0)
13	4	(3)	92	(7)	92	-	73	(9)	1.0	(2.0)
17	1	(2)	85	(4)	88	(8)	63	(15)	2.9	(2.0)
18	5	(4)	93	(2)	85	(16)	77	(12)	1.1	(2.0)
19	4	(4)	89	(2)	-	-	59	(23)	1.3	(2.3)
21	4	(3)	99	(2)	96	(6)	88	(6)	2.0	(2.3)
23	3	(3)	92	(6)	94	(5)	80	(8)	2.7	(4.1)
24	0	-	-	-	88	-	84	-	4.0	-
25	2	(2)	95	(2)	100	-	92	(3)	0.0	(0.0)

Notes:
a. All values represent percent cover as determined by point transects. Units not listed were designated as prescribed fire, aerial yarding, or hand-thinning treatments.

b. Effective ground cover is shown by maximum erosion hazard rating (EHR) class.
c. The table shows the arithmetic mean for each unit, with the standard deviation shown in parentheses.

Table 3.37. Results of the soil field surveys in planning areas.[a]

Planning Area	Skid Trail and Landing Cover		Effective Ground Cover[b]				Fine Organic Matter Cover		Coarse Woody Material Cover	
			Moderate EHR[c]		High EHR					
1G	2	(3)	—	—	72	(23)	62	(20)	4.0	(0.0)
2G	10	(9)	92	(11)	75	(17)	74	(13)	0.8	(1.8)
3G	9	(0)	80	(17)	84	—	69	(15)	0.0	(0.0)
4G	4	(7)	90	(8)	80	—	73	(12)	1.3	(2.3)
5G	12	(11)	91	(10)	76	(17)	69	(12)	0.8	(1.8)
6G	21	(16)	81	(8)	—	—	65	(8)	2.7	(2.3)
7G	16	(6)	100	—	100	—	94	(3)	0.0	(0.0)
8G	3	(4)	92	(6)	86	(6)	76	-	0.0	-
9G	16	(6)	—	—	84	(11)	80	(6)	0.0	(0.0)
10G	5	(2)	96	—	98	(3)	88	(4)	0.0	(0.0)
11G	12	(7)	94	(3)	92	—	81	(2)	1.3	(2.3)
12G	7	(4)	86	(3)	91	(6)	76	(6)	0.0	(0.0)
13G	1	(2)	98	(3)	84	—	84	(11)	1.3	(2.3)
14G	4	(4)	88	(3)	96	(7)	75	(17)	0.0	- (0.0)
15G	6	(3)	84	(6)	—	—	74	(3)	0.0	(0.0)
16G	2	(3)	90	(3)	—	—	84	(6)	0.0	(0.0)
17G	2	(2)	100	(0)	86	(8)	92	(11)	1.0	(2.0)
18G	5	(2)	93	(2)	84	(23)	76	-	0.0	-
19G	2	(3)	88	(6)	92	(4)	69	(17)	1.7	(2.1)
20G	8	-	88	—	—	—	80	-	0.0	-
21G	3	(2)	94	(3)	100	—	92	(4)	0.0	(0.0)
22G	4	(4)	98	(3)	96	—	89	(6)	1.3	(2.3)
23G	7	(8)	60	—	82	(8)	73	(11)	0.0	(0.0)
24G	7	(5)	86	(8)	96	(6)	81	(15)	0.0	(0.0)

Note:
a. All values represent percent cover as determined by point transects. Effective ground cover is shown by maximum erosion hazard rating (EHR) class. The table shows the arithmetic mean for each unit, with the standard deviation shown in parentheses. Values in bold type exceed the compaction threshold.

Environmental Consequences — Watershed Effects Common to the Action Alternatives

CWE Analysis – Direct and Indirect Effects. The proposed fuel treatment and planning area activities would increase ERA values in the subwatersheds where treatments would occur. Road reconstruction and construction would increase ERA values due to construction disturbance and, in the case of new roads, the addition of roaded acres on the landscape. Road decommissioning would decrease ERA values because road impacts, such as runoff and sedimentation, would be reduced, and roaded acres would be removed from the landscape. Road closures would not affect ERA values because the road surface, road bed, and stream crossings would not be altered by the closures.

In all alternatives, the objective of the RHCA treatments in the fuel treatment units is to reduce the potential for adverse impacts from high-intensity wildfire. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). During wildfires, drainages can behave like chimneys, rapidly directing fire upslope through the drainage area. These RHCA treatments would provide a safer and more effective fire suppression environment, improve forest health, and provide for a more sustainable vegetation condition consistent with protecting and maintaining riparian habitat values, as discussed in the "Cumulative Watershed Effects and Soils Assessment" (USDA Forest Service 2007c). An interdisciplinary team (comprised of a fisheries biologist, wildlife biologist, botanist, soil scientist, and fuels specialist) evaluated riparian areas within the fuel treatment units to determine treatment needs and streamside protection measures. Hill slope, stream channels, soil, vegetation, and habitat characteristics were considered when developing the RHCA treatments. Design elements were incorporated into RHCA treatments in all alternatives to prevent accelerated erosion and sedimentation into the drainage network, regardless of tree removal prescriptions.

Within RHCAs, the green line would be preserved and remain unaffected by harvest activities. Within the immediate riparian areas, the physical effects derived from in-channel LWD would be sustained because no natural in-channel debris would be removed. In forested stream systems, debris can help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg et al. 2002). Future recruitment of LWD would be encouraged through release of the existing conifers, and the snag retention standards for channel morphology, channel function, and bank stability. Thinning within the RHCA may initially reduce the interception of precipitation, thus potentially increasing runoff in the short term. Thinning within the RHCAs may reduce evapotranspiration, thus retaining increased ground water. The main objective is to reduce the potential for catastrophic wildfire, and thus, retain the RHCA's desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges.

Harvest activities may locally alter soil moisture regimes and subsequent water yield due to altered interception and evapotranspiration. Harvested areas would be more susceptible to erosion and sediment transport to the channel network. However, implementation of Best Management Practices would help greatly reduce these effects. Equipment exclusion zones would prohibit ground-based equipment from operating in near-stream or other sensitive areas such as springs, seeps or wet meadows. These buffer areas would serve as filters and absorptive zones for potential sediment originating from upslope treatments. All group selection and individual tree selection will be excluded from riparian habitat conservation areas (RHCAs). In fuel treatments where RHCAs would be mechanically treated, ground-based equipment would only be used on slopes less than 30 percent and on stable soils. These limitations will reduce the potential for accelerated erosion and sedimentation. Short-term sediment delivery to streams may occur after burning. However, scorched conifers often drop needles following low- or moderate-severity fires. This needle cast provides ground cover that can help reduce rill and interrill erosion and sediment delivery (Pannkuk and Robichaud 2003). Despite the risk of erosion, the greater long-term benefit of treating these RHCAs is the potential protection from high-severity wildfire.

Road decommissioning may include culvert removal, subsoiling of the roadbed, recontouring the hillslope, and/or seeding the affected area. These measures would help initiate revegetation and recovery of the road area. Over time, decommissioned roads would produce less sediment and surface runoff to adjacent watercourses. As a result, their contribution towards the ERA of a watershed would be reduced. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff, and sediment production compared to subsoiling or cover cropping. Road construction would create new sources of sediment and disrupt the hydrologic continuity on affected hillslopes. Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing or upgrading culverts where needed. Short-term increases in sediment may be offset by long-term improvements to water quality as a result of improved road drainage and stream crossings.

CWE Analysis – Cumulative Effects. Road decommissioning would reduce ERA contributions by roads, and result in long-term beneficial effects on water quality. Increases in ERA may lead to detrimental effects, including erosion from treated hillsides and chronic sedimentation. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover. Prescriptions for the Empire Project include harvests, underburning, and mastication. The harvest operations would cause associated disturbance from skid trails, site preparation, and transportation needs, such as temporary roads. Erosion into stream channels could decrease coldwater fish habitat quality by infilling pools and embedding spawning gravels. Following these prescriptions, there would be some canopy retention and surface vegetation recovery that would contribute to rebuilding forest floor materials.

The cumulative ERA values predicted for each alternative would vary by subwatershed. Relatively large increases in ERA would translate to an increased risk of detrimental effects. In some cases, different alternatives would result in only marginal differences in the predicted ERA for a given subwatershed. Following the cumulative watershed effects model, marginal increases in ERA would result in similarly marginal changes in the risk of detrimental watershed effects.

Higher ERA values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment loads off-site. Stream channels in poor condition tend to be more sensitive to increases in peak flows because the channels frequently lack an effective root mass to bind streambanks and large organic debris to retain bedload materials. These channels are frequently downcut (have eroded down into the bottom of their channels) and all flow is confined to the channel, rather than to a broader floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream.

While fire ignitions are expected to continue following the activities proposed in the action alternatives, fuel treatments would be designed to give wildland fire managers "a higher probability of successfully attacking a fire" (Agee et al. 2000). A future severe wildfire would have the effects described under alternative B, but implementation of an action alternative would reduce the likelihood of such an event.

Environmental Consequences — Soil Effects Common to the Action Alternatives

Detrimental Compaction — Direct and Indirect Effects. Empire Project standard management requirements include implementation of best management practices (BMP) and other soil protection measures, such as wet weather standards, to minimize soil compaction (Appendix F). However, the use of heavy forestry equipment and frequent stand entries would increase the potential for soil compaction (Powers 1999). Holland soils and soils of the Ultic Haploxeralf-Inville family occupy more that 70 percent of the acres that would be treated. While these are slightly to moderately susceptible to compaction, the Empire project would reduce potential compaction by restricting operations with wet weather standards. Proposed mechanical treatments, in both the fuel treatment units and planning areas, would likely cause soil displacement and compaction from physical ground disturbances by equipment and harvested materials during yarding, mastication, machine piling of slash, or biomass removal. Among these disturbances, mastication would generally result in relatively reduced ground disturbance because the masticator can operate on top of the masticated materials, which provide a physical buffer between the machine and the underlying soil. Largely due to the nature of group selection silvicultural systems, treatments would occur only on about 45 percent of the acres contained in treatment units. Less than one third of the planning area acres would be treated with ground-based equipment such as tractors. Additionally, about one third of the fuel treatment units would be treated with hand-thinning or prescribed fire, which are not expected to result in additional soil compaction.

Compacted and heavily disturbed ground can cause soil productivity to decline over time (Grigal 2000; Horwath et al. 2000). Recent research suggests however that compaction does not necessarily lead to productivity declines (Gomez et al. 2002; Powers et al. 2005). These studies show that in California's Mediterranean climate the effects of compaction are dependent on soil texture. The studies show that compaction of sandy loam and coarser textured soils can actually increase productivity because compaction increases available water holding capacity. In loamy soils compaction can have a neutral or insignificant effect, and in clayey soils compaction has a detrimental effect. Since the project soils are mostly gravelly loam to gravelly clay loams, the applicable standard limiting skid trails and landings to 15% of an area are relatively conservative in protecting the soils from productivity loss due to compaction.

For any mechanical harvest, the extent and degree of compaction depends on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations, and harvest equipment features. For the Empire Project, the compaction threshold for skid trails and landings is 15 percent. That is, if more than 15 percent of a unit is occupied by skid trails and landings, the unit exceeds the compaction threshold. Three techniques were used to estimate the extent of skid trails and landings following the proposed harvest treatments, based on: 1) inputs from the logging system specialist working on the Empire Project; 2) soil monitoring data of skid trails, landings, and roads following HFQLG projects; and 3) soil monitoring data of detrimental compaction following HFQLG projects (tables 3.38 and 3.39). As part of the project design, units that are predicted to exceed 15 percent would be reevaluated after treatment. Under the direction of the district soil scientist, subsoiling would be prescribed to ameliorate detrimental compaction and place the units in an improved condition that does not exceed the compaction threshold. These units are shown in bold type in tables 3.38 and 3.39.

For the fuel treatment units, each estimate predicts that all units would remain at or below the compaction threshold (table 3.38). In the existing condition, three planning areas (6G, 7G, and 9G) exceed the compaction threshold (table 3.39). The logging specialist estimate predicts that only these same three units would require subsoiling in order to remain at or below the threshold following harvest. The estimate based on HFQLG monitoring of skid trails, landings and roads predicts that an additional three units (3G, 5G, 11G) would require subsoiling to stay at or below the threshold. The estimate based on HFQLG monitoring of detrimental compaction predicts that only units 6G, 7G, and 9G would require subsoiling to stay at or below the compaction threshold.

Skid trail and landing estimate #1: Empire Project logging system specialist:

The number of skid trail and landing acres needed for the proposed activities in each planning area and a number of fuel treatment units were estimated by a logging systems specialist. This thorough, site-specific examination of the treatment units included extensive aerial photograph interpretation and field review. In his analysis, the logging system specialist incorporated the different treatments proposed by the different alternatives. In skyline units, for example, he estimated the number of landings based on the number of skyline corridors needed to harvest the unit. In helicopter units, the landing size was increased to 2 acres in order to provide services to the aircraft. Based on his timber harvest experience and field reconnaissance of the units, the logging system specialist estimated that re-use of existing skid trails and landings could account for about half the skid trails and landings needed to implement the proposed treatments. By utilizing pre-existing skid trails and landings, fewer new skid trails and landings would be needed, resulting in less new disturbance. Based on the estimates provided for the planning areas, a rule-of-thumb for increases in skid trails and landings was developed for the remaining fuel treatment units. Landings and skid trails would occupy approximately 14 percent of each fuel treatment unit. However, re-use of existing trails and landings would reduce the amount of new trails and landings needed to harvest the areas. It is assumed that all fuel treatment alternatives would require the same amount of skid trails and landings to service the treated acres. Results are shown under the heading “estimate #1” in tables 3.38 and 3.39.

Skid trail and landing estimate #2: HFQLG soil monitoring of skid trails, landings, and roads

As part of the HFQLG soil monitoring, the extent of skid trails, landings, and nonsystem roads were determined for group selection and DFPZ units (USDA Forest Service 2005). While these treatments occurred on a variety of soil types that may differ from those found in the Empire project, the treatments are similar. The monitoring showed that the overall average density of skid trails, landings, and non-system roads was 19 percent. To estimate the skid trails and landings, this value was applied to the treatment acres proposed within each planning area. Only about 25% of the area in each planning area would be treated. For DFPZs, the monitoring data found an average density of skid trails, landings and nonsystem roads of 15 percent. This value was applied to the fuel treatment units, assuming the re-use of existing skid trails and landings. Results are shown under the heading “estimate #2” in tables 3.38 and 3.39. For our purposes, these values may be an overprediction: the monitoring included skid trails used for the most recent harvest, but presumably also included all existing landings and nonsystem roads. While we used these values to predict the extent of skid trails and landings needed for the proposed treatments, the values also represent nonsystem roads as well as unused landings.

Skid trail and landing estimate #3: HFQLG soil monitoring data for detrimental compaction:

Pre-treatment monitoring of detrimental soil compaction in thinning units and group selection units for several HFQLG projects occurred each year from 2001 to 2004 (USDA Forest Service 2002, 2004b, 2005). Post-treatment soil monitoring occurred from 2004 to 2006 (USDA Forest Service 2006a). While the treatments occurred on a variety of soil types that may differ from those found in the Empire project, the treatments are similar. The monitoring showed that changes in detrimental compaction varied by project. In 2004, 9 thinning units were surveyed after treatment and, on average, total compaction in the unit increased from 16 percent to 24 percent of the treatment unit (USDA Forest Service 2005b). In 2005, 20 thinning units and 11 group selection units were monitored after treatment and, on average, compaction *decreased* from 20 percent to 19 percent of the treatment unit (USDA Forest Service 2006b). Of the 31 monitored units, 18 showed a decrease or no change in the extent of detrimental compaction. The report provided possible explanations for the unexpected decrease in compaction: seven units had been subsoiled (which is commonly prescribed to mitigate compaction): errors may have occurred in the 2001 pretreatment sampling for these units; post-treatment samples were not taken from the same locations as pre-treatment samples; and the compaction assessment is largely based on the field crews' judgment – differences in field skills can lead to differences in results. The 2006 Soil Monitoring Report (USDA Forest Service 2006a) summarizes the average change in the extent of detrimental compaction for all three years of post-treatment monitoring. However, units that showed a decrease or no change in compaction were excluded from this summary. In general, each entry added a little compaction. On average, the extent of detrimental compaction increased by 13.5 percent relative to the extent of compaction prior to treatment. Because this value summarizes all three years of monitoring results, 13.5 percent was applied to the treatment units. Results are shown under the heading "estimate #3" in tables 3.38 and 3.39.

Compaction remediation with subsoiling

Data shown in tables 3.38 and 3.39 only reflect subsoiling in the few units predicted to exceed the compaction threshold (shown in bold). As part of the project design for each treatment unit, all landings and skid trail approaches to landings would be subsoiled after use to reduce compaction effects. To reduce the risk of subsequent erosion, slopes greater than 25 percent would not be subsoiled. Subsoiling would not occur on shallow or highly rocky soils where the displacement of rocks would disrupt soil horizons, or where there are concerns about the spread of root disease or damage to tree boles. Effective subsoiling requires an implement, such as a winged subsoiler, capable of being inserted into the soil a minimum of 16 inches, and pulled to create lateral and vertical shattering of the soil (USDA Forest Service 1992) Without sufficient power, proper design, application, and timing for appropriate soil moisture, there is minimal effectiveness in the reduction of detrimental compaction by subsoiling (USDA Forest Service 2006c) When properly designed and implemented, however, subsoiling is effective at reducing compaction (Kolka and Smidt 2004) and the soil benefits (USDA Forest Service 2002a). Effectiveness of subsoiling varies with equipment used, soil type, amount of rockiness, and soil moisture; and is expected to range between 60-80 percent (USDA Forest Service 2002c). On the Plumas National Forest, the application of subsoiling to loosen soil and restore soil porosity has been applied on the Spike, Chance, Clairville, Westside, Maddalena, and various service contracts. This technique was successful in loosening the soil, restoring soil porosity, providing a high infiltration capacity, and thereby reducing cumulative watershed effects (USDA Forest Service 2002b). Where subsoiling was not effective, this was due, in part, to a lower standard of acceptance, wide skid trails that were treated with only one pass by the subsoiler rather than two or more, and non-compliance with environmental documents (USDA Forest Service 2001c).

Empire Project SMRs include implementation of best management practices (BMP) and other soil protection measures, such as wet weather standards, to minimize soil compaction. The SMRs include a drawing of a winged subsoiler ripper shank with design specifications. By following the SMRs, using existing skid trails where feasible, and adhering as best as possible to the estimates of new skid trail needs, increases in detrimental compaction due to skid trails are expected to remain at the levels shown in tables 3.38 and 3.39.

Detrimental Compaction — Cumulative Effects. Tables 3.38 and 3.39 show the predicted cumulative level of skid trail and landing cover for the fuel treatment units and planning areas. All treated units are expected to remain at or below the compaction threshold.

Table 3.38. Cumulative effects on skid trail and landing cover in fuel treatment units[a].

[a] Units not listed were designated as prescribed fire, aerial yarding, or hand-thinning treatments.

Fuel Treatment Unit	Existing Condition, Average (± s.d.)		Cumulative Total for All Alternatives		
			Estimate #1 project-specific estimates	Estimate #2 HFQLG monitoring of skid trails, landings, roads	Estimate #3 HFQLG monitoring of detrimental compaction
1	2	(2)	14	15	2
3	7	(4)	14	15	8
4	3	(3)	14	15	3
6	10	(3)	15	15	11
13	4	(3)	14	15	5
17	1	(2)	14	15	1
18	5	(4)	14	15	6
19	4	(4)	14	15	5
21	4	(3)	14	15	5
23	3	(3)	14	15	3
25	2	(2)	14	15	2

[a] Units not listed were designated as prescribed fire, aerial yarding, or hand-thinning treatments.

Table 3.39. Cumulative effects on skid trail and landing cover in planning areas[a].

[a] Values in bold reflect the additional use of subsoiling to stay at or below the compaction threshold.

Planning Area	**Existing Condition, Average (± s.d.)**		**Cumulative Total by Alternative**			**Cumulative Total for All Alternatives**	
			Estimate #1 project-specific estimates			**Estimate #2** HFQLG monitoring of skid trails, landings, roads	**Estimate #2** HFQLG monitoring of skid trails, landings, roads
			Alt A	Alt A	Alt A		
1G	2	(3)	3			6	2
2G	10	(9)	11			11	11
3G	9	(0)	11	11		**15**	11
4G	4	(7)	5	4	5	6	5
5G	12	(11)	15	15	13	**15**	14
6G	21	(16)	**15**	**15**	**15**	**15**	**15**
7G	16	(6)	**15**	**15**		**15**	**15**
8G	3	(4)	4	4		4	3
9G	16	(6)	**15**			**15**	**15**
10G	5	(2)	7	8	7	10	6
11G	12	(7)	14	13	13	**15**	14
12G	7	(4)	9	8	9	13	8
13G	1	(2)	5	5	5	8	2
14G	4	(4)	6	6	6	11	5
15G	6	(3)	8	8	8	12	7
16G	2	(3)	5	3	3	9	2
17G	2	(2)	3	3	3	3	2
18G	5	(2)	7	7	6	11	5
19G	2	(3)	3	4	3	6	2
20G	8	-	9			10	9
21G	3	(2)	4	4	4	4	3
22G	4	(4)	5	5	5	5	5
23G	7	(8)	10			12	8

[a] Values in bold reflect the additional use of subsoiling to stay at or below the compaction threshold.

Soil Cover and Organic Matter — Direct and Indirect Effects. Soil cover and organic matter are inherently linked and so are discussed together as forest floor material. Increases in forest floor material generally correlate with increases in soil cover and surface fine organic matter. It is difficult to accurately predict treatment effects on forest floor materials. Harvest operations may increase activity fuels and forest floor material, while pile burning and underburning would reduce the cover of this material. Mastication would increase soil cover and organic matter as materials are broadcast away from the machine. Pile burning would remove forest floor materials locally, and underburning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Under the HFQLG soil monitoring protocol, soil cover was evaluated as a composite of the two recommended thresholds from the Region 5 Supplement to the Soil Management Handbook (USDA Forest Service 2006a). Pre-treatment cover conditions were similar to those found in the Empire Project area. From 2004 to 2006, post-treatment monitoring in thinning units showed that treatments decreased absolute soil cover, on average, by 11 to 16 percent (USDA Forest Service 2005b, 2006a, 2006b). Assuming that the Empire units would undergo an absolute decrease in soil cover of 16 percent, two units (1G and 2G) would not meet the Forest Plan standards for soil cover. However, less than 20 percent of unit 1G and less than 10 percent of unit 2G would be treated by the proposed activities. It is unlikely that they would undergo a large decrease in soil cover or significant increase in the risk of soil erosion. In all units, ground cover should recover quickly as leaf fall contributes to the litter layer. Cover of fine organic matter is also expected to remain within recommended values for all sampled units.

All action alternatives would retain 10 to 15 tons per acre of the largest down logs, where available. Based on 20-inch diameter, 10-foot logs, 10 to 15 tons per acre corresponds to 33 to 50 such logs per acre (Blonski and Schramel 1981). Based on published research, fuel treatments using mechanical treatment followed by fire are not expected to significantly reduce the overall total volume of sound existing large woody debris, though reductions in rotten large woody debris may occur due to use of prescribed fire (Stephens and Moghaddas 2005). Reintroduction of fire into treatment units for surface fuel reduction is expected to reduce rotten woody debris in the short term (Fire, Fuels, and Air Quality), but recruitment of woody debris is expected to come from trees directly killed by prescribed fire (Brown et al. 2003; Stephens and Moghaddas 2005). Sound woody debris is less susceptible to spot ignition and combustion due to its relatively higher density when compared with rotten debris. Recruitment of both additional snags and coarse woody debris resulting from existing snags burning and falling down during the burn has been documented in published literature (Brown et al 2003; Stephens and Moghaddas 2005) and has been regularly observed during prescribed burn activities carried out by the Plumas National Forest in similar vegetation types.

A reduction in forest floor cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of forest floor material across a large area would be more effective at intercepting surface water than large areas devoid of cover. Local reductions in forest floor material may have local effects on soil temperature. Larger reductions may result in greater temperature extremes in the soil. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson et al. 1985). These small-scale microclimate changes would produce localized effects on nutrient cycling in the soil. In addition, combustion of forest floor materials during prescribed fires would cause short-term alterations to the nutrient cycling regime. Such heating could rapidly cycle soil nutrients, which may then be taken up by plants or removed by volatilization, leaching, and ash convection.

Soil Cover and Organic Matter — Cumulative Effects. The treatments proposed in the action alternatives are expected to reduce forest floor materials from the existing condition (tables 3.36 and 3.37). The cumulative impacts of the proposed activities, when considered with the past, present and future activities, are expected to result in forest floor conditions that remain in compliance with the Forest Plan standards and Region 5 recommended levels. A reduction in ground cover would likely be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. A wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone. This is discussed under alternative B below. Following the proposed treatments, forest floor material would decrease in some areas, due to mechanical displacement or consumption by fire, and would increase in other areas due to additions of masticated material. Patches of organic matter would provide habitat for soil invertebrates and microorganisms. Patches of bare areas would be susceptible to local erosion. Increases in woody materials on the forest floor due to mastication may cause short-term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift 1977). Microclimate changes at the forest floor due to reduced canopy cover could alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Erickson et al. 1985).

Past, Present, and Reasonably Foreseeable Actions

The existing condition reflects the impact of past activities and natural events such as wildfire. The current condition of forested stands, in terms of stand structure and species composition, reflects the effects of the past events discussed in this section. As described above, only those events that occurred within the last 30 years were included in the ERA model analysis. The soils analysis did not incorporate a past timeframe, and the current effects of these past activities, if any, were assessed by the soils field surveys. The affected environment section above describes the cumulative watershed and soil conditions that have resulted from these activities.

Beginning in the early 1850s, mining and associated timber harvesting were the dominant impacts within the analysis area. A number of ditches traverse the landscape assessment area. These were used to transport water to mining sites. Many streams were affected by historic mining, including Spanish, Cashman, Little Blackhawk, Squirrel, and Pine creeks, as well as Massack Ravine, Greenhorn Gulch, and many other drainages. Mining activities contributed large amounts of sediment to streams. Ditches diverted streamflow and interrupted hydrologic continuity of some hillslope and stream channel processes.

Timber harvest became a significant land use in the early twentieth century, especially around Butterfly Valley, Massack, Squirrel Creek, and Quincy. These areas were harvested using railroad logging systems that removed large overstory Douglas-fir and pine, leaving abundant smaller trees on site. Tractor logging systems were later utilized within the Empire project area. Timber harvests conducted during the twentieth century have left a marked impact on the composition of the timber stands remaining today, including effects on tree species composition, age, and diameter classes. Stream protection measures were relatively limited during early timber harvests. During this period, intermittent and ephemeral stream channels were used to skid and land logs. With the enactment of the National Forest Management Act and Clean Water Act, and the implementation of best management practices, riparian and aquatic protection has substantially increased. From the mid 1960s to 2004, scheduled timber harvests on public lands treated about 11,000 acres within the analysis subwatersheds. In some cases, individual stands were treated with multiple entries, so the actual number of affected acres is slightly less. Silvicultural prescriptions included clear cutting, overstory removal, group selection, sanitation, shelterwood, and individual tree selection.

Based on data received from the California Department of Forestry and Fire Protection, between 1994 and 2003 proposed harvest activities on private lands called for harvests on more than 9,000 acres of timberland within the analysis subwatersheds. Timber harvests are ground-disturbing activities that can compact the soil, displace surface organic matter, and contribute to accelerated soil erosion. In general, clearcut, group selection and shelterwood harvests create the most ground disturbance, overstory removal and individual tree selection are intermediate, and sanitation and salvage harvests are relatively less ground disturbing. This broad ranking, however, is highly dependent on the site specific prescription, harvest equipment, slope characteristics, and site preparation methods.

Between 1970 and 2001, 4,100 acres within the analysis subwatersheds burned in wildland fires. Approximately 88 percent of these acres burned at moderate intensity, 12 percent at low intensity, and less than 1 percent burned at high intensity. Several large wildfires during the 1970s, such as the Bell, Cashman, and Oak burns, likely resulted in severe impacts to soil productivity and subwatershed condition. Due to loss of cover and vegetation, these large wildfires likely increased erosion from affected hillslopes, and increased peak flows, with effects lasting from several months to several years following the fires. These areas are now occupied by montane chaparral, and soil conditions will continue to improve as soil cover and organic matter accumulates, and forest successional processes continue. In the past 10 years, wildfires burned about 20 acres, all of which were classified as low intensity. These areas have had adequate time for needlefall to restore soil cover and the risk of erosion due to the fires is low.

Settlers arriving in Quincy, American Valley, and the surrounding communities during the California gold rush (early 1850s) brought livestock with them (see heritage resources affected environment). Historically, such livestock grazing occurred throughout the valley bottoms in the analysis area. Grazing can lead to increases in soil compaction, runoff, and soil erosion. Today, most grazing in this area occurs on private land, within Thompson and American Valleys. A small portion of the Long Valley grazing allotment occurs within the Lee Summit West subwatershed (subwatershed 33). However, the approximately 160 acres of allotment here accounts for less than 1 percent of the 19,174-acre allotment and only 6 percent of the subwatershed area. The allotment is currently vacant. Current grazing impacts to watershed resources are probably quite reduced compared to historic grazing levels. Today, fewer animals are more dispersed throughout the assessment area.

Historic activities such as logging, mining, and grazing have influenced the hydrologic and vegetative characteristics of the analysis watersheds. Such historic legacy effects are common to many of California’s forested watersheds (CDFG 2003). More recent forest activities, including fire suppression and development of the transportation system, continue to affect the watershed conditions in this area. In forested watersheds, unpaved roads are often the primary sediment source to stream channels (Coe and MacDonald 2001).

Generally, recreation activities within the Empire Project are dispersed, and result in negligible or minor effects to the soils or ERA assessment. However, the OHV track, user-created roads and trails, or off-road vehicle use may have contributed to compacted soil conditions where these activities occur. There are 45 placer mining claims along the creeks. The time frame for dredging season is from the third week of May through October 15 each year. In-stream mining can contribute sediment directly into the stream network and can reduce bank stability. Woodcutting, Christmas tree cutting, hunting, and special use activities have negligible or minor effects to the soils or ERA assessment. Generally, these are dispersed and cause very minimal ground disturbance. Power line clearances however, may consist of corridors with low soil cover. Where these traverse steep slopes, these corridors may be susceptible to localized runoff and erosion. Woodcutting does remove large logs from the forest floor, and would reduce the amount of large woody organic matter. However, this activity is generally limited to near-road areas.

2005 and 2006 activities shown in Appendix G would result in minimal increases in ERA due to the limited intensity and dispersed locations of these projects. The Dancehouse-Chandler Project would likely cause the greatest ground disturbance over the greatest area. Projects expected to be implemented in 2005 were included in the ERA evaluation for the existing public harvest assessment in the cumulative watershed effects, discussed below. Several projects do not fall within analysis subwatersheds and so were not included in the analysis. DFPZ maintenance would occur after at least 10 years of watershed recovery. Barring other activities in these subwatersheds, DFPZ maintenance would not increase ERA values to the extent that there would be a high risk of cumulative effects. Treated subwatersheds are anticipated to undergo considerable recovery by the time maintenance would be implemented. Future DFPZ maintenance, as well as the 2006 Corridor Project, would cause some ground disturbance, but may also reduce watershed vulnerability to the damaging effects of future severe wildfires. In addition, future wildlife guzzlers and waterholes, as well as Medusahead treatments, would have negligible, localized effects in the subwatersheds in which they would occur. Routine road maintenance would contribute very minor additions to cumulative effects due to the ground disturbing nature of the activity. However, road maintenance can have beneficial effects. By keeping culverts clear and road drainages functioning properly, road maintenance can help reduce the potential sediment entering streams from the road network. Fire suppression activities would continue to contribute to ground disturbance, but effects would vary by the type of equipment used and extent of the suppression activities. The Rhinehart Meadow OHV restoration project would have beneficial effects to water quality by prohibiting vehicle access to the meadow, restoring meadow features, and stabilizing stream banks in the area.

Environmental Consequences by Alternative — Watershed and Soil resources

Alternative A — Watershed

CWE Analysis — Direct and Indirect Effects. Direct and indirect effects were discussed above under “Effects Common to the Action Alternatives.” Under alternative A, the increase in ERA values was predicted to range from 2 to 55 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 8 to 94 percent of the TOC. The ERA contribution for proposed activities is shown in figure 3.17.

CWE Analysis — Cumulative Effects. Figure 3.17 shows the modeled increase in disturbed area in each analysis subwatershed due to the treatment activities proposed in alternative A. The relatively large increases in ERA in the subwatersheds for Clear, Cashman, Tollgate, and Taylor Creek subwatersheds would lead to a higher risk of detrimental effects in those areas. These effects include erosion from treated hillsides and chronic sedimentation. Despite low to moderate ERA increases in the Massack, Greenhorn, and Lee Summit West subwatersheds, they received higher risk ratings as well because the cumulative ERAs in these areas are nearing the TOC (refer to tables 3.34 and 3.35). Two subwatersheds in particular would closely approach the TOC: the Greenhorn Creek subwatershed would have a cumulative ERA value that is 91 percent of the TOC; the Lee Summit West subwatershed would have a cumulative ERA value that is 94 percent of the TOC. Besides the subwatersheds identified in this discussion, all other areas were rated at low or moderate risk of detrimental effects.

Alternative A — Soils

Direct, Indirect, and Cumulative Effects. By following the standards contained in the PNF Forest Plan and staying at or below the compaction threshold, there would be a low risk that soil productivity would be impaired. Alternative A would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. The direct, indirect, and cumulative effects on soil productivity would be similar to alternative D, less than alternative C, and greater than alternatives B, E, and F.

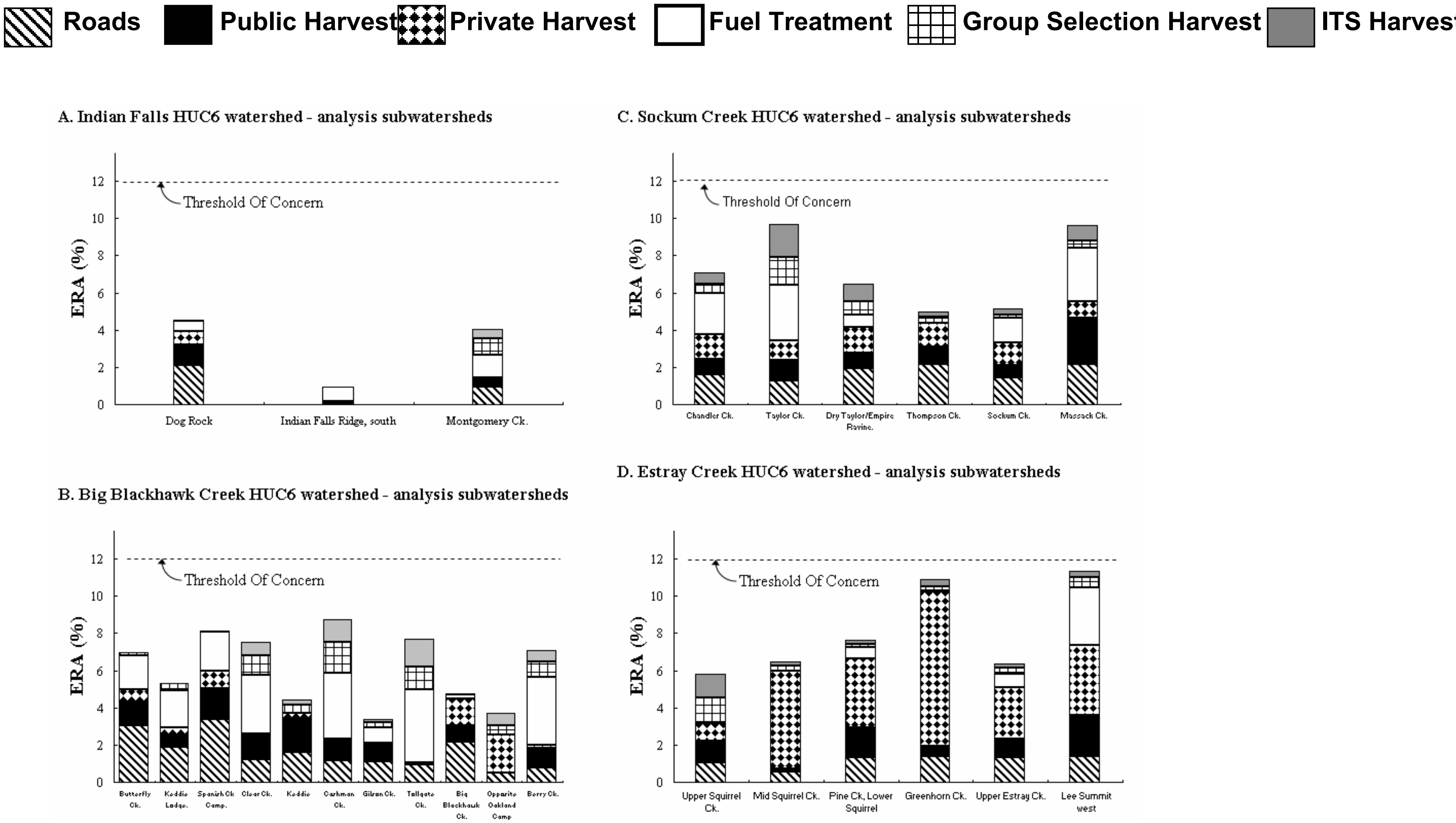


Figure 3.17. Alternative A (proposed action): equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC6 watersheds are shown in A, B, C, and D, respectively.

Alternative B (no action) — Watershed

CWE Analysis — Direct and Indirect Effects. Under the no-action alternative, all subwatersheds would continue to recover, and ERA values would slowly decline to a baseline level over time. Road decommissioning activities would not occur, so watershed benefits and reductions in ERA values due to road decommissioning would not be realized. Fuel treatment activities would not occur. A future severe wildfire could greatly increase ERA values within and across subwatersheds. Figure 3.16 shows the contribution of roads and public and private activities to the existing ERA values in each analysis subwatershed. These are discussed above (under the watershed disturbance heading of the affected environment section).

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

CWE Analysis — Cumulative Effects. Figure 3.16 shows the contribution of roads and public and private activities to the existing ERA values in each analysis subwatershed. Private harvests are expected to continue within the overall watershed analysis area, though it is difficult to predict the location, type of harvest treatments, or number of acres that would be affected. In the event of a future severe wildfire, affected areas may be highly susceptible to erosion, and generate large pulses of sediment to stream channels (Elliot and Robichaud 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

Alternative B (No action) — Soils

Detrimental Compaction — Direct Effects. Tables 3.36 and 3.37 show the existing level of skid trail and landing cover within the fuel treatment units and planning areas. Under the no-action alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals, would contribute to the increase in soil porosity and decrease in compaction. In addition, incorporation of organic matter into the soil by biological processes, such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

Detrimental Compaction — Indirect Effects. As the degree and extent of soil compaction is reduced slowly over time, soil productivity would increase. Soil infiltration would be enhanced as porosity is increased. Increased infiltration may reduce surface runoff and subsequent erosion and sedimentation.

Detrimental Compaction — Cumulative Effects. In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity (Clark 1994).

Soil Cover and Organic Matter — Direct Effects. Under the no-action alternative, soil cover and organic matter can be expected to increase as organic materials accumulate on the forest floor.

Soil Cover and Organic Matter — Indirect Effects. As a result of increased soil cover, the risk of soil erosion may decline on forested hill slopes. Soil cover dissipates the energy of falling raindrops by intercepting them before they strike the soil surface. Reduced soil erosion would help retain soil nutrients and a favorable growth medium on site. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Soil Cover and Organic Matter — Cumulative Effects. If soil cover were reduced to bare soil following a wildfire, the soil would be more susceptible to erosion. In addition, fire can create a nonwettable layer below the surface, sometimes described as a “tin roof” effect (DeBano 2000). During a precipitation event, soil above the nonwettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a fire, the affected stand may not meet the Forest Plan standard of 50 percent cover of organic matter. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk and Robichaud 2003). Fires short circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. When organic matter burns, essential nutrients can be transferred to the atmosphere through volatilization and ash convection (Raison et al. 1984). Nutrients may also be lost following fire due to leaching (Boerner 1982). Some nutrients are returned relatively quickly by terrestrial cycling pathways. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils would experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et al. 1999). Such changes in the soil temperature regime would affect the rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

Alternative C — Watershed

CWE Analysis — Direct and Indirect Effects. Direct and indirect effects were discussed above under "Effects Common to the Action Alternatives." Under alternative C, the increase in ERA values were predicted to range from 0 to 60 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 8 to 93 percent of the TOC. The ERA contribution for proposed activities is shown in figure 3.18.

CWE Analysis — Cumulative Effects. Figure 3.18 shows the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in alternative C. Disturbances to the Clear, Cashman, Tollgate, Taylor, Massack, Greenhorn, and Lee Summit West subwatersheds would place these areas at higher risk for detrimental effects (refer to tables 3.34 and 3.35). These effects include erosion from treated hillsides and chronic sedimentation. One subwatershed in particular would closely approach the TOC: the Lee Summit West subwatershed would have a cumulative ERA value that is 93 percent of the TOC. Besides the subwatersheds identified in this discussion, all other areas were rated at low or moderate risk of detrimental effects.

Alternative C — Soils

Direct, Indirect, and Cumulative Effects. By following the standards contained in the PNF Forest Plan and staying at or below the compaction threshold, there would be a low risk that soil productivity would be impaired. Alternative C would have the greatest amount of mechanical treatments, so there would be the greatest amount of ground disturbance from equipment, skid trails, and landings. Direct, indirect, and cumulative effects on soil productivity would be greater than alternatives A, B, D, E, and F.

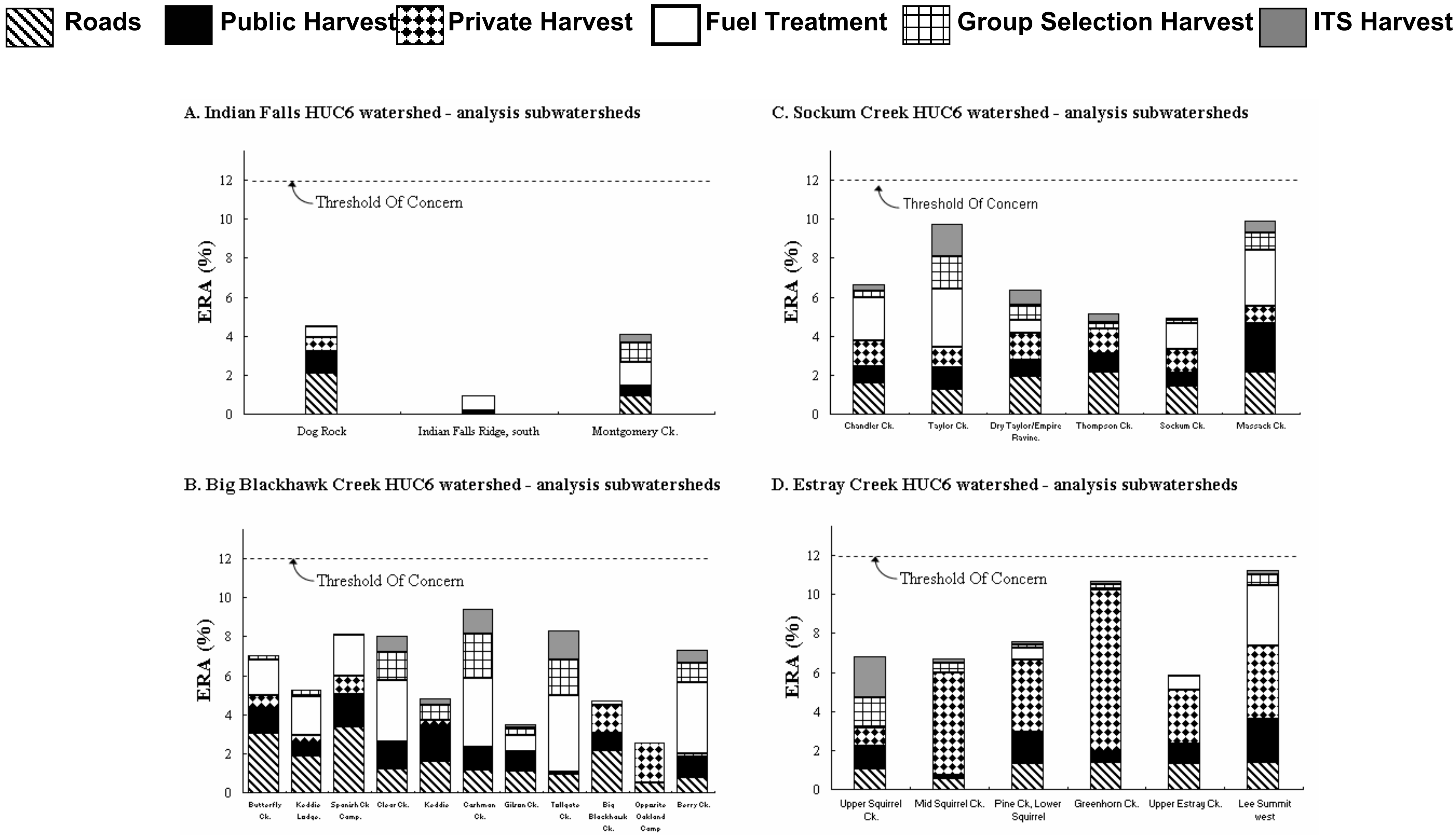


Figure 3.18. Alternative C: equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC6 watersheds are shown in A, B, C, and D, respectively.

Alternative D — Watershed

CWE Analysis — Direct and Indirect Effects. Direct and indirect effects were discussed above under "Effects Common to the Action Alternatives." Under alternative D, the increase in ERA values were predicted to range from 0 to 51 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 8 to 89 percent of the TOC. The ERA contribution for proposed activities is shown in figure 3.19. To reduce impacts in RHCAs, the fuel treatment prescription within RHCAs was modified to retain all trees greater than 20 inches DBH and a canopy cover of 50 percent. As a result, the amount of ground disturbance in RHCAs would potentially be reduced in Alternative D. The fuel treatment prescription was also changed within six units that had been proposed for prescribed burning, with and without mastication, in the proposed action. As described in the methods section, these units were as though mastication would occur over the entire area. As a result, the prescription changes in these six units would not change the potential effects.

CWE Analysis — Cumulative Effects. Figure 3.19 shows the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in alternative D. The cumulative ERA values in the Clear, Taylor, Massack and Lee Summit West subwatersheds place them at higher risks for detrimental cumulative effects. These effects include erosion from treated hillsides and chronic sedimentation. All other areas were rated at low or moderate risk of detrimental effects. Alternative D was designed, in part, to reduce disturbances in several higher-risk subwatersheds that have been heavily impacted by relatively recent private harvest activities. In those areas, the planning area treatments have been dropped, but fuel treatments were retained to help realize the associated benefits of reduced fire risk. The modified prescription for fuel treatments within RHCAs would lead to a reduced risk of potential erosion and sedimentation into the stream network. The project design elements, implementation of BMPs and normal erosion control measures are expected to provide adequate protection against erosion and subsequent sediment delivery.

Alternative D — Soils

Direct, Indirect, and Cumulative Effects. By following the standards contained in the PNF Forest Plan and staying at or below the compaction threshold, there would be a low risk that soil productivity would be impaired. Alternative D would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. To reduce impacts in RHCAs, the fuel treatment prescription within RHCAs was modified to retain all trees greater than 20 inches DBH and a canopy cover of 50 percent. As a result, the amount of ground disturbance in RHCAs would potentially be reduced in Alternative D. The direct, indirect, and cumulative effects on soil productivity would be similar to alternative A, less than alternative C, and greater than alternatives B, E, and F.

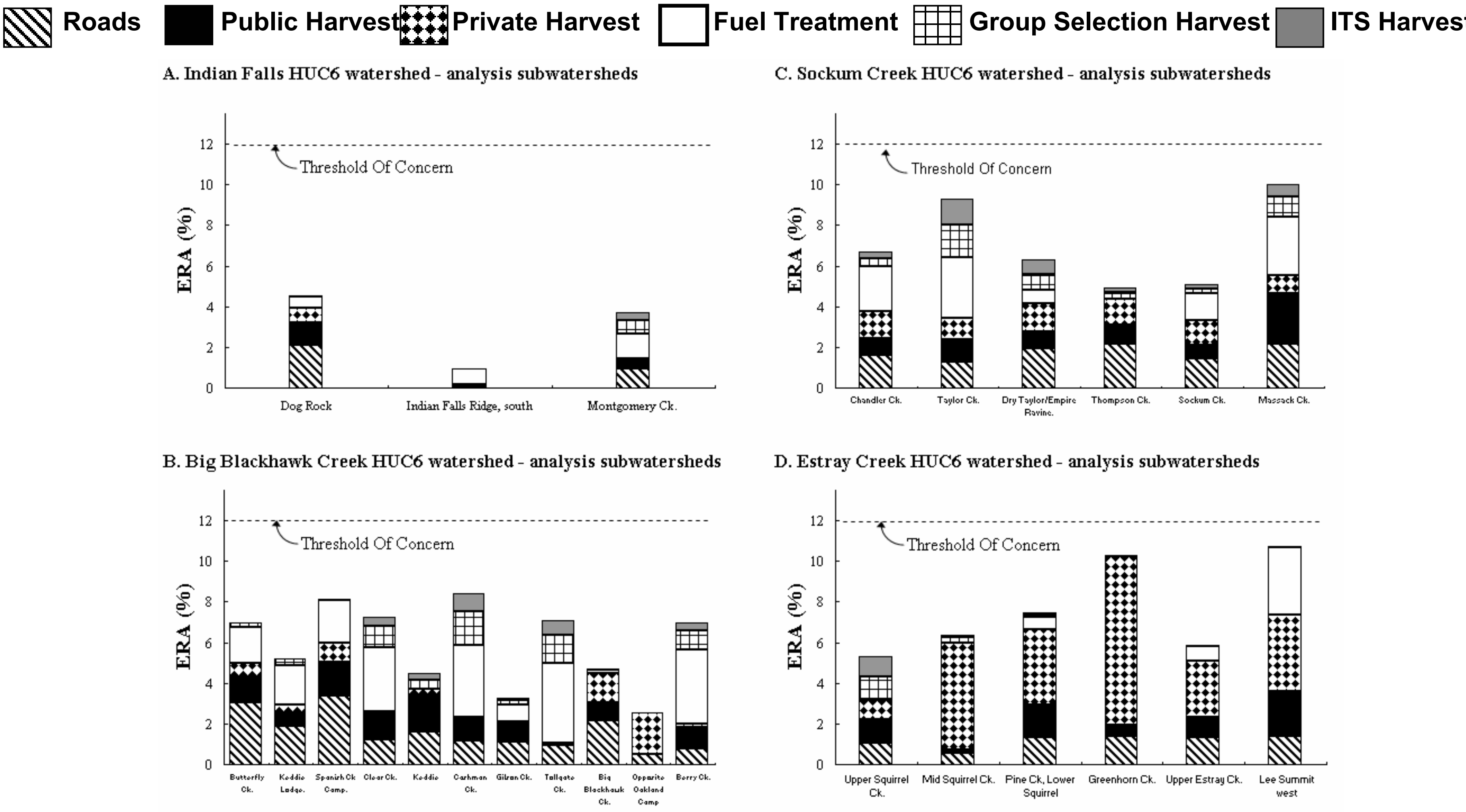


Figure 3.19. Alternative D: equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC6 watersheds are shown in A, B, C, and D, respectively.

Alternative E — Watershed

CWE Analysis — Direct and Indirect Effects. Direct and indirect effects were discussed above under "Effects Common to the Action Alternatives." Under alternative E, the ERA values were predicted to increase from 0 to 45 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 8 to 94 percent of the TOC. The ERA contribution for proposed activities is shown in figure 3.20. The fuel treatment prescription was changed within six units that had been proposed for prescribed burning, with and without mastication, in the proposed action. As described in the methods section, these units were as though mastication would occur over the entire area. As a result, the prescription changes in these six units would not change the potential effects.

CWE Analysis — Cumulative Effects. Figure 3.20 above shows the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in alternative E. The cumulative ERA values in the Clear, Taylor, and Massack subwatersheds place them at higher risks for detrimental cumulative effects. These effects include erosion from treated hillsides and chronic sedimentation. Besides the subwatersheds identified in this discussion, all other areas were rated at low or moderate risk of detrimental effects. In addition to reducing disturbance in several higher-risk watersheds, as described for alternative D, alternative E would result in slightly less ground disturbance in the fuel treatment areas due to the change in harvest prescription.

Alternative E — Soils

Direct, Indirect, and Cumulative Effects. By following the standards contained in the PNF Forest Plan and staying at or below the compaction threshold, there would be a low risk that soil productivity would be impaired. Alternative E would have a moderate amount of mechanical treatments, so there would be a moderate amount of ground disturbance from equipment, skid trails, and landings. The direct, indirect, and cumulative effects on soil productivity would be less than alternatives A, C, and D and greater than alternatives B and F.

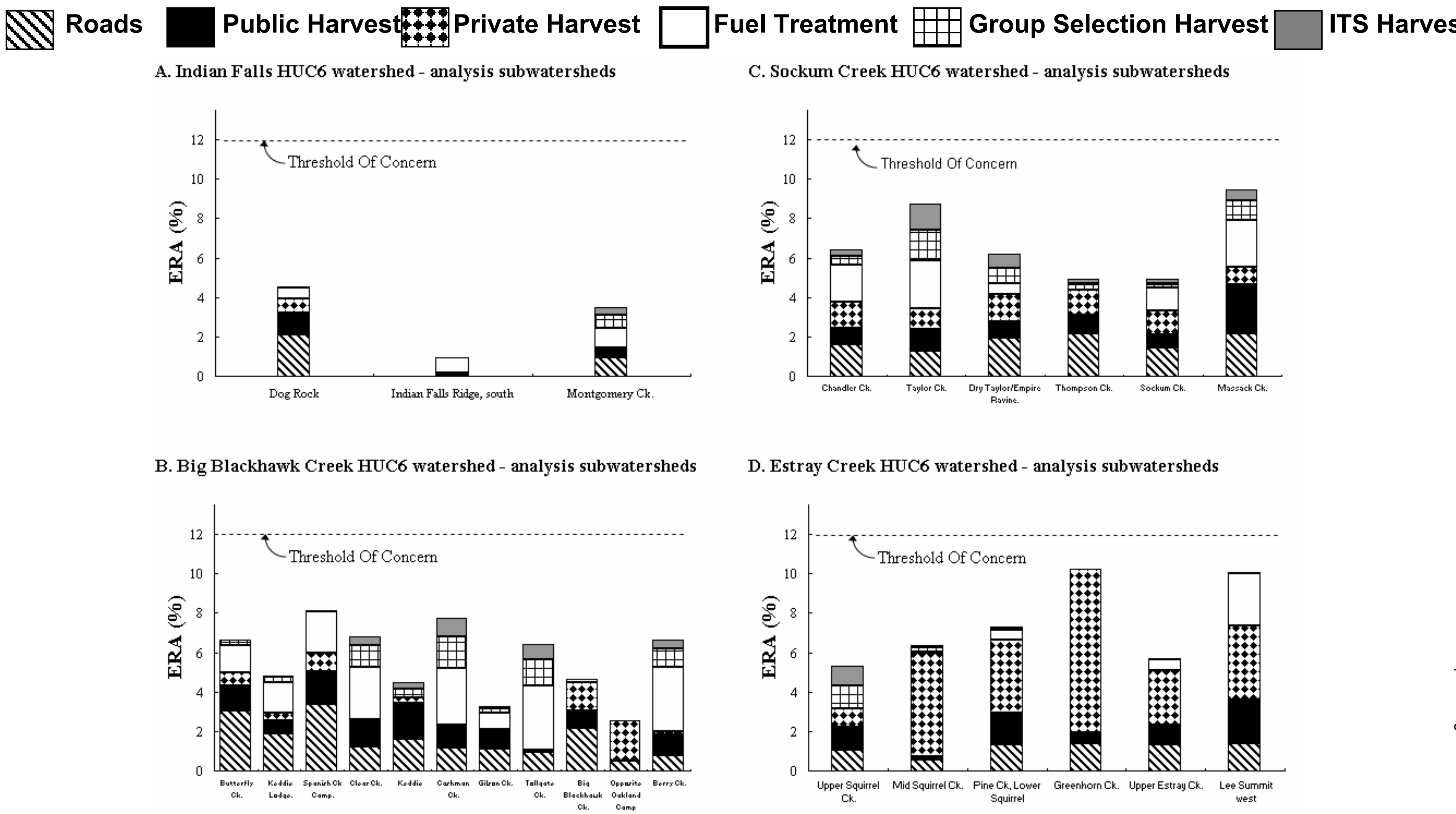


Figure 3.20. Alternative E: equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC6 watersheds are shown in A, B, C, and D, respectively.

Alternative F — Watershed

CWE Analysis — Direct and Indirect Effects. Direct and indirect effects were discussed above under "Effects Common to the Action Alternatives." Under alternative F, the change in ERA values was predicted to range from less than 1 to more than 28 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 8 to 85 percent of the TOC. The ERA contribution for proposed activities is shown in figure 3.21. The fuel treatment prescription was changed within six units that had been proposed for prescribed burning, with and without mastication, in the proposed action. As described in the methods section, these units were as though mastication would occur over the entire area. As a result, the prescription changes in these six units would not change the potential effects.

CWE Analysis — Cumulative Effects. Figure 3.21 shows the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in alternative F. The planning area treatments were dropped in alternative F, resulting in greatly reduced levels of disturbance to many subwatersheds. No area was rated as being at higher risk for detrimental watershed effects. There would be low to moderate risks of realizing detrimental effects. These effects include erosion from treated hillsides and chronic sedimentation.

Alternative F — Soils

Direct, Indirect, and Cumulative Effects. By following the standards contained in the PNF Forest Plan and staying at or below the compaction threshold, there would be a low risk that soil productivity would be impaired. There would be no individual tree selection or group selection in alternative F, so there would be a reduced amount of mechanical treatments, resulting in less ground disturbance from equipment, skid trails, and landings. The direct, indirect, and cumulative effects on soil productivity would be less than alternatives A, C, D, and E, and greater than alternative B.

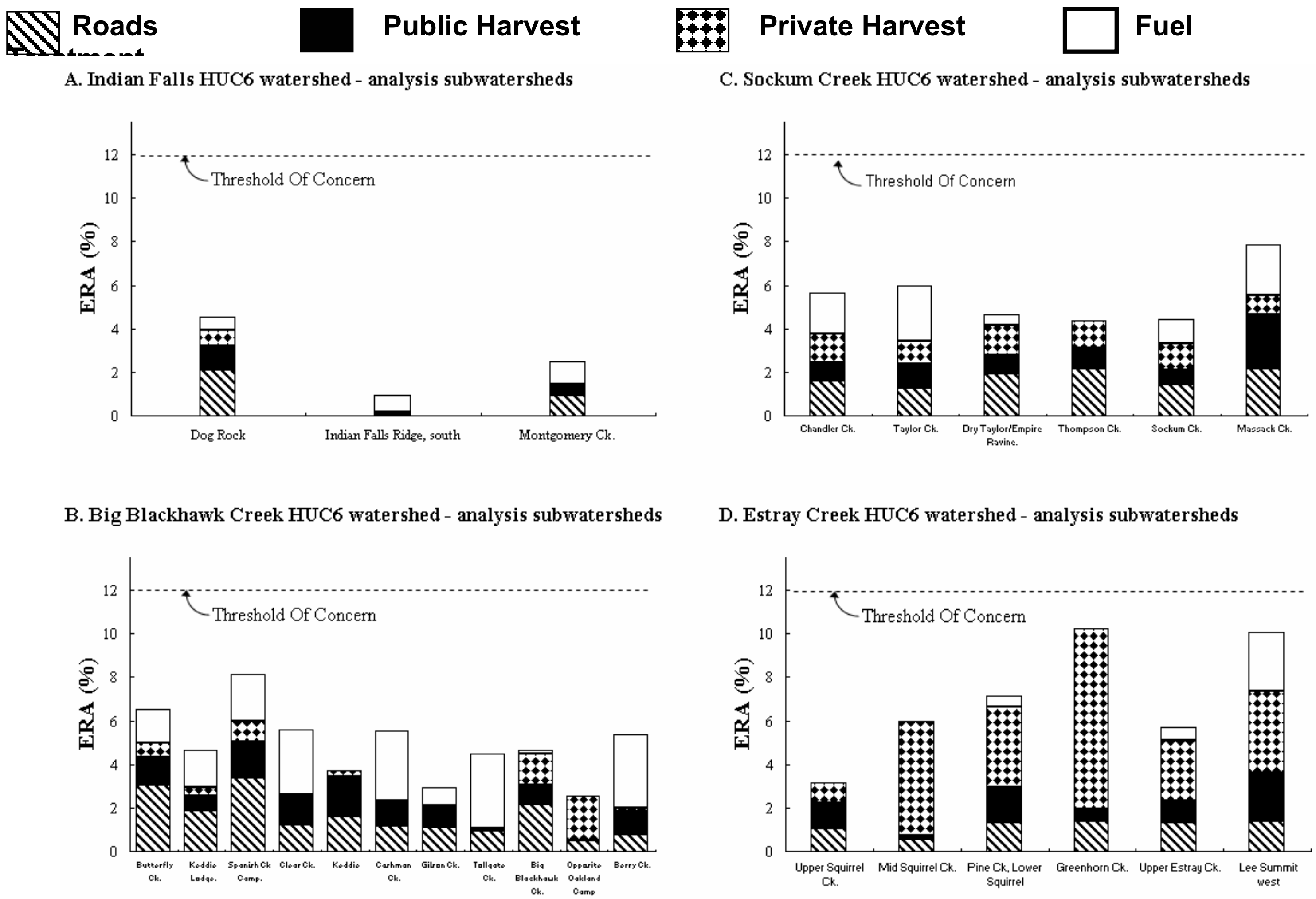


Figure 3.21. Alternative F: equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds within the Indian Falls, Big Blackhawk Creek, Sockum Creek, and Estray Creek HUC6 watersheds are shown in A, B, C, and D, respectively.

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SOCIOECONOMICS

Summary of Effects

Alternative A, C, and D would range in net value from $294,069 to $1,858,574 dollars; alternatives E and F would result in negative net values. Alternatives A, C, and D would provide a greater opportunity to meet the purpose and need for the Empire Project in a cost-effective manner. Table 3.40 displays total value and cost and net value, relative to each alternative. See appendix H for detailed information.

Removing biomass would be a net loss for the Empire Project in all action alternatives due to low value of *hog fuel* for energy generation. Costs would include surface replacement deposits, yield tax collections, scaling costs, and minimum advertised rates.

Although the ability to predict time, location, and size of a wildfire is difficult, it is clear that economic investments to reduce the size and severity of wildfires now, would be off set in the future by savings associated with reduced suppression and resource loss.

Alternative C would provide the most full-time jobs and total employee-related income of all the alternatives considered in this analysis. Alternative F would provide the least.

Table 3.40. Relative net value by alternative.

Alternative	Total Value	Total Cost	Net Value
A	$5,401,424	$4,927,429	$473,995
B	0	0	0
C	$7,237,262	$5,378,688	$1,858,574
D	$4,913,599	$4,619,530	$294,069
E	$4,476,588	$4,577,868	-$101,280
F	$905,219	$2,127,221	-$1,222,001

Affected Environment

The *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) promotes ecologic and economic health for certain federal lands and communities in the Sierra Nevada area (Title IV Section 401). The act directs the Secretary of Agriculture to use "…the most cost-effective means in conducting the pilot project." The economic health and environment for Plumas County is the focus for this affected economic environment discussion. Appendix S of the HFQLG FEIS describes Quincy Library Group core area as the three counties contained within the pilot project. The focus of the programmatic pilot project social economic analysis is on 41 communities in the Northern Sierra socioeconomic subregion. Appendix S provides a broad, programmatic socioeconomic picture. Although the Empire Project is located in the Quincy Library Group core area, for the purpose of this discussion, Plumas County is used to describe the economic affected environment.

The affected economic environment for the Empire Project is framed by the work accomplished by Plumas Corporation, a nonprofit economic development organization chartered in 1983. The description of the affected economic environment that follows uses the "Plumas County Economic Development Strategy 2002–2003." The economic environment is crucial to the rationale for decisions affecting National Forest System lands associated with the HFQLG Act. The county economic development strategy defines economic vitality for Plumas County as "the process by which the community and business creates and retains jobs and reinvests wealth through its economy, community and natural resources."

Data gleaned from the Community Assessment Demographics for Plumas County are summarized below:

- The population is up 5.5 percent from the 1990 census figures; this lags behind the California growth rate of 13.6 percent.
- Plumas County has an older population than the rest of the state.
- Plumas County is less ethnically diverse than California with the exception of American Indians.
- Plumas County has historically had lower incomes than the rest of California and the nation.
- Plumas County has a smaller amount of its incomes derived from wages and job-related earnings than does the rest of California; this is somewhat a reflection of the relatively older population in Plumas County.
- Plumas County's business base consists of approximately 1,181 businesses, of which 98 percent of the businesses have less than 50 employees, and 88 percent have less than 10 employees. Only 2 percent of the businesses have over 50 employees and six (out of 20) of those businesses are government operations. Only 5 percent of the businesses are in the manufacturing sector, although 20 percent of the jobs are in manufacturing.
- The unemployment rate in Plumas County has historically been above the state average.
- Overall, the number of jobs in Plumas County has increased by about 2 percent from 1990 to 1999; the manufacturing sector has declined about 10 percent due to declines in the logging industry.

Plumas County local market factors include rural isolation, reliance on forestry base, and seasonal employment/underemployment.

When comparing industry divisions of Plumas County to the state, the greatest differences appear in the government and service industry areas. Federal government industry is 33 percent compared to the state at 15 percent. This is partially contributed to by the high number of Forest Service personnel located in Plumas County and the reality that 75 percent of the lands in the county are National Forest lands. Similar percent levels occur in neighboring counties.

There are five strategies for local economic development. One of the five strategies is product development and is described as infrastructure, industrial land development, natural resource management and development, housing development, and workforce development. A product development initiative of the Plumas County Economic Development Strategy 2002–2003, includes the objective, "maintain national leadership for natural resource management – develop special products which will give Plumas County recognition as a leader in alternative developments, such as green energy, natural resource development, and niche markets of natural resources."

Environmental Consequences of All Alternatives

Direct Effects

The direct economic effects of the Empire Project analysis shows, among other things, the total value, total cost, net value, and total nonharvest cost for the action alternatives (A, C, D, E and F). Each of these items is marked in capital letters on the spreadsheets included in "Appendix H: Economic Analysis Report for Empire Vegetation Management Project."

"Total value" represents the amount a logger would receive when selling the harvested timber to a mill or other purchaser, minus standard logging and hauling costs. "Total cost" represents the amount it would cost a logger, in addition to standard logging and hauling expenses, to harvest the timber and deliver it to a mill or other producer. "Net value" is the difference between the two and represents the approximate amount a logger would pay the Forest Service to harvest the trees (i.e., stumpage). The "total nonharvest cost" represents costs associated with actions not directly tied to the harvest and selling of timber but which nonetheless must be done as part of completing the project.

The focus of this net value analysis is limited to those revenues and treatment costs associated with implementing thinning and fuels reduction treatment, group selection and individual tree selection harvests, and biomass removal in the Empire Project area. The purpose of this economic analysis is to display the revenues and costs associated with each of the alternatives for comparison purposes. The analysis does not include monetary values assigned to resource outputs such as wildlife, watershed, and soils. It is intended only as a relative measure of differences between alternatives based on direct costs and values used.

The differences between alternatives A, C, D, and E are largely associated with the differences in group selection, individual tree selection, and biomass actions. The range of alternatives provides a contrast of costs and values associated with differences in placement of group selection units. The contrast between alternatives is depicted in the difference between alternatives A and C. Alternative A would place 1,347 acres of groups across all 24 planning areas, whereas alternative C would place 1,600 acres of groups on 19 planning areas. Although the cost per unit would be higher in alternative C, the value derived from the 19 planning areas would provide a higher total net value. Alternative A would be $1,384,579 lower in net value than alternative C.

Alternative D was developed in order to provide a lower density of group selection harvest units across the landscape, and although the total cost would be lower in alternative D than in A and C, the value would also be lower. Alternative D proposes a total of 1,226 acres of groups on 16 planning areas. Alternative D would be $179,926 lower in net value than alternative A.

Alternative E is similar to alternative D in the design of the group selection and individual tree selection harvest units, with the major difference being the diameter limit and 50 percent canopy retention of the fuel treatments. Alternative E provides a contrast in how much the net value would be affected on the project, as a whole, with a lower diameter limit (in this case, the sawlog timber between 20 and 30 inches dbh resulting from the fuel treatment units eliminated from the analysis in E). Alternative E would be a negative $101,280. The negative value indicates a service contract would be required at a relative cost.

The fuel treatment actions provide some economic contrast between alternatives D and E (see above); however, the greatest contrast is provided by alternative F, when group selection, individual tree selection, and biomass harvests are eliminated from the actions. Alternative F looked at implementing fuel treatments only and also looked at a diameter limit of 20 inches. The net value of alternative F would be negative $1,222,001. The negative value indicates a service contract would be required at a relative cost. Therefore, the project would require a budget of approximately $1,222,001, in contrast to positive net values that would be realized by alternatives A, C and D.

Indirect Effects

The Plumas National Forest contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to the local county revenues. Although some economic effects are dispersed over a broad area, the most important impacts are felt locally in Plumas County.

Based on historical relationships between employment and harvest in California during the 1980s, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, an estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration and fuel work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full-time field job. All jobs are equivalent to year-round employment. Based on these assumptions, table 3.41 predicts the indirect full-time job and employee-related income resulting for each alternative.

Table 3.41. Empire Project — comparison of employment-related effects.

Alternative	Total Full-time Jobs	Total Employee-Related Income
A	394	$16,957,187
B	0	0
C	441	$18,954,852
D	356	$15,309,797
E	313	$13,457,271
F	49	$2,092,996

Even though the biomass removal is projected to be a large cost to the project, it is an essential component of reducing hazardous fuels, which in turn is anticipated to reduce large fires and the costs associated with them. The typical large fire in the Empire Project area is approximately 1,600 acres (USDA 2007). The typical suppression cost of a fire of this size is $2,116,800, and the resource loss is estimated to be $3,414,000. These estimates are based on values used in the National Fire Management Analysis System, Plumas National Forest Budget Year 2004 Analysis for the Fire Management Zone in which the Empire Project is located. For the purposes of this economic analysis, $1,500,000 was used as a conservative figure for future reduced fire suppression costs and to provide a basis for comparative analysis. Figures for resource loss are recognized here, however, they were not included in the economic analysis.

The Quincy Library Group Community Stability Proposal, dated October 12, 1993, was the basis for the eventual passing of the Herger-Feinstein Quincy Library Group Forest Recovery Act in 1998. The HFQLG Act is intended to be a five-year pilot project "to implement and demonstrate the effectiveness of the resource management activities described in subsection (d) . . . ." In 2003, Congress extended the pilot project for 5 more years. The economic efficiency that the pilot project is interested in demonstrating has yet to be fully implemented or evaluated based on setbacks and delays due to the forest plan amendments in 2001 and 2004.

Monitoring economic trends is accomplished in the Annual Report to Congress required by the HFQLG Act. Conclusive trends in economic effectiveness of the resource management activities described in the Empire Project would not be fully realized unless the pilot project is fully implemented. Alternatives A, C, D, and E would implement the pilot project activities at the various levels described in chapter 2 and would lend to discovery of the important trends that were intended by the HFQLG Act. Alternative F would neither fully implement the intent of the HFQLG Act nor meet the purpose and need for this project in terms of implementing the pilot project activities, including group selection and individual tree selection harvest.

Future land management decisions affecting Plumas County and the economic outcome of these decisions would be largely based on the outcome of the effectiveness of the management activities proposed in the alternatives for the Empire Project, in conjunction with the other site-specific projects associated with the HFQLG Act.

TRANSPORTATION

Summary of Effects

A net reduction of approximately 12.6 miles of system roads in alternative A; 9 miles of system roads in alternative C, D, and E; and 12 miles of system roads in alterative F would occur after the transportation work is completed. No reduction in system roads would occur in alterative B.

Alternative A is different from C, D, E, and F because it proposes a greater number of miles for decommissioning. Alternative A would decommission 15.6 miles of road, compared to 12 miles in alternatives C, D, E, and F. There are 3.6 miles of forest system road currently on the off-highway vehicle (OHV) inventory, which are proposed for decommissioning in alternative A.

Similarly, alternative A is different from C, D, E, and F because it proposes 6 miles more road closure than alternatives C, D, E, and F. There are 6 miles of roads currently on the OHV inventory that are proposed for closure in alternative A. Table 3.42 summarizes and compares the proposed road treatments.

Table 3.42. Transportation comparison of proposed alternatives to the proposed action.

Alternative	System Road Construction / Closure (miles)	Temporary Road Construction Decommission (miles)	System Road Reconstruction (miles)	Road Closure (miles)	Road Decommission (miles)
A	3	6.2	113	17.1	15.6
B	0	0	0	0	0
C	3	6.2	107.1	11.1	12
D	3	6.2	101.8	11.1	12
E	3	6.2	101.8	11.1	12
F	0	1.9	48.3	11.1	12

Affected Environment

Primarily, four major arterial routes access the Empire Project area: Plumas County Road 511 (Quincy-LaPorte Road), Plumas County Road 508 (Greenhorn Creek Road), Plumas County Road 401 (Squirrel Creek Road), and Plumas County Road 403 (Mount Hough Road). The area in the project area is considered to have a fully developed arterial and collector road system.

There are a total of approximately 224.7 miles of existing National Forest System roads in the Empire Project area. The system roads are inventoried, mapped, constructed to a specific design level, and categorized into a maintenance schedule. In addition to the existing system roads, there are numerous nonsystem roads, abandoned roads, and skid trails in the Empire Project area. These nonsystem roads, abandoned roads, and skid trails are not part of the annual road maintenance schedule and budget. The “Empire Project: Transportation Analysis”, was used to develop the proposed action, is located in the project record, and is incorporated by reference.

Maintenance levels are identified by road construction type and use. There are five maintenance levels described here. Generally, a gate or sign closes Level 1 roads, which receive intermittent maintenance service. Level 2 roads are required to be open for limited passage of traffic. Level 3 roads are required to be open and maintained for safe travel by a prudent driver in a passenger car. Level 4 and 5 roads are required to provide a moderate to high degree of user comfort and convenience at moderate travel speeds. Table 3.43 quantifies the amount of roads by road system level categories in the Empire Project area.

Table 3.43. Forest Service road system miles, by category, in the Empire Project area.

Road System Categories	Miles of Road in the Empire Project Area	Maintenance Summary
Level 1	4.9	Closed, intermittent maintenance
Level 2	175.5	Open, limited traffic, intermittent maintenance
Level 3	42.9	Open road, maintained for passenger car
Levels 4 and 5	1.4	Open, maintained for high degree of user comfort
Total	**224.7**	

The purpose of the Forest Service road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. In addition, needs for the road system include minimized adverse effects on watershed and wildlife resource values. Roads near streams or in riparian zones have the greatest probability of intercepting, concentrating, and diverting flows from natural flow paths and should therefore, be minimized where feasible. Road/stream crossings have the potential for failing and diverting water and should therefore be minimized, where feasible.

The proposed action (alternative A) did not take into account the findings from the 2004 field season as a result of the OHV route designation process that the Plumas National Forest is currently undertaking. This issue was remedied by including the OHV route designation information in all other action alternatives (alternatives C, D, E, and F). Miles of road decommissioning and closure were used to measure this issue, as well as show comparisons with the proposed action.

Environmental Consequences of All Alternatives

System Road Construction and Closure

Alternatives A, C, D, and E would construct (and eventually close) 3 miles of road in contrast with no new road construction in alternative F. There would be no need to access planning areas for group selection and individual tree harvests because these treatments are not proposed in alternative F. Alternative B, the no-action alternative, would not construct and close any new system roads, which is similar to alternative F. The 3 miles of new road construction involving approximately 9 acres is considered an irretrievable commitment for alternatives A, C, D, and E because forested land would be taken out of timber production.

The 3 miles of system road construction (and eventual closure) proposed in alternatives A, C, D, and E would provide limited access upon completion on the project for fire suppression resources. Soil and watershed impacts could potentially increase after a road is closed and receives limited maintenance service. This potential increase is accounted for in the cumulative watershed assessment for alternatives A, C, D, and E, where 3 miles of road construction (and eventual closure) are discussed for each subwatershed.

With alternative D Road 25N73B would be rerouted with approximately 1,000 feet of new road construction and approximately 1,000 feet of the existing road would be decommissioned. This would be done to provide access for chip truck which have a wide turning radius, as well as emergency vehicles. The construction and decommissioning of Road 25N73B would result in negligible effects to the transportation system.

Temporary Road Construction and Decommission

Alternative F proposes only 1.9 miles of temporary road construction and decommissioning compared to alternatives A, C, D, and E. Again, the reason is similar to system road construction. In alternatives A, C, D, and E, there would be a need to construct an additional 6.3 miles of temporary road in order to access group selection and individual tree selection units.

Unlike system road construction and closure, the temporary road construction and decommissioning proposal would completely eliminate the road from future access. There would be no maintenance requiredupon decommission. However, the temporary roads would not be accessible for suppression resources upon completion of this project.

This would also have a bearing on the effects on watershed resources. The potential for increased cumulative watershed effects would be minimal because all temporary roads would be decommissioned. Decommissioning temporary roads would not improve access for future suppression resources and would not increase the potential for cumulative watershed effects.

Road Reconstruction

The road reconstruction proposed in alternative A was categorized into light, moderate, and heavy. This would provide a relative gauge for effects that would result from reconstruction in each watershed. There are also implications on costs associated with, for instance, a light reconstruction consisting of road grading, versus a heavy reconstruction consisting of replacing culverts. Table 6 (located in appendix D on page 24 of the document titled “Proposed Action, Empire Vegetation

Management Project," February 9, 2005) shows the entire road proposal by watershed, road location, and length. It also shows the relative amount of light, moderate, and heavy reconstruction.

Road Closure

Alternative A proposes 17.1 miles of road closure, in contrast to alternatives C, D, E, and F, which propose 11.1 miles of closure. The difference between these two proposals is the 6 miles of road proposed for closure, which are currently on the OHV route designation process.

Similar to the effects for system road construction and closure, the 17.1 miles of system road closure proposed in alternative A, and 11.1 miles of system road closure proposed in alternatives C, D, and E, would provide limited access upon completion of the project for suppression resources because these roads would be closed and maintained as a Level 1 road.

Again, when a road is closed and receives limited maintenance service, the potential impacts on soils and watershed could increase. This potential increase is accounted for in the cumulative watershed assessment for alternative A. There is slightly less potential for increases in soil and watershed impacts in C, D, and E, where 11.1 miles of road closure are proposed within each subwatershed.

Alternative B proposes no road closure, so it would have no impact on the OHV route designation process.

Road Decommissioning

Alternative A is slightly different from C, D, E, and F because it proposes a greater number of miles for decommissioning. Alternative A proposes decommissioning of 15.6 miles of road, compared to 12 miles for alternatives C, D, E, and F. There are 3.6 miles of forest system roads currently on the OHV inventory that are proposed for decommissioning in alternative A.

Alternative B (no action) proposes no road decommissioning. Roads identified for decommissioning for watershed and wildlife resource impacts would continue to impact those resources and, in some cases, would increase over time.

Road decommissioning would reduce the impacts on watershed and wildlife resources. It would also limit access for firefighting suppression forces.

RECREATION AND MINING

Summary of Effects

The locations of the proposed fuel treatments in the action alternatives would have a beneficial effect of reducing the risk that wildfire would enter and damage or destroy the recreational facilities within the project area.

A number of roads proposed for decommissioning and closures identified in alternative A are in direct conflict with the Off Highway Vehicle (OHV) route designation process currently ongoing on the Plumas National Forest. Alternatives C, D, E, and F have removed these roads from the closure/decommissioning proposal.

Affected Environment

The "Empire Vegetation Management Project: Recreation Analysis" was used to develop the proposed action, is located in the project record, and is incorporated by reference.

Most of the recreational use within the Empire Project boundaries is by individuals and small groups participating in dispersed activities that include hiking, horseback riding, mountain biking, Christmas tree cutting, dirt biking, pleasure driving, OHV riding, hunting, fishing, camping, rock hounding and mining, and firewood gathering.

There are two developed campgrounds in the Empire Project area:

Spanish Creek—Located 8 miles north of Quincy. Section 15, T25N, R9E. In 2004 this campground was fully developed and had approximately 1,000 campers from July 1 to October 15. It is estimated that in the future about 2,000 campers would visit the site from May 1 through October 15.

Brady's Camp—Sits just below the top of Grizzly Ridge, slightly to the north and east of Argentine Rock, in the SW ¼, Section 9, T 24 N, R 11 E. Approximately 100 campers use Brady's Camp from June 1 through October 15, mainly by deer hunters in September and October.

There is a developed OHV track, with an unloading ramp and trailhead, at Four Corners, 0.25 mile west from the junction of Forest Service (FS) Road 25N14 and County Road 403. Approximately 200 to 250 people a year use this facility. It is a fairly new development (reconstructed in 2003), so future use is expected to increase.

There are six designated OHV routes, totaling approximately 103 miles, in the Empire Project boundary. Approximately 200 to 250 people per year use these OHV routes. This area is also used by horseback riders. The approximate use by mountain bikes is 75 to 100 riders per year.

The Plumas National Forest is currently undergoing an OHV route designation process. Through this process, the forest will establish a designated OHV route system by early 2008. This designated route system will be based on existing system roads and trails, as well as non-system roads and trails. There are a number of non system roads and trails in the Empire Project boundary that forest recreation users currently use for OHV riding.

The deer tag quota for this area (California Department of Fish and Game Zone X6A) is approximately 380. The season runs for approximately three weeks in October.

There are over 70 mining claimants and 45 placer mining claims along the creeks. The time frame for dredging season is from the third week of May through October 15th each year.

Environmental Consequences — Recreation and Mining

Direct, Indirect, and Cumulative Effects of All Alternatives

The action alternatives (A, C, D, E, and F) would have no direct effects on the developed campgrounds because no project vegetation management actions would be implemented in them. Fuels treatments (thinning and burning) would be implemented in the OHV track and loading ramp area, but these facilities would be protected from planned activities. Because of the location of fuel treatments, the action alternatives would have the beneficial indirect effect of reducing the risk that wildfire would enter and damage or destroy the recreational facilities in the project area.

With all action alternatives, the increased high use of logging trucks could have minor short-term negative effects on recreation user experiences. Logging trucks, heavy equipment, and water trucks would increase the potential hazards encountered by users of the road system. There also may be short-term effects from noise in the vicinity of the two recreation sites and dispersed recreation areas.

The road decommissioning and closure in the proposed action (alternative A) are in direct conflict with the OHV route designation process currently ongoing on the Plumas National Forest. Alternatives C, D, E, and F have removed these roads from the closure/ decommissioning proposal, thereby following the route designation process, timeframes, and guidelines. The OHV route designation process is at the end of the first stage of the planning effort, and the Plumas National Forest will establish a designated OHV route system by early 2008.

The proposed road decommissioning would not change existing access to mining claims.

Alternative B (no action) would forego an opportunity to reduce fuels in the vicinity of the recreation sites and to reduce the severity of wildfires. High-severity fire is more likely to occur under this alternative than under any action alternative. These fires could result in major loss of forest canopy and burn through either of the two recreation sites and destroy their facilities. Alternative B would have the least effect on OHV users and would provide the highest level of OHV opportunities because all roads and trails would be retained at current levels and conditions.

Fuel and vegetation treatments, and transportation system changes proposed under the alternatives A, C, D, E, and F would have no negative cumulative effects on recreation and mining resources in the Empire Project boundary.

BOTANICAL RESOURCES

Summary of Effects — Botanical Resources

The effects determinations discussed here are based on existing information, including the existing condition within the botany analysis area; professional experience and judgment; and the potential impacts of the alternatives. An effects determination is the culmination of potential direct, indirect, and cumulative effects. Even if the potential direct effects are low, there is often the potential for indirect or cumulative effects to influence the viability of the species.

This effects analysis is qualitative not quantitative because too little is known about the specific habitat requirements and life histories of the species analyzed to make any attempt at a quantified analysis meaningful.

The Empire Project would not affect *Orcuttia tenuis, Ivesia webberi,* or any other any federally listed threatened, endangered, or candidate plant species because the project area does not contain suitable habitat for any of these species, and no individuals are known or are expected to occur in the project area.

Any alternative of the Empire Vegetation Management Project would not affect other species listed as sensitive by Region 5 (California) in the Plumas National Forest (USDA Forest Service 1998). These species include *Astragalus pulsiferae* var. *pulsiferae, Allium jepsonii, Astragalus lentiformis, Astragalus pulsiferae* var. *suksdorfii, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium montanum, Bruchia bolanderi, Clarkia mosquinii, Calycadenia oppositifolia, Calystegia atriplicifolia* ssp. *buttensis, Clarkia biloba* ssp. *brandegeae, Clarkia gracilis* ssp. *albicaulis, Fritillaria eastwoodiae, Hydrothyria venosa, Ivesia aperta* var.*aperta, Ivesia sericolueca, Lewisia cantelovii, Meesia triquetra, Meesia uliginosa, Monardella follettii*, *Monardella stebbinsii, Pyrrocoma lucida, Rupertia hallii, Scheuchzeria palustris* var. *americana, Senecio eurycephalus* var. *lewisrosei*, *Sedum albomarginatum, Silene occidentalis* ssp. *longistipitata,* and *Vaccinium coccineum.* These determinations are based on the absence of known occurrences and the lack of suitable habitat in the project area.

Table 3.44. Summary of determinations for sensitive species within the analysis area

Species	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Arabis constancei	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Astragalus webberi	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Cypripedium fasciculatum	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Cypripedium montanum	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Lupinus dalesiae	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Penstemon personatus	may affect*	would not affect	may affect*	may affect*	may affect*	may affect*
Oreostemma elatum	would not affect	would not affect	would not affect	would not affect	would not affect	would not affect

*= affect individuals, but is not likely to lead to a trend toward federal listing or loss of viability

Affected Environment — Botanical Resources

Geographic extent of the analysis area

The analysis area includes all treatment units (planning areas and DFPZ units), and access roads to the treatment units and the area within one mile of all treatment units. The analysis area is 87, 666 acres. Threatened, endangered, and sensitive species within the analysis area have the potential to be affected by the project. Threatened, endangered, and sensitive species not known from the analysis area are unlikely to be affected by the project because individuals of these species are not found close enough to proposed treatment units to be impacted. Species not known in the analysis area are not analyzed in this EIS.

Methods of analysis

Effects of proposed management actions were considered based on potential impacts to population numbers and habitat. The analysis was based on species abundance on a global, statewide, forestwide, and projectwide scales (table 3.45). Furthermore, known information about the species ecology was interpreted based on the management actions proposed near sesnsitive and MIS plant locations (tables 3.46 and 3.47).

Species included in the analysis

Project-specific field surveys for threatened, endangered, and sensitive plants have been conducted (Dittes 2004, 2004a; Buck 2004, 2004a; Dillingham 2004; Lubin 2004, Belsher-Howe 2005). The field surveys were designed around the phenology (annual emergence, development, and flowering as influenced by weather patterns) and ecology of the threatened, endangered, and sensitive species determined to have the potential to occur in the project area. The potential to occur determination was based upon known occurrences from surveys of past projects within several miles of the Empire Project; the known habitat types in the project area; how long a species has been listed and surveyed for; and how much is known about the species ecology, distribution, and life history.

Requiring surveyors to record all species located meets the need to document all species on the U.S. Fish and Wildlife Service (USFWS) list for the Plumas National Forest, all species on the Region 5 sensitive species list, and all species on the Plumas National Forest sensitive and special interest plant list. Tables 3.45, 3.46, and 3.47 show the sensitive and management indicator species known to occur in the analysis area.

The USFWS list of federally listed threatened and endangered species that potentially occur in the Plumas National Forest includes one threatened plant species: *Orcuttia tenuis,* slender Orcutt grass (USFWS 2005). *Orcuttia tenuis* is limited to relatively deep vernal pools or vernal pool type habitat with clay soil. Furthermore, the candidate species, *Ivesia webberi,* is listed as potentially occurring on the Plumas National Forest. *Ivesia webberi* is found in open areas of sandy volcanic ash to gravelly soils in sagebrush and eastside pine or with sagebrush on small mounds in meadows. Based on soil and geology maps, and field surveys, no suitable habitat for these species occurs in the project area; therefore, no threatened, endangered, or candidate species are considered likely to occur in the project area.

Environmental Consequences — Botanical Resources

Direct Effects, General Discussion: Direct effects occur when plants are physically impacted by management activities. These impacts can physically break, crush or uproot plants by driving over them, by covering them, by falling trees on them, or by burning them. Damage to plants can alter their growth and reproduction. Severe damage can kill plants. These impacts to individual plants can alter population size and the viability of a species across the landscape.

Actions such as timber falling, skidding, yarding, hand mechanical fuels treatment, skid trail ripping, road construction, sporax application, fireline construction, prescribed fire, prescribed fire control lines, and slash pile burning can result in direct effects to plants.

Indirect Effects, General Discussion: Indirect effects are removed in time or space from management actions. These effects may be beneficial or detrimental to plants depending on the species ecological charactersitics. Examples of indirect effects include: changing a low light environment to a high light environment by thinning trees, changing a late seral forest to an early seral forest through group selection harvest, reducing dead plant material on the ground through the use of prescribed fire, and introducing or spreading noxious weeds by using contaminated equipment or materials and mixing the soil.

Noxious weeds and other invasive organisms have become such a large problem that they have been declared one of the four threats to the health of the nation's forests and grasslands (Bosworth 2003). Weed infestations generally expand slowly at first, become well established, and then explode rapidly (Radosevich et al. 2003, USDA Forest Service 2001a). The following are a few examples of documented weed spread in the western US (Bisson 1999):

- Medusahead has seen explosive spread in western public land states within the last ten years.
- In northern California, yellow starthistle has spread from one to 10 million acres in just 15 years.
- In Idaho, rush skeletonweed has spread from 40 acres to 4 million acres from 1964 to 1995.
- In Colorado, spotted knapweed, leafy spurge and Canada thistle now occupy over 1 million acres of land where 18 years ago there were minimal infestations.

Noxious weeds can lead to habitat changes that are detrimental to sensitive plant species and native plant communities. Noxious weeds, once established, could indirectly impact sensitive plant species through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) (Bais et al. 2003), changing the fire regime (Archer 2004), or direct competition for nutrients, light, or water (Bossard et al 2000).

Burning hand or machine piles has the potential to alter seedbank (dormant seeds in the soil), soil biotic and chemical properties for years (Korb et al. 2004), which in turn greatly influences the degree, and type of plant colonization of the fire scarred site.

Cumulative Effects, General Discussion

Spatial scale of cumulative effects: The botany analysis area is used for the cumulative effects boundary.

Temporal scale of cumulative effects: Too little is known about most sensitive species to be able to state when the effects of the proposed treatments will no longer be altering the species populations and habitats considered in this analysis. A reasonable estimate for recovery time of the vegetation to near baseline (current) conditions is 100 years for group selection and 50 years for fuel treatments.

Past and current activities have altered sensitive plant populations and their habitats. The effects of past activities (appendix G) are built in to this analysis in that they are largely responsible for the existing landscape. It is unclear if the sensitive species included in this analysis have always been rare or were once more common, but are currently rare due to land use practices over the last 150 years. Very little is known about population dynamics and metapopulations (a population of populations) of sensitive species. For example, how long do individuals live? How long do colonies persist? How often are new colonies formed? How long do seeds persist in the seed bank? A thorough understanding of species population dynamics and metapopulations would be necessary in order to accurately assess the cumulative impacts of past, present, and future projects on a species.

This cumulative effects analysis is based on what is currently known about species distribution, ecology, and life history. Current management direction is designed to eliminate or reduce possible negative cumulative impacts by protecting sensitive plant species from direct and indirect impacts.

The approach taken in this analysis is that if direct and indirect negative effects to sensitive plant species are minimal, then this project does not contribute substantially to cumulative effects to the species. The effects of future projects are likely to be minimal and similar to those for this project because of existing planning methods and management guidelines, such as sensitive species surveys, protection of known sensitive species locations, and noxious weed mitigations.

EXISTING ENVIRONMENT AND EFFECTS OF THE ALTERNATIVES

Eight sensitive or MIS species are known within the analysis area. Table 3.45 compares the known abundance of these species from the global to the project scales. This comparison helps put in context the potential effects to the species as a whole. Occurrences are defined as an aggregation of all known locations within ¼ mile of each other. This results in some occurrences having many individuals distributed across many acres and others being as small as one individual. Another peculiarity of this methodology is that the discovery of new locations can result in a decrease in the number of occurrences.

Table 3.45. A comparison of sensitive and MIS species abundance across global, statewide, forestwide, and project scales.

		Number of Occurrences		
Species	Global Rank	CNDDB	Plumas NF	Botany Analysis Area
Arabis constancei	G3	52	36	2
Astragalus webberi	G1	10	9	2
Cypripedium fasciculatum	G4	NR*	87	1
Cypripedium montanum	G4	NR	15	9
Lupinus dalesiae	G3	162	131	31
Oreostemma elatum	G2Q	9	12	2
Penstemon personatus	G2	24	10	1
Silene invisa	G4	NR	26	3

G1 = critically imperiled; less than 6 viable occurrences, OR less than 1,000 individuals, OR less than2, 000 acres.

G2 = imperiled; 6-20 viable occurrences, OR 1,000 to 3,000 individuals, OR 2,000 to 10,000 acres.

G3 = vulnerable to extirpation or extinction; 21 to 80 occurrences, OR 3,000 to 10,000 individuals, OR 10,000 to 50,000 acres

G4 = apparently secure; factors exist to cause concern such as limited habitat or population threat.

G5 = demonstrably widespread, abundant, and secure.

Q = some question regarding validity of species classification
NR= not recorded
*=208 occurrences are documented on National Forest lands in CA.

Tables 3.46 and 3.47 are a project level comparison of species distribution within the analysis area. Because of the locations within the analysis area potential effects may not change by alternative (see *Arabis constancei*) or may vary to some extent (see *Cypripedium montanum* and *Lupinus dalesiae*).

Table 3.46. Sensitive and MIS species known outside of treatment units in the analysis area.

Species	Number of Locations	Approximate Acres
Astragalus webberi	4	<0.5
Cypripedium fasciculatum	1	<0.1
Oreostemma elatum	3	4.522
Penstemon personatus	1	<.1
Silene invisa	9	27

Table 3.47. Sensitive and MIS species potentially affected by each alternative.

Species	Project Unit	Approximate Acres	Number of Locations	Alternative A	Alternative C	Alternative D	Alternative E	Alternative F
Arabis constancei	DFPZ 4	0.1	1	x	x	x	x	x
	DFPZ 6	0.6	1	x	x	x	x	x
	Analysis area *	0.1	1					
	Totals	0.8	3					
Cypripedium montanum	DFPZ 1	0.3	4	x	x	x	x	x
	Planning 12	0.1	1	x	x	x	x	
	Planning 14	0.4	4	x	x	x	x	
	Planning 17	0.1	1	x	x	x	x	
	Planning 19	0.1	1	x	x	x	x	
	Analysis area*	2	21					
	Totals	3	32					
Lupinus dalesiae	DFPZ 4	21.5	60	x	x	x	x	*x*
	DFPZ 5	0.25	1	x	x	x	x	*x*
	DFPZ 6	6.1	21	x	x	x	x	*x*
	DFPZ 23	0.1	1	x	x	x	x	*x*
	Planning 11	2.1	11	x	x	x	x	
	Planning 16	0.2	2	x	x	x	x	
	Planning 1	0.7	7	x				
	Planning 3	0.2	2	x	x			
	Planning 8	0.1	1	x	x			
	Planning 9	0.5	3	x				
	Analysis area*	243.25	83					
	Totals	275	192					

** analysis area means outside of treatment units in the botany analysis area*

Arabis constancei (Contance's rock cress)

Arabis constancei is a Management Indicator Species.

Table 3.48. Distribution of *Arabis constancei* in the analysis area:

Species	Project Unit	Approximate Number of Acres	Approximate Number of Locations	Alt. A	Alt. C	Alt. D	Alt E	Alt F
Arabis constancei	DFPZ 4	0.1	1	x	x	x	x	x
	DFPZ 6	0.6	1	x	x	x	x	x
	Analysis area *	0.1	1					
	Totals	0.8	3					

This species occurs on undisturbed serpentine derived soils in scattered locations in the Plumas National Forest and southernmost part of the Lassen NF, in Plumas and Sierra counties. Some locations appear threatened by shading of encroaching conifer stands. Known occurrences seem to be stable if they have not been impacted. However, many of the known occurrences have been impacted by various activities including mining, road building, timber harvest, off-road vehicle use, and recreation activities. Threats to this species include mining, timber harvest, road construction, off-road vehicle use, and recreational collecting of serpentine rock.

Management Prescription: Protect all plant occurrences from ground disturbance. Keep handpiles at least 20 feet from plants to protect individuals and seedbank from excessive heat. Avoid scattering slash on plants. Evaluate potential effects of prescribed fire on a site by site basis considering factors such as population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations. Evaluate other activities on a site by site basis considering species abundance, population size, geographic distribution, and known species ecology.

Indicator measures

- Disturbance: Plants are found in undisturbed sites.
- Canopy cover: The two documented occurrences within the project area occur at sites with <50% canopy cover. Outside of the project area, the majority of occurrences (71%) are found at sites with <40% cover.

Direct and Indirect Effects:

- No Action (Alternative B): No direct effects are anticipated because no project related activities would occur. Indirect effects are also unlikely because both locations in treatment units are barrens supporting little or no tree growth. Since both locations are in naturally open areas densification of surrounding stands is not predicted to reduce habitat.

- Action Alternatives (A, C, D, E, and F): Direct effects may occur. *A*ll known locations have been flagged for avoidance during mechanical thinning, group selection harvest, mastication, pile burning, or piling of slash activities. All habitat is not being avoided. Backing fires may enter the designated control areas. Although fire may kill some individuals it will also reduce the amount of duff and litter creating more favorable growing conditions. Hand thinning may occur if material is hand piled outside of the control areas. The indirect effects of the action alternatives on *Arabis constancei* are considered slightly negative. The two locations in treatment units are in open habitat and would not benefit or harmed by a decrease in canopy cover. Timber harvest and associated activities in DFPZ units 4 and 6 is likely to reduce suitable habitat slightly because this species is not known from disturbed sites.

Cumulative effects:

None of the projects identified in Appendix G can be site specifically tied to the three locations in the analysis area.

- No Action (Alternative B): No cumulative effects would occur since there would be no direct or indirect effects. Future projects on are likely to have effects similar to those described under the action alternatives.

- Action Alternatives (A, C, D, E, and F): Cumulative effects are slightly negative due to habitat impacts. It is predicted that this project will not reduce the viability of *Arabis constancei* because this project proposes little activity on the best suitable habitat. No future projects in appendix G would impact the occurrences in the analysis area.

Astragalus webberi (Webber's milk-vetch)

Table 3.49. Distribution of *Astragalus webberi* in the analysis area:

Species	Number of Locations	Approximate Acres
Astragalus webberi	4	<0.5

The species grows in a variety of habitats from very open rocky areas to moderately dense stands of hardwoods and conifers. It is found in areas that have been disturbed in the distant past (tailings piles and old roads) but not in recently disturbed areas. This species does not seem to be habitat specific. Most of the known occurrences are along highways, on stabilized cutbanks, or on the edge of the forest. This species appears to be in decline. Some plants appear to have been lost when a cut bank failed. Threats from management activities include road maintenance and construction, trash dumping, vehicle parking, and timber harvest.

Prescription: Protect all plant occurrences from ground disturbance. Keep handpiles at least 20 feet from plants to protect plants and seedbank from excessive heat. Avoid scattering slash on plants. Evaluate potential effects of prescribed fire on a site by site basis considering factors such population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations. Evaluate other activities on a site by site basis considering species abundance, population size, geographic distribution, and known species ecology.

Indicator measures

- Disturbance: Not known from recently disturbed sites.
- Canopy cover: There are no occurrences within the project area. Outside of the project area, the species is found at sites with both ≥ 50% and <50% canopy cover.

Direct and Indirect Effects:

- No Action (Alternative B): No direct or indirect effects are anticipated because no project related activities would occur. The species grows in a variety of habitats from very open rocky areas to moderately dense stands of hardwoods and conifers. Given the diversity of habitats in which it is found it is unlikely that no action would result in enough change to have either positive or negative effects on the species and its viability.
- Action Alternatives (A, C, D, E, and F): No direct effects are anticipated because no occurrences are known in treatment units. No indirect effects are likely. The action alternatives may increase the amount of suitable habitat for the species over the long term. This is not considered highly beneficial because of the distance from known locations to project treatment units and the lack of knowledge regarding seed dispersal. The fuels reduction aspects of the project are predicted to help protect existing suitable habitat.

Cumulative effects:

None of the projects identified in appendix G can be site specifically tied to the four locations in the analysis area.

- No Action (Alternative B): No cumulative effects would occur since there would be no direct or indirect effects. Past projects may have impacted this species. Future projects are likely to have effects similar to those described under the action alternatives.
- Action Alternatives (A, C, D, E, and F): No cumulative effects are anticipated. The post project landscape is predicted to protect or enhance suitable habitat. Past projects may have

impacted individuals and suitable habitat. Future projects are likely to have similar effects as those described here under the action alternatives.

Cypripedium fasciculatum (Clustered Lady's Slipper Orchid)

Table 3.50. Distribution of *Cypripedium fasciculatum* in the analysis area:

Species	Number of Locations	Approximate Acres
Cypripedium fasciculatum	1	<0.1

Cypripedium fasciculatum is known from Butte, Del Norte, Humboldt, Nevada, Plumas, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, San Mateo, Tehama, Trinity, and Yuba counties, and in the states of Colorado, Idaho, Montana, Oregon, Utah, Washington, and Wyoming.

The best conditions for *Cypripedium fasciculatum* are thought to exist when crown canopy cover is between 50% and 75% with 60% being optimal (Cramer and Kaye 2003). Most populations are found in late successional stands (Harrod et. al. 1997). It appears that the optimum habitat conditions for *C. fasciculatum* are **not** found in early successional communities (Kagan 1990). *Cypripedium fasciculatum* has an apparent intolerance to intense disturbance that directly reduces the duff layer. However, in some cases *C. fasciculatum* does not tolerate low intensity fire even though the duff layer is reduced or eliminated (Harrod et. al. 1997).

A mycorrhizal symbiont(s) that is only found in mid-to-late successional forest communities may be necessary for *Cypripedium* species viability (Seevers and Lang 1998). Formal studies of the response of *Cypripedium* species to disturbance are limited. The life history of *Cypripedium fasciculatum* appears to be quite complicated. The tiny seeds require the presence of a mycorrhizal fungus (possibly a *Rhizoctonia)* before they will germinate and that the fungal symbiont is necessary for development of plants, possibly throughout the life of the plant. Therefore establishment of new populations requires suitable conditions for the fungus, which are presumed to be moist and shady with adequate organic material to support growth of the fungus.

Threats from management activities include any direct ground disturbance activities including timber harvest, mechanical fuels reductions, intense fire, recreation, livestock grazing, road and trail maintenance, and illegal collection. (Much of the information on *Cypripedium fasciculatum* is summarized from Seevers and Lang, 1998).

Cypripedium montanum (mountain lady-slipper orchid):

Table 3.51. Distribution of *Cypripedium montanum* in the analysis area:

Species	Project Unit	Approximate Acres	Number of Locations	Alt. A	Alt. C	Alt. D	Alt. E	Alt. F
Cypripedium montanum	DFPZ 1	0.3	4	x	x	x	x	x
	Planning 12	0.1	1	x	x	x	x	
	Planning 14	0.4	4	x	x	x	x	
	Planning 17	0.1	1	x	x	x	x	
	Planning 19	0.1	1	x	x	x	x	
	Analysis area*	2	21					
	Totals	3	32					

The habitat for this plant is broad including moist conifer forests (Douglas fir, white fir, mixed conifer) in partial shade (canopy closure is generally between 60 and 80 percent) and often on slopes. It is also known to occur in oak woodlands and riparian areas.

The range of distribution includes many counties throughout California from Del Norte to Sierra County. It also occurs in 6 other western states. The Six Rivers, Shasta-Trinity, Klamath, Sierra, Modoc, Lassen (2 occurrences), Stanislaus, and Plumas (21 occurrences) National Forests have known occurrences of this plant.

Trend appears to be down based on what is known about the complicated life history, which includes mycorrhizal relationships, limited establishment, factors, apparent intolerance to intense disturbance, and location (lands available to timber harvest).

Threats due to management activities include ground disturbing activities including timber harvest, wild and/or prescribed fire at intense level, recreation, land exchange, livestock grazing, and poaching. Populations are often very small and highly isolated. There are concerns regarding overall viability related to the small size of occurrences and associated genetic fitness. (Much of the information on *Cypripedium montanum* is summarized from Seevers and Lang (1998).

Prescription for *Cypripedium fasciculatum* and *Cypripedium montanum:* Buffer all plant occurrences by about 100 ft. from ground disturbance to maintain canopy closure, hydrologic conditions, and mycorhhizal relationships. Keep handpiles at least 50 ft. from plants to protect plants, seedbank and mycorhhizae from excessive heat. Avoid scattering slash on plants. Evaluate potential effects of prescribed fire on a site by site basis considering factors such population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations. To the extent possible, avoid ignitions within occurrences and avoid building fire control lines in or near occurrences. Also, allow fire to creep/back into occurrences from adjacent terrain if the fuel loading permits. Do not advertise locations, to minimize poaching. Evaluate other activities on a site by site basis considering species abundance, population size, geographic distribution, and known species ecology.

Indicator measures for *Cypripedium fasciculatum* and *Cypripedium montanum*

- Disturbance: Generally undisturbed or in areas with localized small-scale disturbance.
- Canopy cover: Within the project area, 56% of CYMO occurrences are at sites with ≥ 50% canopy cover. Outside of the project area, over 85% of CYMO and CYFA occurrences are found at sites with > 40% canopy cover.

Direct and Indirect Effects to *Cypripedium fasciculatum* and *Cypripedium montanum***:**

- No Action (Alternative B): No direct effects are anticipated because no project related activities would occur. Stands would continue to densify and noxious weeds would continue to spread but neither of these seem to threaten existing locations of *Cypripedium fasciculatum* or *Cypripedium montanum* because of habitat requirements and locations of weeds.
- Action Alternatives (A, C, D, E, and F): No direct effects are anticipated for *Cypripedium fasciculatum* because no occurrences are known in treatment units. No direct effects are anticipated for *Cypripedium montanum* because all known locations have been flagged for avoidance or are in other protected areas such as RHCAs and wildlife PACs. No mechanical thinning, group selection harvest, mastication, pile burning, underburning, or piling of slash would occur within the designated control areas. Hand thinning may occur if material is hand piled outside of the control areas. Some habitat would be lost in the short term through reductions in canopy cover and ground disturbance. Since the forest will regrow suitable habitat is not considered lost in the long term (50-100 years). Each action alternative proposes reducing crown canopy to between 30% and 50%, below the best best conditions for these species. This reduction in canopy cover is considered essential in reducing the fire hazard and will aid in protecting not only the treated stands but, also the surrounding stands that contain occurrences of *Cypripedium montanum.* Most locations in the area are within RHCA's. Overall, indirect effects are considered only slightly negative because while suitable habitat is lost in the short term, all known sites are buffered from management activities and the preferred RHCA habitat is mostly protected from management activities.

Cumulative effects to Cypripedium fasciculatum and Cypripedium montanum:

None of the projects identified in appendix G can be site specifically tied to the locations in the analysis area.

- No Action (Alternative B): No cumulative effects would occur because no direct or indirect effects are predicted. Past projects may have impacted some or all of these species. Future projects are likely to have effects similar to those described under the action alternatives. The known locations would have an increased risk to being lost to catastrophic fire, but this is not an effect until it occurs.

- Action Alternatives (A, C, D, E, and F): *Cypripedium fasciculatum* and *Cypripedium montanum* have probably lost individuals and have lost habitat due to activities in appendix G. Sensitive plant surveys and incorporation of protection measures began around 1980 on the Plumas NF. Protection of these species has varied since 1980. All of these activities to one extent or another have resulted in a reduction in canopy cover, an alteration of stand dynamics, an alteration in fire frequency and intensity, and changes in microclimate. This project will protect known locations, but not all suitable habitat. It is predicted that the implementation of this project will result in stands that are less prone to catastrophic wildfire. Hence, the protected sites and unimpacted suitable habitat will be more likely to support populations of *Cypripedium fasciculatum* and *Cypripedium montanum* because these stands will be less likely lost to wildfire. Future projects will have similar effects as this one.

Lupinus dalesiae **(Quincy lupine):**

Lupinus dalesiae is a Management Indicator Species

Table 3.52. Distribution of *Lupinus dalesiae* in the analysis area:

Species	Project Unit	Approximate Acres	Number of Locations	Alt. A	Alt. C	Alt. D	Alt. E	Alt. F
Lupinus dalesiae	DFPZ 4	21.5	60	x	x	x	x	*x*
	DFPZ 5	0.25	1	x	x	x	x	*x*
	DFPZ 6	6.1	21	x	x	x	x	*x*
	DFPZ 23	0.1	1	x	x	x	x	*x*
	Planning 11	2.1	11	x	x	x	x	
	Planning 16	0.2	2	x	x	x	x	
	Planning 1	0.7	7	x				
	Planning 3	0.2	2	x	x			
	Planning 8	0.1	1	x	x			
	Planning 9	0.5	3	x				
	Analysis area*	243.25	83					
	Totals	275	192					

Lupinus dalesiae is found in disturbed sites such as old skid trails and road cut banks or undisturbed sites, in open canopy mixed conifer forests. Recent visits to old project areas have shown that this species tolerates and even thrives on disturbance. The intensity, extent, or frequency of the disturbance(s) associated with these occurrences has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes. The trend for this plant is stable. Threats include road construction and maintenance, mining, off-road vehicle use, timber harvest, release, and site preparation activities. Development is a threat on private lands.

Prescription: Protect 30% of known occurrences within a project area from ground disturbance. Favor protection of locations that have open tree and shrub canopies (<50% cover) over those with high tree and shrub canopies. In control areas, keep handpiles at least 20 feet from plants to protect individuals and seedbank from excessive heat. Avoid scattering slash on plants. Evaluate potential effects of prescribed fire on a site by site basis considering factors such population size, fuel load, season of burn, predicted intensity and duration of burn, and risk of wildfire vs. potential effects from prescribed fire. Develop monitoring plans to evaluate fire effects on individuals and populations before prescribed burning operations. Favor allowing ground disturbance and prescribed fire in areas of dense shrub or tree cover. Evaluate other activities on a site by site basis considering species abundance, population size, geographic distribution, and known species ecology.

Indicator measures

- Disturbance: Undisturbed or disturbed.
- Canopy cover: Within the project area, 65% of *Lupinus dalesiae* occurrences are in sites with <50% canopy cover and 35% occur in stands with ≥50% canopy cover.

Direct and Idirect Effects

- No Action (Alternative B): No direct effects are anticipated because no project related activities would occur. *Lupinus dalesiae* may be negatively affected by this alternative. Occurrence records from project surveys document duff accumulation and shading at some locations (Dittes 2004). Allowing the forest near occurrences to continue to increase in density and canopy cover is predicted to lead to the elimination of the from some of the known sites. Personal observations after the Storrie Fire lead me to believe that *Lupinus dalesiae* responds well to stand replacing fires.

- Action Alternatives (A, C, D, E, and F): *Lupinus dalesiae* may be directly affected by the action alternatives. Some individuals of this species are likely to have their vigor and productivity reduced in the short-term or to be killed by project activities. Pile burning is likely to kill the seed bank located underneath or in close proximity to the pile (Korb et al 2004). *Lupinus dalesiae* is predicted to benefit in the long term even though some individuals may be directly impacted as stated above. This species is known to readily colonize disturbed sites such as roadsides and skid trails. Project activities would create ground disturbance and reduce canopy cover thus creating more suitable habitat for this species to colonize.

Cumulative effects

None of the projects identified in appendix G can be site specifically tied to the locations in the analysis area.

- No Action Alternative (Alternative B): The no action alternative may affect *Lupinus dalesiae* because of potential changes to habitat. Past projects may have impacted this species.

Future projects are likely to have effects similar to those described under the action alternatives.

- Action Alternatives (A, C, D, E and F): *Lupinus dalesiae* have most likely benefited from the effects of past projects. This species has the ability to colonize previously disturbed sites as well as undisturbed sites, many occurrences are known outside but near project units, and control areas are designated within projects units. Through the application of protection measures similar to the existing Interim Management Prescriptions, LRMP Standards and Guidelines, and Best Management Practices this species is likely to benefit from the effects of this and other future projects. These conclusions are reached based on the above discussions of species ecology and known distribution in the vicinity of the project. The proposed project is likely to benefit this species because of the habitat it occupies. Future projects are likely to have similar effects as this one.

Oreostemma elatum (Plumas aster):

Table 3.53. Distribution of *Oreostemma elatum* in the analysis area

Known distribution in the analysis area.

Species	Number of Locations	Approximate Acres
Oreostemma elatum	3	4.522

Oreostemma elatum grows in perennially wet meadow, springy banks, and fen habitats in mixed conifer plant communities. These sites have an open canopy largely due to the high soil moiture. The sites are usually undisturbed although sometimes impacted by cattle grazing. The trend for this recently described species is unknown. Threats from management activities include mining, road building, livestock grazing, and recreation activities.

Prescription: Protect all plant occurrences from ground disturbance. Maintain, enhance, or restore hydrologic conditions supporting occurrences. Evaluate other activities on a site-by-site basis considering species abundance, population size, and known species ecology. Evaluate activities and use mitigations consistent with Riparian Management Objectives (HFQLG FEIS) or Riparian Conservation Objectives (ROD, Sierra Nevada Forest Plan Amendment, p. 32-35) as appropriate.

Indicator measures

- Disturbance: Low.
- Canopy cover: Open sites typically maintained by high soil moisture.

Direct and Indirect Effects

- No Action (Alternative B): No direct effects are anticipated because no project related activities would occur. *Oreostemma elatum* grows in wet meadows that maintain an open character because of a high water table. These wet sites are unlikely to be invaded by trees or experience high intensity wildfire, thus no indirect effects are likely for *Oreostemma elatum.*

- Action Alternatives (A, C, D, E, and F): No direct effects are anticipated for *Oreostemma elatum* because occurrence is flagged for avoidance and is within an RHCA. No indirect effects are anticipated for *Oreostemma elatum* because it is found in very wet and open habitats, thus it is predicted that thinning and group selection harvest will not change the microenvironments in which they are found. Furthermore, no changes in hydrology or significant increase in sedimentation is anticipated at the location within the project analysis area were it is known.

Cumulative effects

None of the projects identified in appendix G can be site specifically tied to the locations in the analysis area.

- No Action Alternative (Alternative B): No cumulative effects would occur because no direct or indirect effects are predicted under this alternative. Past projects may have impacted this species. Future projects are likely to have effects similar to those described under the action alternatives.

- Action Alternatives (Alternatives A, C, D, E and F): No cumulative effects are anticipated for *Oreostemma elatum* as a result of this project because no direct or indirect effects would occur. All known locations of this species are designated for protection and suitable habitat will be protected through the incorporation of Best Management Practices in project implementation. Past projects may have impacted this species. Future projects are likely to have similar effects as those described here under the action alternatives.

Penstemon personatus (closed-throated beardtongue):

Penstemon personatus is a Management Indicator Species.

Table 3.54. Distribution of *Penstemon personatus* in the analysis area

Known distribution in the analysis area.

Species	Number of Locations	Approximate Acres
Penstemon personatus	1	<.1

Penstemon personatus is rhizomatous (spreads via an underground stem) which seemingly explains the large but localized populations. This plant is known to grow in westside mixed conifer and/or red fir plant communities. The trend appears to be stable. This plant appears to tolerate limited disturbance that does not change the microhabitat. It is known from open canopy to closed canopy settings. Threats from management activities include road construction and maintenance, timber harvest activities, timber site preparation and release, high intensity burn piles, livestock grazing, mining, and off-road vehicle use. A species management guide was written for this species in 1987.

Prescription: Use guidance in the Preferred Alternative of the approved Penstemon personatus (PEPE) Species Management Guide of 1987 to develop a set of key PEPE Areas (occurrences or portions of occurrences) within each metapopulation, which will be protected from management disturbances. These key areas would be established within occupied habitat to maintain geographic distribution within the species. Priority for the delineation of key areas would be given to those occurrences that currently exhibit a diversity of habitat types. Avoid building landings or temporary roads through known occurrences. Avoid sub-soiling through known occurrences. Strive to apply mechanical treatments after seed-set. Avoid machine piling within known occurrences. To the degree possible, lop-and-scatter hand fuel and mechanical fuel treatments to avoid creating piles within known occurrences. If other resource issues necessitate pile burning, work with the District Botanist to avoid placing piles on individual plants within the occurrence to the degree feasible. Strive to apply prescribed fire in the fall. Evaluate other activities on a site by site basis considering species abundance, population size, geographic distribution, and known species ecology.

Indicator measures

- Disturbance: low to moderate.
- Canopy cover: There are no occurrences within the project area. Outside of the project area, over 75% of occurrences are found at sites with <60% canopy cover.

Direct and Indirect Effects

- No Action (Alternative B): No direct effects are anticipated because no project related activities would occur. The site location is unlikely to experience a high intensity fire. Disturbance is not required (although it is tolerated under many conditions) for regeneration or survival. No indirect effects are likely for *Penstemon personatus.*
- Action Alternatives (A, C, D, E, and F): No direct effects are anticipated for *Penstemon personatus* because no occurrences are known in treatment units. No indirect effects are likely because observations at the site support a stable, but not expanding or contracting population. Since the population does not seem to be spreading locally it seems unlikely that it would be affected by habitat alteration in stands about ½ mile away. Seed dispersal mechanisms are not known. Effects to suitable habitat are considered beneficial to the species.

Cumulative effects

- No Action (Alternative B): No cumulative effects would occur because no direct or indirect effects are predicted under this alternative. Past projects may have impacted some or all of these species. Future projects are likely to have effects similar to those described under the action alternatives.

- Action Alternatives (A, C, D, E and F): Because *Penstemon personatus* is tolerant of varying stand conditions and is somewhat tolerant of disturbance the magnitude of effects from past land use on species viability is unclear. The current project is designed to reduce negative effects and maximize beneficial effects to *Penstemon personatus.* Future projects will likely have similar effects as this one if the current management practices remain the same.

Silene invisa (hidden-petal campion)

Silene invisa is a Management Indicator Species

Table 3.55. Distribution of *Silene invisa* in the analysis area

Known distribution in the analysis area.

Species	Number of Locations	Approximate Acres
Silene invisa	9	27

Silene invisa typically inhabits the Red-fir/ upper montane zone between 5800-9000 feet in elevation. It has been found in moist or dry meadow edges, ephemeral stream banks and flood plains, and forest edges under the partial or open canopy of young and mature red fir (Lawlor 1998). Threats to the species include ground disturbance that would cover or compact the soil, remove or change the existing vegetation, increased shading, or bury existing plants and seeds (Lawlor 1998).

Prescription: Protect at least 30% of all known occurrences within a project analysis area from all disturbances associated with management activities. Hand thin and scatter or pile outside of occurrences. Do not construct fire control line through occurrences. Allow for at least 5 years rest between disturbance prescriptions to the same occurrence. Evaluate other activities on a site-by-site basis considering species abundance, population size, geographic distribution, and known species ecology.

Direct and Indirect Effects

- No Action (Alternative B): No direct effects would occur because no activities would take place. Indirect effects may occur because of increased shading.

- Action Alternatives (A, C, D, E, and F): No direct effects would occur because the species is not known in any treatment unit. Indirect effects are unlikely under alternative A because the locations are a few hundred feet outside planning area 2G on the east side of the ridgeline. Indirect effects would not occur under other action alternatives because planning area 2G is not included in them.

Cumulative effects

- <u>No Action</u> (Alternative B): No cumulative effects would occur because there are no direct or indirect effects.

- <u>Action Alternatives</u> (A, C, D, E and F): No cumulative effects would occur because there are no direct or indirect effects.

Management Indicator Species

The species designated as Management Indicator Species in the 1988 Plumas NF Land and Resource Management Plan are: Arabis constancei, Fritillaria eastwoodiae, Lewisia cantelovii, Lupinus dalesiae, Monardella stebbinsii, Penstemon personatus, Sedum albomarginatum, Vaccinium coccinium, and Silene invisa.

Table 3 is a summary of our current knowledge of MIS species, known in the botany analysis area, compared to our knowledge of the species in 1988 when the Plumas NF Land and Resource Management Plan was published (USDA Forest Service 1988a).

The decrease in *Penstemon personatus* occurrences is due to more accurate mapping of the locations, finding new locations between those known in 1988, and a recalculation of occurrences using GIS. Occurrences are defined as all locations within ¼ mile of each other. This project will not affect *Fritillaria eastwoodiae, Lewisia cantelovii, Monardella stebbinsii, Sedum albomarginatum,* or *Vaccinium coccinium* because they are not known within the botany analysis area. The effects to Arabis constancei, Lupinus dalesiae, Silene invisa, and Penstemon personatus are described in detail above.

Table 3.56. MIS comparison of 1988 and 2006 population data.

	1988	2006	2006	2006	2006
Species	**PNF Occurrences**	**CNDDB (2006) Occurrences**	**PNF Occurrences**	**PNF locations**	**PNF acres**
Arabis constancei	7	52	36	208	769.14
Lupinus dalesiae	many	162	131	564	1, 713.01
Penstemon personnatus	14	24	10	116	4, 563.78
Silene invisa	4	Not tracked	26	134	952.59

NOXIOUS WEEDS

Summary of Effects — Noxious Weeds

Noxious weed surveys were conducted throughout 2004. Six B and C rated were documented at various locations in and adjacent to proposed treatment units. Two A-rated weed species were documented within the analysis area.

Table 3.57. Noxious weed species within the analysis area.

Species	Rating	Locations in Analysis Area
Spotted knapweed	A	2
Rush skeletonweed	A	1
Canada thistle	B	9
Jointed goatgrass	B	1
Medusahead	C	65
Scotch broom	C	21
Yellow starthistle	C	72
Field bindweed	C	1
Bull thistle	C	Not recorded
Klamathweed	C	Not recorded

The Empire Project is predicted to result in low risk of noxious weed introduction and a moderate risk of spread because of incorporated Standard Management Requirements and mitigations.

Post project monitoring would assess effectiveness of Standard Management Requirements and mitigations.

Affected Environment — Noxious Weeds

Noxious weed species pose a serious threat to biological diversity because of their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed are spread by on- and off-road vehicles; recreational activities such as camping, hiking, horseback riding, and hunting; and ongoing land management activities. The areas at greatest risk in the analysis area are those located next to roads. Road density is considered moderate to high in the project area. Roads contribute to the spread (dispersal) of noxious weed species because they (1) create favorable conditions (ground disturbance due to road construction/reconstruction, maintenance) for weeds to establish, (2) make weed invasion more likely by stressing or removing native species, and (3) allow for easier movement by animals and humans (Trombulak and Frissell 2000). These dispersal factors, in addition to activities on nearby private industrial timberlands, contribute to a moderate risk of noxious weed infestations.

Noxious weed surveys for the Empire Project were conducted from April to September 2004 (Dittes and Guardino 2004; Dittes and Guardino 2004a; Buck 2004, 2004b; Dillingham 2004; Lubin 2004). Surveys were concentrated along roads, in riparian areas, and in areas that have been highly disturbed by past activities.

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

No A-rated weeds were located in treatment units. Two A-rated weeds, *Chondrilla juncea* (rush skeletonweed) and *Centaurea maculosa* (spotted knapweed), were documented in the analysis area. One B-rated weed, *Cirsium arvense* (Canada thistle), was found in treatment units. Another B-rated weed *Aegilops cylindrical* (jointed goatgrass) was found in the analysis area. Six C-rated weeds *Centaurea solstitialis* (yellow starthistle), *Hypericum perforatum* (Klamathweed), *Taeniatherum caput-medusa* (medusahead), *Cytisus scoparius* (Scotch broom), *Cirsium vulgare* (bull thistle), and *Convolvulus arvensis* (field bindweed) were documented in and near treatment units as well as in the analysis area (refer to table 3.57)

Table 3.58. Known noxious weed locations within treatment units and along road segments.

Noxious weed	Location information Treatment unit Road (RD), Planning area (PA), or DFPZ unit	Treatment
Canada thistle	PA: 17G	Group selection harvest
	RD: 25N14, 25N19 PA: 19G DFPZ: 13	System road reconstruction/ Group selection harvest/mechanical thin
	RD: 25N18A (at Squirrel Creek crossing) PA: 6G	System road reconstruction/ Group selection harvest
	RD: 25N10Y (non-system at Taylor Creek tributary)	System road reconstruction
	PA: 14G	Group selection harvest
medusahead	RD: 25N41A	System road reconstruction
	RD: 24N52Y	System road closure
Noxious weed	**Location information** **Treatment unit** **Road (RD), Planning area (PA), or DFPZ unit**	**Treatment**
	DFPZ: 7	Prescribed burn
	DFPZ: 6	Hand thin/ mechanical thin
	PA: 11G	Group selection harvest
	RD: non-system "dancehouse" road at Mt. Hough Road	Non-system road reconstruction
	PA: 16G	Group selection harvest
	DFPZ: 9	Prescribed burn
medusahead	RD: 25N14B	System road reconstruction & closure
	RD: 24N80	System road reconstruction
	DFPZ: 2	Prescribed burn
	RD: 25N14	System road reconstruction
	RD: 25N19	System road reconstruction
	DFPZ: 2	Prescribed burn
	RD: 25N14	System road reconstruction
	DFPZ: 8	Prescribed burn
	DFPZ: 1	Mechanical thin
	DFPZ: 2	Prescribed burn
	PA: 14G	Group selection harvest
rush skeletonweed	RD: 24N02X (at junction with PC 508 &	System road reconstruction

	Rattlesnake Creek Road)	
Scotch broom	RD: unmarked rd off of 25N12 DFPZ: 28	Hand thin
Noxious weed	**Location information** **Treatment unit** **Road (RD), Planning area (PA), or DFPZ unit**	**Treatment**
yellow starthistle	RD: 25N41A DFPZ: 7	System road reconstruction & prescribed burn
	17G	Group selection harvest
	RD: non-system "dancehouse road" at Mt. Hough Road	Non-system road reconstruction
	RD: non-system road 34 ("Quarry Road")	Non-system road reconstruction
	DFPZ: 8	Prescribed burn
	RD: 25N14	System road reconstruction

Environmental Consequences — Noxious Weeds

The effects analysis is based on the incorporation of SMRs and mitigation measures (included after analysis of alternatives). Post-implementation surveys of the Antelope Border defensible fuels profile zone did not document noxious weeds (Merriam et al. 2003). This supports the effectiveness of implementing Standard Management Requirements to prevent the introduction of noxious weeds.

At present, neither the Forest Service nor Plumas County actively treats occurrences of Klammathweed or Canada thistle. Klammathweed has an effective biological control agent that keeps populations under control. An effective nonherbicide control method for Canada thistle is not available at this time. Bull thistle, although widespread, is generally not found in dense or extensive stands so is not considered a high priority for control.

Alternatives A, C, D, E, and F (Action Alternatives)

Direct and Indirect Effects. Under all five action alternatives, the proposed fuel and timber treatments would result in disruption of the soil surface and removal of existing vegetation, thus greatly increasing the amount of suitable habitat for noxious weeds. Table 3.59 shows the differences between the action alternatives and provides a comparison of the number of locations and acres potentially affected by each action alternative.

The majority of locations (67 of 82) and acres (27.1 of 28) are associated with fuel treatment units rather than group selection planning areas.

Table 3.59. Noxious weed species in the Empire Project area compared across the five action alternatives.

	Alternative A		Alternative C		Alternative D		Alternative E		Alternative F		Within 1 Mile of Empire Project Area	
Species[a]	**#[b]**	**Acres**	**#**	**Acres**	**#**	**Acres**	**#**	**Acres**	**#**	**Acres**	**#**	**Acres**
Medusahead	56	25.2	56	25.2	56	25.2	56	25.2	50	24.3	30	2.6
Yellow starthistle	12	1.7	12	1.7	12	1.7	12	1.7	11	1.7	52	12
Spotted knapweed											2	1
Field bindweed	1	< 0.1	1	< 0.1	1	< 0.1	1	< 0.1	1	< 0.1	1	<0.1
Rush skeletonweed											1	<0.1
Scotch broom	6	< 1.1	5	< 1.1	5	< 1.1	5	< 1.1	5	< 1.1	13	1.6
Canada thistle	7	< 0.1	7	< 0.1	7	< 0.1	7	< 0.1	0	0	2	< 0.1
Total	**82**	**28**	**81**	**28**	**81**	**28**	**81**	**28**	**67**	**27.1**	**101**	**17.3**

Notes:

a. Klammathweed and bull thistle were observed in the Empire Project area, but the abundance and distribution were not documented in detail or quantified.

b. The "#" column represents the number of documented locations.

The risk associated with proposed fuel treatments would be similar regardless of alternative. The overall risk would be higher with the incorporation of group selection harvest under alternatives A, C, D, and E and lower in alternative F, which only proposes fuel treatments.

Table 3.60. Comparison of alternatives, risk of introduction and spread of noxious weeds.

Alternative	Action 1	Action 2		Action 3
	Implement Fuel Treatment Strategies	Group Selection Harvest	Individual Tree Selection Harvest	Transportation System Changes
A	Moderate risk of introduction and spread	Higher risk of introduction and spread	Moderate risk of introduction and spread	Higher risk of introduction and spread
B	Lower risk of introduction and spread	No actions to reduce Lower risk of introduction and spread	No action to reduce Lower risk of introduction and spread	No actions to reduce Lower risk of introduction and spread
C	Moderate risk of introduction and spread	Higher risk of introduction and spread	Moderate risk of introduction and spread	Higher risk of introduction and spread
D	Moderate risk of introduction and spread	Higher risk of introduction and spread	Moderate risk of introduction and spread	Higher risk of introduction and spread
E	Moderate risk of introduction and spread	Higher risk of introduction and spread	Moderate risk of introduction and spread	Higher risk of introduction and spread
F	Moderate risk of introduction and spread	Lower risk of introduction and spread	Lower risk of introduction and spread	Lower risk of introduction and spread

There would be an increased potential for weeds to enter the project area in the short term from the proposed road maintenance, temporary road construction, new system road construction, road reconstruction, and the reconstruction and construction of harvest landings. The proposed road decommissioning and closures upon project completion would reduce the potential for noxious weed invasion in the long term. As the native plant community, specifically trees, develops over time, the suitable habitat for weeds would decline.

The likelihood of introducing and spreading weeds during project implementation would be greatly reduced because of the incorporated SMRs and weed control mitigation measures. These SMRs and mitigation measures are similar to those suggested by Siegel and Donaldson (2003) for construction activities and Ferguson et al. (2003) for backcountry road maintenance and weed management.

Cumulative Effects. The activities proposed in the action alternatives, coupled with the existing environment and high levels of prior disturbance, would contribute to and increase the risk of noxious weed introduction and spread. However, the SMRs and weed control mitigation measures would greatly reduce the likelihood of introducing and spreading noxious weeds.

The project area currently has a moderate potential for noxious weed invasion due to the number of known noxious weed locations in the project area, the numerous noxious weed sites in populated areas adjacent to the project area, and the moderate risk due to habitat vulnerability and nonproject-dependent factors. Implementing the SMRs would not change the existing habitat vulnerability or nonproject-dependent dispersal factors. However, the potential for noxious weed spread into the project area would be greatly reduced through monitoring after project implementation, avoidance of known sites, implementation of the weed control mitigation measures, and avoidance of weed occurrences discovered during project implementation.

The potential for cumulative effects would be reduced by managing the direct and indirect effects through project design and mitigation measures. In addition, most other activities on National Forest system lands would be subject to similar SMRs. By incorporating SMRs and post-project monitoring, the effects of future projects would be negligible and would not result in introduction or spread of noxious weeds.

Alternative B (No Action)

Direct and Indirect Effects. Alternative B proposed no ground-disturbing activities, and therefore, the amount of suitable noxious weed habitat would remain at current levels. However, no mitigation measures would be implemented, so existing noxious weed occurrences would continue to expand along roadsides and into native plant communities. There would be no reduction in the number of existing noxious weed dispersal factors because roads slated for closure under the action alternatives would remain open.

Cumulative Effects. Under the no-action alternative, ground-disturbing project activities would not occur, so there would be no project activities to contribute to the cumulative effects of noxious weeds. Future wildland fires would continue to occur, and it is anticipated that the fires would be of greater intensity than under any of the action alternatives. Changes in the fire regime may increase the likelihood of noxious weed spread and infestation. There would be no cumulative effects resulting from the reduction in the tree canopy by thinning from below. Noxious weeds would continue to spread into suitable habitat at an estimated rate of 10 to 30 percent per year (Eiswerth et al. 2001). The cost of treating noxious weed populations would increase due to increased size and density of populations.

HERITAGE RESOURCES

Summary of Effects

Alternatives A, C, D, E, and F (Action Alternatives)

The Standard Management Requirements (SMRs) would be followed during implementation of any of the action alternatives, so there would be no effects on heritage resources. In fuel treatment unit 24, one site would be entered; however, it would be protected through compliance with the SMRs (see the "Heritage Resources" section in "Appendix F: Standard Management Requirements and Monitoring Plan").

Alternative B (No Action)

Alternative B would not provide the means to remove hazards that may adversely affect heritage resources.

Affected Environment

Introduction

The "Empire Project Heritage Resource Inventory" is located in the project record and incorporated by reference.

The Forest Multiple Use Policy (Forest Service Manual 2361), Executive Order 11593, sections 106 and 110 of the *National Historic Preservation Act* (36 CFR 800), the *American Indian Religious Freedom Act* (1978), and other regulations require the Forest Service to take into account the effects of any undertakings on heritage resources that may be eligible for the National Register of Historic Places, and the effects of such undertakings on the interests of Native American groups. The *Plumas National Forest Land and Resource Management Plan* (1988 and amendments [USDA 1988a]) Standards and Guidelines (pp. 4–28 and 4–29) mandate the inventory, evaluation, protection, and enhancement of heritage resources.

Ethnographic Overview

California is largely a landscape defined by culture. The biological and landscape diversity is equaled by cultural diversity. By the time Europeans began recording events on the landscape, large-scale landscape and cultural changes had largely erased the indigenous signature (Stevens 2004, p. 1)

At the time of Euro-American contact, the lands now within the Empire Project area boundaries were inhabited by the Mountain or Northeastern Maidu (Dixon 1905: 123–125; Kroeber 1925: 391–392; Riddell 1978: 370–371). Following Riddell (ibid.) these people are referred to as the Maidu.

The Maidu hunted and gathered, inhabiting winter villages located in large valleys, such as Big Meadows (Lake Almanor), Butt Valley (Butt Lake), Indian Valley, and Genesee Valley. The higher elevations were occupied during all or part of the spring, summer, and fall. According to Dixon (1905: 175, 201), their lodges were earth and conical, occupied for four or five months out of the year, beginning around November, and basically unoccupied during the summer months. Village locations were along the edges of valleys, with the timbered areas on one side and the open level valleys on the other side (Kroeber 1925: 396). Seasonal camps were located at the edges of valleys (McMillan 1963: 67).

The Indian Valley Maidu fished on the North Fork of the Feather River using nets and spears. The fish were then smoked in nearby camps. This type of activity was reported as late as 1900 (McMillan 1963:9). Bear grass was gathered by the Maidu and Pit River people. The Maidu still gather bear grass in mid-summer. On a site-specific basis, bear grass is burned in the fall in order to replicate the historically natural fire process. Natural fires stimulated fresh bear grass sprouting by burning off dead shoots. Bear grass is still used in the basket-making process.

With new paleoecological, ethnographic, and ethnohistoric evidence, it is now clear that human-set fires were an important factor in the enhancement of native grassland distribution, size, and vigor in many parts of California (Anderson and Moratto 1996, pp. 409–410).

Current researchers theorize that the ancestors of the Maidu were from the last of a series of migrations of Penutian-speaking people into California (Kowta 1984; Whistler 1977). Kowta's model assumes a movement of ancestral Maidu into the foothills around AD 500, with subsequent movements into other areas, including the mountains and valleys of Plumas County, around AD 1000.

Overview of the Area Prehistory

Humans have influenced the landscape, beginning with Native American use of fire to improve wildlife forage and acorn production. The frequent low-intensity fire used by these indigenous people created open stands of large scattered trees of varying ages and arrangements (Anderson and Moratto 1996).

Initial cultural complexes ranging from about 6,000 BC to 1500 BC were the Tahoe Beach and Spooner Phases. Later inhabitants were bearers of the Kings Beach and Martis cultural complexes as inferred from local projectile point types and the results of excavations at Bucks Lake (Crew 1983; Johnson 1980). The Martis Complex appears to date from about 2,000 BC to AD 500 (Elston 1970; Elston and Davis 1972) but may have persisted until AD 1,000 or later in the central Sierras (Moratto 1972). The Kings Beach Complex appeared in the eastern Sierras around AD 500 and continued until the ethnographic present. It was considered by Heizer and Elsasser (1953) to be the ancestor of the ethnographically known Washo (Johnson et al. 1980: 36-37).

Historical Overview

The American Valley, Elizabethtown, and Quincy were the supply centers used by miners arriving in the area shortly after the gold rush began in California (early 1850s) (Young 2003). Trees closest to the settlement centers were used for barns, fencing, homes, water flumes, business structures, and mine adits. The project area lies near several historic mining districts. Gudde (1975: pp. 333–4) found a notation concerning Squirrel Creek mining as early as 1872. Harris (1984: 6g.6) also notes mining activity on Squirrel Creek. In the 1860s, there was extensive quartz and hydraulic mining at Argentine, which was known historically as “Greenhorn Diggings” (Gudde 1975, p. 21). Spring Garden contains a number of small lode mines and some areas where hydraulic mining occurred. (Clark 1963: p. 124 and Gudde 1975: p. 332). Evidence of the hydraulic and hard rock mining is present to this day and paints a dramatic picture across the landscape.

Timber harvest also became a significant land use in the early 1900s, especially around Butterfly Valley, Massack, Squirrel Creek, and Quincy. These areas were harvested via railroad logging systems which removed large overstory Douglas-fir and pine, leaving abundant small trees on site. Massack, located along the extreme southwest boundary of the Empire Project area, is a railroad logging system owned first by the Iceland Wood and Lumber Company in 1910 and later by the Massack Timber and Lumber Company and the M. J. Scanlon Lumber Company Railroad in the 1920s. A 36-inch-gauge railroad operated northeastward up Massack and Sockum creeks to the Dry Taylor Creek area (Boynton 2002).

In order to quantify the amount of harvest and/or tree removal in the Empire Project area, the Forest Activity Tracking System (FACTS) was queried for all records from 1946 to the present. The earliest records indicate salvage of fire-burned timber was the predominant activity from 1946 to 1965.

Livestock grazing was another resource use the settlers brought with them until a drought in 1860 killed most of the cattle in California. After this, sheep were used as the dominant livestock, gaining in numbers with the statewide peak reported in 1872. The decline from this peak was gradual, and it is noted that even as late as 1900, overgrazing was still occurring in parts of the Northern Sierra (McKelvey and Johnston 1992). In areas where overgrazing occurred, the understory vegetation was significantly reduced, producing bare mineral soil on which abundant conifer regeneration established once grazing ceased.

Heritage Resource Inventories

The Lassen and Plumas National Forests comply with the *National Historic Preservation Act* (36 FR 800) by following the process outlined in the "Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region, the Advisory Council on Historic Preservation, and the California State Historic Preservation Officer, Regarding the Process for Compliance with Section 106 of the National Historic Preservation Act for Undertakings on the National Forests of the Pacific Southwest Region". The Forest Service is required by the *National Historic Preservation Act* to take into account the potential effects of projects and activities on heritage resources prior to initiating any actions that could affect those resources.

Heritage resource data for the Empire Project is based on available information located on the Plumas National Forest, Mount Hough Ranger District. The heritage resource files include literature pertaining to prehistory and history; site records; the ArcView database, and atlases that show recorded site locations, previously surveyed areas, and other heritage resource data.

There were 57 heritage resource inventories conducted in the Empire Project area between 1976 and 1997. The inventory was conducted with varying intensities, ranging from Intensive (0- to 12-meter transect spacing) to Cursory (40- to 70-meter transect spacing).

There are 60 known previously recorded historic properties in the proposed Empire Project area. Two of these sites have been determined not eligible for inclusion in the National Register of Historic Places.

In 2004, Mount Hough Ranger District archaeologists monitored the 57 previously recorded heritage resource sites under Archaeological Resources Report (ARR) #02-24-2004. Monitoring consisted of flagging and tagging site boundaries for avoidance and an overall site assessment. Two of these sites were previously determined not eligible for nomination to the National Register of Historic Places and were therefore, not monitored. One site could not be relocated. In addition, 7 new heritage resource sites were located and recorded during monitoring of sites.

In 2004, an additional 17,809 acres in the project area were inventoried for heritage resources under contract at the complete (0- to 20-meter pedestrian transects), general (20- to 40-meter pedestrian transects), and cursory (40+ meter pedestrian transects) intensity level under ARR# 02-23-2004. Under this inventory, 34 new sites were recorded. In addition, the boundaries of two previously recorded sites were expanded.

Two of the previously recorded heritage resource sites have been evaluated for eligibility to the National Register of Historic Places. None of the 41 newly recorded sites have been evaluated for eligibility to the National Register of Historic Places.

Environmental Consequences — Heritage Resources

Alternatives A, C, D, E, and F (Action Alternatives)

Alternative A (proposed action), alternative C (enhanced operability and economics), alternative D (reduced watershed and wildlife impacts), alternative E (modified fuel treatment), alternative F (fuel treatment only).

Direct Effects on Site #05-11-56-622 within DFPZ Unit 24. The fuel treatment methods for fuel treatment unit 24 consists of hand thinning, hand carrying the thinned material outside of the site boundary, and piling and burning outside of the site boundary. No mechanized wheeled or tracked equipment would be permitted in the site boundary.

Direct Effects on Site #05-11-56-622 within Planning Area 23G. No direct effects are anticipated from proposed fuel treatments, logging systems, and access needs. Individual tree selection and group selection harvests would occur outside the boundary of Site #05-11-56-622.

In the summer of 2004, the boundary of Site #05-11-56-622 was clearly flagged with red and black tape and tagged with red plastic Control Area (CA) tags. Flagging would be refreshed as project implementation commences.

Direct and Indirect Effects on All Other Heritage Resource Sites. Alternatives A, C, D, E, and F involve ground-disturbing activities. Indirect effects may take the form of (1) inadvertent felling of trees into the heritage resource site boundaries, (2) an increase in soil erosion due to ground-disturbing activities in adjacent areas, and (3) possible site vandalism due to the increase in human activities in adjacent areas. However, resource protection measures (described below) would be implemented to take federal undertakings into account and to mitigate direct and indirect effects.

The Standard Resource Protection Measures (Region 5 Programmatic Agreement, 2001) state that

> At a minimum, historic properties (heritage resources) shall be excluded from areas where there are planned activities associated with Federal undertakings. All historic properties within an area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect historic properties. Historic properties shall be delineated with coded flagging and/or other effective marking (black/red striped flagging and Area Control plastic tags). Activities within historic property boundaries will be prohibited with the exception of using developed Forest transportation systems when the HRM recommends that such use is consistent with the terms and purposes of this agreement.

> Historic property location and boundary marking information shall be conveyed to appropriate Forest Service administrators or employees responsible for implementation so pertinent information can be incorporated into planning and implementation documents, and contracts (e.g., clauses or stipulations in permits).

There would be no anticipated effects on heritage resource sites (historic properties), provided that the Standard Resource Protection Measures are implemented and followed.

Alternative B (No Action)

Direct and Indirect Effects. There are no project activities proposed for implementation under alternative B, so there would be no direct effects on heritage resources. Possible indirect effects on heritage resource sites would be (1) damage by dying and dead trees falling within the site boundaries; (2) an increase in fuel loading, and therefore, an increase in risk of damage to heritage resources by wildfire; and (3) an increase in erosion rate in the case of wildfire.

Cumulative Effects — All Alternatives. Cumulative effects take into account past, present, and foreseeable future actions.

Past, present, and foreseeable future actions include wildland fires, recreational use, personal and commercial woodcutting, livestock grazing, Timber Harvest Plans on private property, Forest Service timber sales, Resource Advisory Committee projects, DFPZ maintenance, roadside hazard tree removal projects, and wildlife habitat improvement projects. Cumulative effects on heritage resource sites could occur from site vandalism as a result of an increase in human activity in the vicinity of these resources.

Using a flag-and-avoid method of site protection in alternatives A, C, D, E, and F may have the cumulative effect of creating islands of unthinned, unburned fuels that may burn hotter and longer than treated areas in the event of a fire. Similarly, in the no-action alternative, the exclusion of fire and other fuel treatments across the landscape would lead to continued natural accumulation of duff, litter, branches, and large woody debris from future tree mortality caused by insects, fire, or drought. This may produce more intense burning through heritage resource sites in the event of a wildfire, which may cause increased resource damage.

In general, past events (human and natural) have had cumulative effects of varying degrees on heritage resources. There would be no substantive difference in cumulative effects predicted for heritage resources between the alternatives.

SCENIC RESOURCES

Summary of Effects

The landscape character in all of the action alternatives would be slightly improved by the treatments because a more diverse and open forest canopy would be created. In alternative A the scenic integrity would be slightly diminished throughout the treatment units due to soil disturbance and creation of stumps and openings from group selection cuts. Alternatives D, E, and F would achieve the desired landscape character sooner because fewer planning areas would better maintain the scenic integrity of the project area. The scenic integrity of alternative C would be the most diminished due to the higher concentration of tree removal.

Affected Environment

The “Empire Vegetation Management Project: Scenic Analysis” is located in the Empire Project Record and incorporated by reference.

The existing landscape character of the project area is generally a diverse, largely continuous mixed conifer forest. Most of the project area is on the moderately steep to steep slopes of southwest-facing Grizzly Ridge. A small portion of the project area is located near Butterfly Valley, and another small portion is located south of Thompson Valley. Valued scenery attributes include the diverse and largely continuous tree canopy of mixed conifer and understory vegetation such as oak, serviceberry, and bigleaf maple. Close-up view of the forest canopy from project area roads on Grizzly Ridge are complemented by occasional views of and across American Valley to Claremont Peak and other ridges to the far southwest. Vegetation is often dense, largely due to historic fire suppression, making for a moderate risk that valued scenery attributes may be lost for decades or centuries through wildfire events.

Sensitive Places, Viewsheds/Viewpoints

Highway 70/89 is part of the Feather River Scenic Byway system. Almost the entire Grizzly Ridge is an important viewshed seen from select areas along the Highway 70/89 corridor and from the community of Quincy. The Visual Quality Objectives (VQO) are “Modification” for background (4 to 5 miles from observer), “Partial Retention” for middleground (0.5 mile to 4 miles), and “Retention” in the foreground (0 to 0.5 mile), which is along Chandler Road from about Oakland Camp east to the junction of Highway 70/89, and along the highway to the eastern end of the project area at Williams Loop. The scenic attractiveness of the viewshed is considered distinctive. “Scenic attractiveness” is a measure of the scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. “Distinctive” is a scenic attractiveness classification that refers to extraordinary and special landscapes. These landscapes are attractive, and they stand out from common landscapes.

The Butterfly Valley area is relatively flat, with virtually no viewpoints into the project area though roads pass through it. The VQOs for Butterfly Valley are Partial Retention and Retention. Scenic attractiveness is common.

The area south of Thompson Valley has VQOs of Modification and Partial Retention. Scenic attractiveness is considered common.

Existing Scenic Integrity

Scenic integrity meets Partial Retention and Modification, mostly due to past road, logging, and fire alterations that allow the naturally established landscape character to remain dominant.

Desired Landscape Character

The desired landscape character for the Empire Project area is a slightly more open forest cover, displaying and sustaining the following valued scenery attributes: a largely continuous mature tree canopy of mixed conifer and understory vegetation such as oak, serviceberry, and bigleaf maple (PNF LRMP pp. 4–95 and 4–105).

Environmental Consequences — Scenic Resources

Direct, Indirect, and Cumulative Effects

Alternative A (Proposed Action)

The landscape character would be slightly improved by the thinning, group selection, and individual tree harvest treatments because slightly more diverse, open, and mature forest canopy and small, irregularly shaped areas would be displayed.

The scenic integrity would be slightly more diminished over the short term (less than 10 years) throughout the treatment units due to soil disturbance, skid trail construction, brush and small tree crushing, and the creation of stumps and openings from group selection cuts. Thinning of canopies in fuel treatment units would likely not be noticed as a reduction in scenery attributes because thinnings would be visually slight to moderate.

After the short-term post-project period, all VQOs of the Forest Plan would be met. The treated landscape would appear natural, and management activities would generally not be evident, or visual elements would be comparable to those of natural occurrences.

Alternative B (No Action)

There would be no change of the landscape character or scenic integrity under the no-action alternative. There would be a greater potential to change the attributes and appearance of the area because the risk of scenery-changing wildfire would not be reduced and would only increase over time.

Alternative C

The effects would be similar to those described for alternative A; however, the scenic integrity would be further diminished by the higher concentration of group selection and individual tree selection harvests in fewer planning areas.

Alternative D (Preferred Alternative)

The effects would be similar to those described for alternative A. Eight planning areas would be dropped from treatment: 1G and 2G have VQOs of Retention and Partial Retention and are in the far background from the highway corridor; 7G, 8G, and 20G are on relatively flat ground and not easily seen from the highway corridor; 23G faces north into the Spanish Creek drainage; and 3G and 9G are within the Partial Retention VQO. On the whole, there would not be much difference, but the scenic integrity would be slightly enhanced from alternative A because less area would be disturbed.

Alternative E

The effects would be similar to those described for alternative D, though the higher canopy closure and lower upper diameter limit of the fuel treatment units would maintain the scenic integrity slightly better.

Alternative F

The effects would be similar to those described for alternative E, though the effects on landscape character would not be as great because there would be no group selection or individual tree selection harvests.

Fuel and vegetation treatments, and transportation system changes proposed under the alternatives A, C, D, E, and F would have no negative cumulative effects on scenic resources in the Empire Project boundary.

DFPZ Maintenance

In July 2003, a Record of Decision was signed for the *Herger-Feinstein Forest Recovery Act Final Supplemental Environmental Impact Statement*. The Record of Decision documented the results of the analysis of effects of alternative management strategies for maintenance of DFPZs in the HFQLG Pilot Project area. The FEIS and Record of Decision, in combination with the original HFQLG FEIS and Record of Decision, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot Project area.

The Empire project record includes acreages that would be treated by various methods if the Empire Project DFPZs were maintained exactly as projected in the FEIS. The various identified methods were developed from criteria in the FEIS involving land allocations, slope classes, and vegetation characteristics, which were applied to the treatment units. However, based on site-specific analysis of vegetation types and slopes in the Empire treatment units, and reviews of completed projects on the Mount Hough Ranger District having similar vegetation types and slopes the foreseeable maintenance of the project DFPZs would consist of prescribed fire, hand treatments, and some mechanical treatments only. Herbicide use would not be included. Future maintenance of the project DFPZs under the proposed action is predicted to include 6,034 acres of prescribed fire; 380 acres of hand treatment; and 222 acres of mechanical treatment.

After the construction of the Empire project DFPZs, grasses and forbs would regrow in the site initially, followed by brush species endemic to the area. Brush species could occupy the site in approximately 5 to 10 years and would mature in 15 to 20 years.

The Empire Project DFPZs are designed to be effective for a period of 10 years, and treatments to maintain DFPZ effectiveness would not be needed for at least 10 years following DFPZ construction. This is based on Interdisciplinary (ID) Team review of similar projects. The McFarland Project (1997–2000), Camp Project (1999–2002), and Spanish Project (1998–2000), were completed 5 to 7 years ago. A review of fuels conditions in these projects indicate that treatments to maintain desired fuel loading are still not needed after 7 years. The Empire Project ID Team estimates that maintenance treatments would not be needed for these completed projects for another few years (i.e. 8 to 10 years following completion of each project).

The 2003 Record of Decision for the *Herger-Feinstein Quincy Library Group Forest Recovery Act Final Supplemental Environmental Impact Statement* (FSEIS), discloses expected environmental consequences of implementing four methods of maintaining DFPZs and controlling invasive or noxious weeds that may invade DFPZs: hand treatment, herbicide treatment, mechanical treatment, and prescribed fire treatment. The environmental consequences of DFPZ maintenance are disclosed on pages 47–305 of the FSEIS and are summarized as applicable to the Empire project:

Public Health and Safety

The FSEIS (pp. 249–251) discloses some risk of adverse effects from hand, mechanical, and prescribed-fire DFPZ construction treatments. Page 251 states that for site-specific projects, significant adverse risks would not be expected if the treatments are conducted according to silvicultural or burn prescriptions and typical Forest Service safety requirements are imposed.

Soil, Water Quality, and Riparian Habitat

The effects from changes in water quality, watershed conditions, and riparian habitat from the DFPZ maintenance treatments included in the HFQLG FSEIS, alternative E, are summarized in the FSEIS Executive Summary, pages ix and x, table S-3. Some risks of adverse effects do exist, ranging from low to slightly higher, depending on the method of DFPZ maintenance.

Finally, page 176 states that cumulative watershed effects modeling shows that the watershed effects of the DFPZ maintenance treatments would be small, relative to other disturbances in the watersheds of the pilot project area. The maintenance treatments would occur over relatively small portions of the affected watersheds, entail limited change to watershed condition, and be carried out relatively infrequently. The modeling shows that neither of the action alternatives would significantly increase cumulative watershed effects or cause exceedance of any of the watershed Threshold of Concern values.

Old-Forest Habitat

The HFQLG FSEIS "Chapter 3 – Affected Environment and Environmental Consequences," page 75, states that the FSEIS alternative E would result in continuation of DFPZ-related habitat changes described for the 1999 HFQLG FEIS alternative 2. And, for all old-forest associated species, it is expected that direct effects from DFPZ maintenance would be minimal, since habitat alteration would already have occurred during DFPZ construction.

Threatened, Endangered, Sensitive and Management Indicator Species

Viability determinations for threatened and endangered species, old-forest associated sensitive species, and Management Indicator Species, based on the effects of DFPZ maintenance, are found on pages 139–140 of the HFQLG FSEIS, "Chapter 3 – Affected Environment and Environmental Consequences" (determinations for aquatic/riparian associated species are found on pages 241–243).

Noxious Weeds and Invasive Exotic Weeds

The risk of invasive or noxious weed infestations from the DFPZ maintenance treatments included in the FSEIS alternative E are summarized in the HFQLG FSEIS Executive Summary, page xi, table S-4. Some risk (ranging from low to high) does exist, depending on the method of DFPZ maintenance. The HFQLG FSEIS determined there would be a high risk of invasion or noxious weeds from mechanical treatment (Executive Summary page xi, table S-4).

Historical and Cultural Resources

The FSEIS does not directly address the effects of DFPZ maintenance on historical and cultural resources or contemporary Native American uses of plants. A new assessment built on the foundation of the original assessment would be done if DFPZ maintenance actions were proposed for the Empire Project area.

Short-term Uses and Long-term Productivity

The *National Environmental Policy Act of 1969* (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 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, sec.101[a]).

The action alternatives (A, C, D, E and F) are expected to implement ground-disturbing activities through mechanical thinning, mastication, hand thinning, prescribed burning, roadwork, and activities associated with fuel treatments. Such activities would produce short-term effects on soil, water quality, and wildlife habitat, as described in this chapter in the "Environmental Consequences" sections for each resource topic analyzed. Only alternatives A, C, D, and E, and to a lesser degree, alternative F, would reduce the severity of future wildfires. Alternatives A, C, D, and E would produce short-term effects on soil, water quality, and wildlife habitat resulting from group selection, individual tree selection, and the limited amount of biomass removal associated with individual tree selection as described in this chapter. Alternative F would not produce the short-term effects associated with these activities. However, long-term productivity would be less in alternative F and greater in alternatives A, C, D, and E in terms of long-term structural diversity associated with a multistoried landscape.

Unavoidable Adverse Effects

Alternative design and prescribed resource protection measures are intended to minimize potential adverse impacts on resources in the project area. However, to move resources toward desired conditions, some unavoidable adverse effects may result. The environmental consequences section describes risks associated with the potential of noxious weed spread. This effect is mostly associated with fuel treatments. A weed control mitigation measure is described in appendix F; however, there may be some unavoidable adverse effects on native vegetation that could be displaced as weeds spread. The effectiveness of the mitigation measures for noxious weed spread would be monitored. The extent of detrimental soil compaction would increase due to mechanical harvest operations. Implementation of Standard Management Requirements would help reduce the amount of detrimental compaction. Treatment activities may lead to increased surface runoff and sedimentation. Implementation of Best Management Practices and Standard Management Requirements would help reduce the amount of detrimental compaction.

Smoke from prescribed fire activity may affect air quality to some degree. Prescribed fire activities would be accomplished with an approved smoke management plan.

Some unavoidable adverse effects may result, including immediate changes in habitat conditions and disturbance/harassment of individual wildlife species, including direct mortality, during project activities. It is assumed in this analysis that all action alternatives would be implemented as proposed, in compliance with all rules and regulations governing land management activities, including the use of Limited Operating Periods. Direct disturbance, including mortality to individual threatened and endangered species addressed in this document, would be highly unlikely due to results of survey efforts for selected species, incorporation of Limited Operating Periods, where appropriate, and implementation of Forest Plan standards and guidelines.

In addition to habitat modification and related affects on Management Indicator Species and Neotropical migratory birds, direct effects on wildlife species could occur as a result of tree removal, mastication, and prescribed burning. These activities have the potential to kill young of the year birds in the nest that cannot fly and species confined to den sites, such as gray squirrels. Increased road use resulting from of project implementation could result in increased road kills of various animals. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. This would affect individual birds. Conservation measures for landbirds, such as snag/down woody retention, use of LOP’s for TES species, avoidance of riparian vegetation, retention of trees greater than thirty inches diameter, which are incorporated into project design, as well as large tracts of forested land not treated with proposed management actions, would alleviate the overall effect on Neotropical migratory bird populations within the analysis area. The Forest Service and the U.S. Fish and Wildlife Service entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. This interim MOU expired on January 15, 2003, yet the conservation measures that are contained in the MOU are still applicable for use in environmental planning (SNFPA FSEIS 2004, ch. 3, p. 172). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities, as authorized by Congress, may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits. The loss of habitat or individuals is not expected to affect viability of wildlife species that occur in the Empire Project area.

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 roads.

New infection of stumps in individual tree selection and group selection harvest units by *annosum* root disease would be an irreversible effect. Once *annosum* infects stumps, root-to-root spread can continue (for up to 50 years) until the roots reach an area free of host roots. In the natural environment, no area remains free of conifer roots for 50 years; so regeneration of new hosts is inevitable. Some stumps would be treated with Sporax; refer to the description of alternative in chapter 2.

Surface organic matter would be reduced by prescribed fire and underburning, which is an irretrievable effect. Soil porosity would be reduced, also an irretrievable effect, resulting in detrimental compaction. Detrimental compaction is described in the “Hydrology and Soils” section of this chapter.

Alternatives A, C, D, and E propose 3 miles of new road construction, which equates to approximately 9 acres of forested land. There would be an irretrievable commitment of a resource in terms of lost timber productivity and wildlife habitat where road construction would occur.

Surface fuels, including coarse woody debris, may be removed directly by prescribed underburning and pile burning, an irretrievable effect. Coarse woody debris would be recruited over time via recruitment from existing snags and future tree mortality.

Snags, particularly “soft” or rotten snags, may be removed due to underburning; snags that pose a hazard to firefighters may be felled prior to conducting underburning or pile burning, an irretrievable effect. Snags would be recruited over time from future tree mortality.

Scorch due to underburning or pile burning may result in mortality of residual trees, an irretrievable effect.

Legal and Regulatory Compliance

The National Environmental Policy Act at 40 CFR 1502.25(a) states, “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review laws and executive orders.” This section provides a summary of all principle environmental laws that are applicable to the Empire Project and how they were considered in the context of this document.

Principle Environmental Laws

Endangered Species Act

There are no species in the Empire Project wildlife analysis area that require consultation with the U.S. Fish and Wildlife Service, as required by the *Endangered Species Act*.

Clean Water Act

The Forest Service is complying with the provisions of this law as it pertains to the Empire Project.

Clean Air Act

The Forest Service is complying with the provisions of this law as it pertains to the Empire Project.

National Historic Preservation Act

The Forest Service is complying with the provisions of the Programmatic Agreement among the USDA Forest Service, Pacific Southwest Region; California State Historic Preservation Officer; and Advisory Council on Historic Preservation regarding the identification, evaluation, and treatment of historic properties managed by the National Forests of the Sierra Nevada, California.

National Forest Management Act

The Forest Service is complying with the provisions of this law as it pertains to the Empire Project.

Executive Orders

Executive orders provide additional direction to federal agencies. The executive orders that apply to the Empire Project proposed action and alternatives are presented below.

Consultation and Coordination with Indian Tribal Governments, Executive Order 13175 of November 6, 2000. Letters were sent out soliciting information regarding areas of religious, traditional, or cultural importance on April 7, 2004, for the Empire Project area and on March 3, 2005, for the document titled “Proposed Action, Empire Vegetation Management Project.” The Forest Service is complying with this executive order as it pertains to the Empire Project.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996. There are two known sacred sites in the Empire Project area: Ch’ichu’yam-bam (Soda Rock) and the Satkini Watam Kumhu (Quincy Junction Dancehouse). The Quincy Junction Dancehouse was flagged and avoided during project implementation of the Dancehouse Resource Advisory Committee Project. There is no vegetation treatment planned within the Soda Rock site.

Invasive Species, Executive Order 13112 of February 3, 1999. This Empire Project Supplemental EIS covers botanical resources and noxious weeds. Mitigation measures, project design, and standard management practices address the introduction and spread of invasive species.

Recreational Fisheries, Executive Order 12962 of June 6, 1995. In accordance with this Executive Order, the Empire Project is designed to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing by

1. Incorporating Scientific Advisory Team standards through implementation of Riparian Habitat Conservation Areas on all ephemeral, intermittent, perennial, and fish-bearing perennial streams in the project area.

2. Conserving and restoring aquatic systems that support recreational fisheries by replacing three culverts that currently prevent fish passage with new culverts that would allow for upstream fish passage.

Migratory Birds, Executive Order 13186 of January 10, 2001. Executive Order 13186 was issued in 2001 to outline responsibilities of federal agencies to protect migratory birds under the *Migratory Bird Treaty Act* (66 FR 3853-3856), including evaluating the effects of federal actions and agency plans on migratory birds through the NEPA process. Migratory birds have been addressed in this SEIS and supporting “Supplementary Wildlife Report” (USDA 2007b). This order also directs federal agencies to work with the U.S. Fish and Wild Service to promote conservation of migratory bird populations. The Forest Service and the U.S. Fish and Wild Service entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. The interim MOU expired on January 15, 2003, yet the conservation measures contained in the MOU are still applicable for use in environmental planning (USDA 2004, ch. 3, p. 172). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities, as authorized by Congress, may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

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 Scientific Analysis Team guidelines, as set forth in the HFQLG FEIS and Record of Decision; and implementing Best Management Practices, Standard Management Requirements, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994. In February 1994, President Clinton signed an executive order that requires federal agencies to conduct activities related to human health and the environment in a manner that does not discriminate or have the effect of discriminating against low-income or minority populations. Although low-income and minority populations live in the vicinity, activities proposed for the Empire 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 on human health and safety or environmental effects on 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.

Use of Off-Road Vehicles, Executive Order 11644 and 11989, amended May 25, 1977. The following paragraphs describe how the Empire Project would comply with both executive orders.

1. A roads analysis was conducted by the Empire Project ID Team during the project planning phase to determine disposition of system roads, resulting in a proposal to keep system roads open, as well as closing and/or decommissioning system roads. Designation of roads to be closed or decommissioned was based on desire to minimize damage to soil, watershed, and vegetation resources; minimize harassment of wildlife or disruption of wildlife habitat; and minimize potential adverse effects on cultural or historic resources.

2. Throughout project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning.

3. The OHV route designation process currently ongoing on the Pumas National Forest would not be affected by the alternatives proposed in the Empire Project, allowing for route designation, timeframes, and guidelines to be followed.

Special Area Designations

The selected alternative must comply with laws, regulations, and policies that pertain to the following special areas:

Research Natural Areas—No Research Natural Areas exist in the Empire Project area and would, therefore, not be affected.

Inventoried Roadless Areas—Approximately one-half of the 8,000-acre Grizzly Peak Semi-primitive Non-Motorized area (SPNMA) is located in the Empire Project area. However, no activities are proposed in the SPNMA within the Empire Project boundary; therefore, it would not be affected.

Wilderness Areas— No Wilderness Areas exist in the Empire Project area and would, therefore, not be affected.

Wild and Scenic Rivers—There are no designated wild and scenic rivers in the Empire Project area. A segment of Indian Creek has been determined to be eligible for wild and scenic status. The segment is located in the Empire Project area, but no activities are proposed within the proposed wild and scenic boundary. Therefore, its integrity would be maintained until a final suitability determination is made.

Special Interest Areas—The Butterfly Valley Botanical Special Interest Area (SIA) and its proposed expansion are in the Empire Project area. However, no activities are proposed within the SIA boundary; therefore, it would not be affected. The proposed Brady's Camp SIA is in the Empire Project area, but no activities are proposed within the SIA boundary; therefore, it would not be affected.

Chapter 4: Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals; federal, state, and local agencies; and tribes during the development of this environmental impact statement:

ID Team Members

Name	Title	Education / Responsibility / Experience
Gary Rotta	Wildlife Biologist	Gary holds a B.S. degree in Wildlife Management from Humboldt State University. He has worked as a Forest Service Wildlife Biologist on the Plumas National Forest since 1978. Gary is responsible for program planning and budgeting; project coordination, planning, implementation; and monitoring for wildlife issues on the Mount Hough Ranger District.
Jim Belsher-Howe	Botanist	Jim has a B.S. degree in Environmental Biology with a minor in Botany and an M.A. in Biology from Humboldt State University. He has worked for Pacific Northwest Research Station, Siskiyou National Forest, and numerous field research projects. He is currently the Mount Hough Ranger District Botanist.
Cristina Weinberg	Archaeologist	Christina has a B.A. degree in Anthropology from Grinnel College. She has 18 years of experience in Cultural Resource Management with the Forest Service in California, Oregon, and South Dakota and Bureau of Land Management in Nevada. She is currently the Mount Hough Ranger District Archaeologist.
Pete Hochrein	Transportation Engineer	Pete holds a B.S. degree in Forest Resource Management from the University of California, Berkeley, and a Master of Forestry degree in Forest Engineering from Oregon State University. He has worked for the Forest Service for 26 years and on the Plumas National Forest for the last 16 years as a Transportation/Logging Systems Group Leader, Engineering Projects Group Leader, and is currently the Forest Transportation Planner.
Ryan Tompkins	Assistant Silviculturist	Ryan has a B.S. degree in Forest Management and a Master of Forestry degree from the University of California, at Berkeley. Prior to working for the Forest Service, he worked for the California Department of Forestry in timber sale preparation, the University of California at Berkeley in forest growth and yield research, and the National Park Service at Golden Gate National Recreation Area and Point Reyes National Seashore in fire effects monitoring. He has worked for the Plumas National Forest as a forester and assistant silviculturist in timber sale preparation, contract administration, and vegetation management planning. He is currently the silviculturist on the Mt. Hough Ranger District of the Plumas National Forest. He has worked for the California Department of Forestry, the University of California, Pt. Reyes National Seashore, and the Plumas National Forest in timber sale

Name	Title	Education / Responsibility / Experience
		preparation, forest growth and yield research, fire effects monitoring, and silviculture.
Jason Moghaddas	Fire Ecologist	Jason has a B.S. degree in Resource Management and an M.S. degree in Environmental Science, Policy and Management from U.C. Berkeley. Jason is also licensed by the State of California as a Registered Professional Forester (#2774). He is currently the Fire Ecologist on the Mount Hough Ranger District of the Plumas National Forest. Prior to working with the Forest Service, Jason was a Staff Research Associate in the Fire Science Lab at the University of California. He has worked as a wildland fire fighter on a Type III wildland fire engine and on both Type I and Type II hand crews and has overseen prescribed burn operations. Jason is currently qualified as a Fire Fighter II on the Mount Hough Ranger District and a member of the Taylorsville Volunteer Fire Department.
Emily Moghaddas	Soil Scientist	Emily holds a B.S. degree in Natural Resource Management and an M.S. degree in Ecosystem Science with an emphasis in forest soils, both from the University of California, Berkeley. She is currently pursuing a Doctor of Philosophy in Forest Science with an emphasis in forest soil and fire ecology from the University of California, Berkeley. Emily has worked at the Blodgett Forest Research Station, as a lead soils researcher for the Fire and Fire Surrogate Study of fuel treatments, and as a lecturer and instructor for Forest Measurements in the forestry program at the University of California, at Berkeley. She is currently the Mount Hough Ranger District Soil Scientist, and is qualified as a standby fire fighter on a Type II handcrew, Burned Area Emergency Response team member, and implementation team leader, and hazardous materials coordinator.
Coreen Francis	Silviculturist	Coreen holds a B.S. degree in Forest Biology from Colorado State University and a Masters of Forestry from Oregon State University. She worked in timber sale preparation and administration on the Tahoe and Plumas Nnational Fforests from 1993 to 1997. Form 1998 to 2003 she worked as a journey level forester in timber sale preparation, stand regeneration, inventory, and contract administration in the Ashland Resource Area, Medford, BLM. For the past two years, she has been the Silvicultural Prescription Forester for the Grants Pass Resource Area, Medford, BLM working with landscape management project planning and implementation. She is currently working on the Mount Hough Ranger District. Coreen currently works with the Bureau of Land Management in Ashland, Oregon.Coreen currently works with the Bureau of Land Management in Ashland, Oregon.
Karla Gallegos	Assistant Resource Officer	Karla is the Mineral Administration Officer for the Mount Hough Ranger District. She has an A.S. degree in Forestry and has worked for the Forest Service since 1990. Karla currentlyKarla currently works on the Umatilla National Forest in Region 6.
Merri Carol Martens	Planner	Merri Carol has a B.S degree in Forestry from West Virginia University. She has 16 years of Forest Service experience in natural resource management.

Name	Title	Education / Responsibility / Experience
Rich Bednarski	Planner	Rich has an A.A. degree in Business Administration from Bergen Community College and a B.S. in Forest Management from Cook College/Rutgers State University. Rich has 26 years of Forest Service experience in natural resource management. He is currently a planner on the Mount Hough Ranger District.
Peggy Gustafson	Public Service Staff	Peggy has a B.S. degree in Forestry from Humboldt State University and over 17 years with the Forest Service. Peggy has worked in Lands, Minerals, and Recreation on the Plumas National Forest for 12 years. She is currently the Public Service Staff on the Mount Hough Ranger District.
Erika Sharp	Assistant Resource Officer	Erika currently administers permits and operating plans for Specials Uses, Recreation, and Mining for the Mount Hough Ranger District. She has worked for the Forest Service for nine years and has a B.S. in Natural Resources from California State University at Humboldt.

Federal, State, and Local Agencies

U.S. Fish and Wildlife Service

Early consultation on the Empire Project occurred on April 20, 2004, when maps of the area were presented to U.S. Fish and Wildlife Service (USFWS) personnel followed by a general discussion of potential actions. The proposed action for the Empire Project was sent to the USFWS in June 2004. One September 2, 2004, a field visit to the Empire Project was conducted by USFWS and Forest Service biologists to examine amphibian habitat and fuels treatments, group selection, and individual tree selection areas, as well as amphibian habitat. After the decision was made to prepare an EIS, the proposed action was mailed to the USFWS on February 10, 2005. The Empire Project draft EIS and draft Empire Vegetation Management Project Biological Assessment / Biological Evaluation were sent to the USFWS on May 18, 2005.

The USFWS provided a list of threatened and endangered species entitled "Federal endangered and threatened species that may be affected by projects on the Plumas National Forest." This list, published on the USFWS world wide website, was updated on June 20, 2005, and used for the Empire Project FEIS analysis.

California Department of Fish and Game

The California Department of Fish and Game (CDF&G) unit biologist, Jim Lidberg, received the proposed action in June 2004 and attended an Empire Project open house in Taylorsville, CA. In September 2004, he accompanied Forest Service biologist Gary Rotta on a field review of the project area. The primary focus of the field review was on the benefits of prescribed burning asin a fuels treatments and group selection in deer winter range. After the decision was made to prepare an EIS, the proposed action was mailed to the California Department of Fish and Game on DF&G on February 10, 2005. The Empire Project draft EIS was sent to the CDF&GUSFWS on May 18, 2005.

Environmental Protection Agency

The Washington, DC and San Francisco offices of the U.S. Environmental Protection Agency received the June 2004 proposed action, the February 2005 proposed action, and the May 2005 draft EIS.

Northern Sierra Air Quality Management District

The Northern Sierra Air Quality Management District received the June 2004 proposed action, the February 2005 proposed action, and the May 2005 draft EIS.

Federally Recognized Tribes

Formal consultation was initiated with these ten10 federally recognized tribes: Auburn Rancheria, Greenville Rancheria, Susanville Rancheria, Mooretown Rancheria, Redding Rancheria, Berry Creek Rancheria, Chico Rancheria, Enterprise Rancheria, Pit River Tribe, and Washoe Tribe of California and Nevada, including the Woodfords Band Community Council.

Native American Communities, Nonprofits, and Groups

Strawberry Valley Maidu

Helem Mesem Cumbel Maidu Cultural Center

Ts'I Akim Maicu

Concow Band of Maidu

United Maidu Nation

Roundhouse Council – Greenville, and Maidu Cultural and Development Group – Greenville, Concow Band of Maidu

United Maidu Nation

Distribution of the Environmental Impact Statement

This final environmental impact statement has been distributed to individuals who specifically requested a copy of the document, those who submitted substantive comments during scoping, and other interested and affected parties. In addition, copies have been sent to the following federal agencies, federally recognized tribes, sate and local governments, and organizations listed in table 4.1.

Table 4.1. Federal agencies, federally recognized tribes, Na native American organizations, state and local governments, and organizations, and individuals receiving the *Empire Vegetation Management Project Final Environmental Impact Statement*.

Federally Recognized Tribes, Native American Communities, Nonprofits, and Groups
• Greenville Rancheria Band of the Mountain Maidu
• Maidu Cultural and Development Group
• Pit River Tribe of California
• Susanville Rancheria
• Washoe Tribe of California and Nevada
Federal, State, And Local Agencies
• Advisory Council on Historic Preservation
• California Department of Fish and Game
• California Department of Food and Agriculture
• Northern Sierra Air Quality Management District
• Plumas and Sierra Counties Department of Agriculture
• Plumas County Board of Supervisors
• Plumas County Department of Public Works
• U.S. Army Engineer Division
• U.S. Coast Guard
• U.S. Department of Agriculture – National Agricultural Library
• U.S. Department of Agriculture – Natural Resources Conservation Service
• U.S. Department of Energy
• U.S. Department of Interior
• U.S. Environmental Protection Agency – San Francisco
• U.S. Environmental Protection Agency – Washington, DC
• U.S. Federal Aviation Administration
• U.S. Federal Highway Administration – CA
• U.S. Fish and Wildlife Service – Sacramento, CA
• U.S. Forest Service – Ecosystem Management Coordination
• U.S. National Marine Fisheries Service
• USDA – APHIS PPD/EAD
• Science Review Team

Table 4.1. (continued).

Federal, State, And Local Agencies (continued)	
• Humboldt University - Department of Environmental and Natural Resources – Jeffery Dunk	
• PNW Seattle – David Peterson	
• PNW Seattle – Don McKenzie	
• PSW Research – Peter Stine	
• U.S. Fish and Wildlife Service – Brian Woodbridge	
• UC Berkeley – Department of Environmental Science and Policy Management – Kevin O’Hara	
• USDA Service Center – Eric Knapp	
Organizations	
• American Lands Alliance – Christine Ambrose	
• Blue Ribbon Coalition – Theresa Combe	
• Californians for Alternatives to Toxics	
• John Muir Project of Earth Island Institute and Center for Biological Diversity – Chad Hanson	
• Plumas Corporation – John Sheenan	
• Plumas Fire Safe Council – , Mike DeLaSaux	
• Plumas Forest Project – John Preschutti	
• Quincy Library Group – George Terhune	
• Sierra Nevada Forest Protection Campaign – Craig Thomas	
• Sierra Nevada Forest Protection Campaign – David Graves	
Individuals	
• Bill Wickman	• Georgia Merfy
• Bob Allen	• Jack Razzeto
• Bob Anderson	• Jay Lininger
• Brian West	• Joseph Bertotti
• Bruce McKay	• Linda Blum
• Carl McDonald	• Michael B. Jackson
• Dennis Odion	• Michael Yost
• Diane McCombs	• Mike Lazzarino
• Douglas Tempel	• Neil Dion
• Elliott Smart	• Terry Preston
• English Properties, Inc.	• Tom Downing – Sierra Pacific Industries
• F. Scott Ulch	• Tommy Miles
• Frank Stewart – QLG Counties Forester	• Warren & Nancy Coulter
• Gayle Laurel	

Acronyms and Abbreviations

ARR	archaeological resources report
AD	*anno domini*; refers to years after the birth of Christ
AOC	Area of Concern
BA/BE	biological assessment / biological evaluation
BC	before Christ; refers to years before the birth of Christ
BMP	Best Management Practice
CA	California
CC	canopy cover
CFR	Code of Federal Regulations
ch.	chapter
CWHR	California Wildlife Habitat Relationship
dbh	diameter at breast height
DFPZ	Defensible Fuel Profile Zone
EIS	environmental impact statement
ERA	equivalent roaded acre
FCC	Fire Condition Class
FIA	Forest Inventory Analysis
FR	Federal Register
FS	Forest Service
FT	fuel treatment
FVS	Forest Vegetation Simulator
GIS	Geographic Information System
GS	group selection
HFQLG	Herger-Feinstein Quincy Library Group
HRCA	Home Range Core Area
HUC	Hydrological Unit Code
ibid.	Latin term meaning “from the same source as previously cited”

ID	interdisciplinary
ITS	individual tree selection
LOP	Limited Operating Period
LRMP	Land and Resource Management Plan
MIS	Management Indicator Species
mmbf	one million board feet.
MOU	memorandum of understanding
mph	miles per hour
NEPA	National Environmental Policy Act of 1969
OHV	off-highway vehicle
OSHA	Occupational Safety and Health Administration
PAC	Protected Activity Center
pers. comm.	personal communication
PNFLRMP	Plumas National Forest Land and Resource Management Plan
p./pp.	page/pages
QMD	Quadratic Mean Diameter
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objective
SEIS	supplemental environmental impact statement
SMR	Standard Management Requirement
SNFPA	Sierra Nevada Forest Plan Amendment
SOHA	Spotted Owl Habitat Area
TOC	Threshold of Concern
USFWS	U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
vol.	volume
VQO	Visual Quality Objective
WUI	Wildland Urban Interface

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.

Anchor point — an advantageous location, usually a barrier to fire spread from which to start constructing a fireline. Used to minimize the chance of being flanked by the fire while the fireline is being constructed.

***Annosum* root rot** — a conifer disease caused by the fungus *Heterobasidion annosum*. The fungus usually enters through freshly cut stump surfaces. *Annosum* can cause mortality and butt rot of conifers.

Backfiring — removing fuels through controlled burning prior to a wildfire reaching an area.

Backing fire — a prescribed fire that gradually burns downhill.

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 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.

Blister rust — a disease caused by a fungus that commonly infects sugar pines and causes branch dieback and bole cankers leading to tree mortality if infection is severe enough.

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.

Burning index — aA relative number related to the contribution that fire behavior makes to the amount of effort needed to contain a fire in a specified fuel type. Doubling the burning index indicates that twice the effort will be required to contain a fire in a specified fuel type, providing all other parameters are held constant.

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

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.

Canopy fuels — the live and dead foliage, live and dead branches, and lichen of trees and small shrubs that lie above the surface fuels (Scott and Reinhardt, 2001).

Chlorotic — abnormally yellow foliage, often a symptom of mineral deficiency, virus infection, root or stem girdling, or extremely reduced light.

Closed (roads) — barricading of roads to prevent use until required for future management actions.

Canopy base height — the height of the lowermost branches of the canopy above the ground.

Crown class — a category of tree based on its crown form and position relative to those of adjacent trees. Examples of crown class include suppressed, intermediate, codominant, and dominant.

Crown closure — see canopy cover.

Crown fire — any fire that burns in canopy fuels (Scott and Reinhardt 2001)

Crowning index — tThe open (20 foot) wind speed at which active crown fire is possible for the specified fire environment" (Scott and Reinhardt 2001). An increase in the crowning index would result in a decreased likelihood of an active crown fire moving through a stand, particularly one impacting a given stand from an adjacent area.

Decommissioned (roads) – culvert removal and removal of stream-crossing fills, and may include re-grading of the road prism, to restore natural slope, contours, and watercourse morphology.

Defensible Fuel Profile Zones (DFPZ) — zones approximately 0.25 mile wide where fuel has been reduced. They usually are constructed along roads or ridgetops. They are intended to break up fuel continuity across the landscape, inhibiting the spread of crown fire, and to provide a defensible zone for suppression forces. Design criteria are described in the HFQLG EIS, Appendix J, pages 1 and 2.

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.

Draw down — reduction of engines, fire crews, and overhead available for initial or extended attack; can occur during multifire events or when fires occur out of season.

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.

Fire Condition Class – a rating system to compare the current fire regime to the historic fire regime, as follows:

> **Fire Condition Class 1** — fire regimes are within historical range. Risk of losing key ecosystem components to wildfire is low. Species composition and structure are functioning within historical range. Potential wildfire intensities and severity are low to moderate.
>
> **Fire Condition Class 2** — fire regimes are slightly altered from historical range. Risk of losing key ecosystem components to wildfire is moderate. This results in moderate changes in one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is moderate encroachment of shade tolerant tree species. Potential wildfire intensities and severity are moderate to high.
>
> **Fire Condition Class 3** — fire regimes are significantly altered from historical range. Risk of losing key ecosystem components to wildfire is high. This results in dramatic changes to one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is high encroachment and establishment of shade tolerant tree species. Potential wildfire intensities and severity are highmoderate to extreme.

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).

Fire Environment — the characteristics of a site that that influence fire behavior. In fires modeling, the fire'ss environment is described by the surface and canopy fuel characteristics, wind speed and direction, relative humidity, and slope steepness.

Fire return interval — the number of years between fires at a specific location that is representative of that vegetation type. The average fire return interval is the arithmetic mean of all intervals (mean intervals).

Flame length — tThe length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

Foëhn-type winds — a wind flowing down the leeward of mountain ranges where air is forcedforces across ranges by the prevailing pressure gradient. Also referred to as the "Santa Ana winds".

Group selection — a silvicultural system that involves harvest of small areas of trees (generally less than two acres). Implementation results in uneven-aged (different ages of treesall-aged) forests consisting of small even-aged (same-aged) groups. Harvest openings must be large enough to allow penetration of sufficient sunlight for regeneration tree seedlings to establish and grow.

Handpiling — piling by hand branches and limbs from tree harvests or thinnings byhand, for burning at a later time.

Hog fuel — waste wood converted into chips for use as fuel or other purposes.

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.

Individual tree selection — aA harvest method resulting in the removal of individual trees from a forested stand or management area.

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.

Ladder fuel — combustible material that provides vertical continuity between vegetation strata and allows fire to climb into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of a crown fire.

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.

Machine piling — piling of branches and limbs from tree harvest or thinning, using mechanical equipment. Machine piles are generally burned at a later time.

Mastication — mechanical grinding of harvest residue or thinnings. Masticated material usually is left scattered on the harvest site.

Mechanical harvest — the use of tractors, cable systems, or helicopters to remove trees that have been cut by chainsaws, or the use of feller-bunchers (wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site).

Off Base and Deferred Lands — federal lands identified in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* as “Off Base” and “Deferred.”. The Act excludes these areas from timber harvest and road construction during the term of the pilot project.

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.

Piling and burning — piling harvest or thinning residues (branches and limbs) and burning when moisture content has been reduced through evaporation, wildfire hazard is low, and atmospheric conditions are favorable for dispersal of smoke.

Planning area — an area or unit used for planning and implementation purposes to determine location and effects of group selection and individual tree selection treatments. Factors used to delineate planning boundaries are described in chapter 2 of the 2005 Empire FEIS in the “General Information: Planning Area” section.

Prescribed fire — fire purposefully ignited to achieve a beneficial purpose, such as reducing fuels on the forest floor or fuels generated by logging or thinning forest trees.

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.

Resistance to control — the relative difficulty of constructing and holding a control line as affected by resistance to fire lineen construction and by fire behavior. Also referred to as “difficulty of control.”

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.

Road closure — see closure.

Road decommissioning – see decommissioned.

Road reconstruction — see reconstructed.

Shade intolerant — species that require full, open sunlight on the forest floor to establish and grow (e.g., ponderosa pine).

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.

Slash chipping — tThe disposal of activity and naturally accumulated slash by utilizing a hand-fed chipper. Chips would be scattered into unit.

Snags — a dead standing tree; for wildlife purposes, one that is at least 15 inches in diameter at breast height (dbh) and 20 feet high.

Sporax — aA borax fungicide for control of *Annosum* root disease.

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.

Stand fragmentation — sStand fragmentation refers to a large patch of habitat broken down into many smaller patches of open habitat, resulting in a loss in the amount of quality forested habitat.

Stocking levels — tThe number of trees per acre in a regeneration site.

Swale — aA shallow, trough-like depression in the landscape that may be hydrologically connected to stream channels downslope. Swales do not have a definable channel, and have no evidence of scour or deposition.

Threshold of Concern — tThe 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.

Torching index — tThe open (20 feet) wind speed at which crown fire activity can initiate for the specified fire environment" (Scott and Reinhardt 2001). An increased torching index would result in a decreased likelihood of torching initiating within the stand. Torching events within a stand can lead to an active crown fire depending on weather, surface, and canopy fuel conditions.

Underburning — a prescribed fire in fuels on the forest floor that is intended to generally remain on the forest floor without consuming significant portions of the forest canopy.

Wildland Urban Interface (WUI) — tThe area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends out for 1.5 miles from the edge of developed private land into the wildland. Sometimes referred to as wildland urban intermix.

Yarding — bringing sawlogs or biomass to a central location for removal from a treatment area.

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