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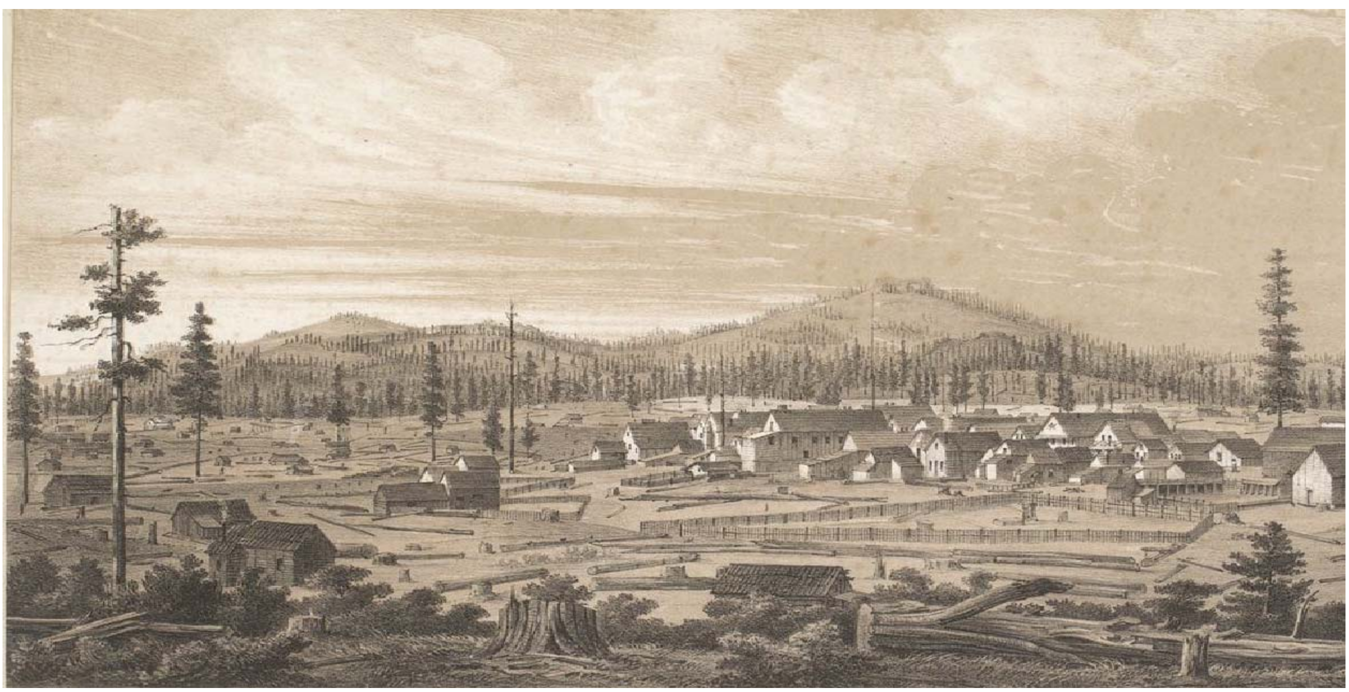
Final Environmental Impact Statement

Sugarberry Project

Feather River Ranger District, Plumas National Forest

Plumas, Sierra, and Yuba Counties, California



Historic townsite of St. Louis, 1856, located in the Sugarberry Project area (lithograph – Bancroft Library)

SUGARBERRY PROJECT

Final Environmental Impact Statement
Yuba, Sierra, and Plumas Counties, California

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Abstract: The United States Department of Agriculture, U.S. Forest Service, Plumas National Forest, Feather River Ranger District proposes to protect rural communities from fire hazards by constructing fuel breaks known as Defensible Fuel Profile Zones (DFPZs); implementing group selection harvest methods to create a fire-resilient healthy forest ecosystem; implementing individual tree selection harvests to restore stand densities more characteristic of past natural fire regimes; performing associated road system improvement work; and carrying out a range of aquatic, native plant, and wildlife habitat improvement activities on forested federal land near La Porte, Strawberry Valley, American House and Clipper Mills, California. This *Sugarberry Project Final Environmental Impact Statement* documents the analysis of the following three action alternatives:

Alternative A — Proposes no action.

Alternative B (Modified Proposed Action) —Alternative B modified proposes fuel treatments that include the construction of DFPZs, group selection harvest, and individual tree selection harvest. This alternative will also enhance black oak and aspen stands, perform road improvements, and restore and enhance aquatic, native plant, and riparian habitat by replacing or upgrading five culverts; restoring meadows, stabilizing stream channels and banks; and constructing one sediment settling pond. See 2.5.2.3 Alternative F for further description of the modifications made to the original proposed action.

Alternative C — This alternative was designed to lower the cumulative effects risk in one subwatershed identified as exceeding the threshold of concern (TOC), and in one subwatershed that would exceed TOC under Alternative B.

Alternative G (Preferred) – This alternative contains all aspects of Alternative C and adds an additional six and one quarter miles of roads to be decommissioned.

SUMMARY

The Feather River Ranger District of the Plumas National Forest proposes to reduce hazardous fuels around rural communities to reduce the risk of high-intensity wildfires and to move the project area towards the desired future condition of a healthy, fire-resilient ecosystem. The proposed treatments include construction of Defensible Fuel Profile Zones (DFPZs), group selection harvest, individual tree selection harvest, road system improvements, black oak and aspen stand improvements, riparian and meadow habitat restoration, and wildlife habitat improvements.

This action is needed because forest stands in the Sugarberry Project area are crowded with heavy brush and dense timber that have become increasingly flammable with age, resulting in an elevated risk of high-intensity wildfire. In addition to threatening communities, high-intensity, stand-replacing wildfires result in seriously degraded watershed health and wildlife habitat. The numbers of thin-barked shade-tolerant trees, such as white fir, tanoak, and incense-cedar, have increased as a result of past fire suppression and management practices. Aspen and black oak stands are declining in size and number as a result of competition with conifers and an interruption in historic disturbance regimes. Meadow habitat is being lost as a result of conifer encroachment, poorly located roads, and changes to hydrologic functions. Streambanks and channels are degraded due to past and present human-caused disturbance and associated erosion and sedimentation. Several poorly designed or maintained culverts in the project area have created barriers for aquatic-dependent species such as rainbow trout.

The proposed project integrates several strategies aimed at reducing hazardous fuels, providing commercial forest products, and coordinating vegetation management activities with local communities. The legislation, strategies, and documents integrated into the Sugarberry Project are as follows:

- *Plumas National Forest Land and Resource Management Plan* (the “Forest Plan”) and Record of Decision (ROD) (1988)
- *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) (1998)
- *Herger-Feinstein Quincy Library Group* (HFQLG) *Final Environmental Impact Statement* (FEIS) and ROD (1999)
- *National Fire Plan* (2000)
- Cohesive Strategy (2000)
- 10-year Comprehensive Strategy (2001)
- *Healthy Forest Restoration Act* (2003)
- Sierra Nevada Forest Plan Amendment (SNFPA) FEIS and ROD (2004)

Purpose and Need for Action

The need for the Sugarberry Project is based on the current condition of resources and related issues within the Project Area. The Forest Service developed the five purpose statements (which are also considered to be the objectives of the project) as a method of categorizing the current condition of resources and resolving the various needs for action. The five objectives of the Sugarberry Project, which constitute the purpose for action, are to:

- Protect rural communities in the Wildland Urban Interface and forest ecosystems by reducing the risk of high-intensity wildfires,
- Promote the desired future condition of a healthy, all-aged, multistoried, fire-resilient forests,
- Contribute to the stability and economic health of rural communities by providing forest products, jobs, and revenues,
- Promote the health of unique plant communities, specifically aspen and black oak,
- Implement restoration projects to achieve healthy aquatic and riparian ecosystems and improve wildlife habitat.

Proposed Action (modified Alternative B)

Alternative B (modified) is designed to move the project landscape toward a more fire-resilient condition, characterized by uneven-aged (all-aged), multistoried, fire-resilient stands and includes the following actions:

- Construct fuel breaks known as DFPZs on approximately 2,100 acres.
- Harvest trees using group selection (1,040 acres) and individual tree selection (155 acres) silvicultural methods.
- Enhance approximately 100 acres of black oak stands and 20 acres of aspen stands.
- Perform road improvements as follows: estimated 4.7 miles of road decommissioning, 26.6 miles of road reconstruction, 0.5 mile of new classified road construction, and 21.7 miles of new temporary spur construction.
- Restore and enhance aquatic, native plant, and riparian habitat by replacing or upgrading five culverts to provide fish access to 4.8 miles of upstream habitat; restoring three meadows, stabilizing two stream channels and banks; and constructing one sediment settling pond.

See 2.5.2.3 discussion of Alternative F which modified Alternative B by comments received during scoping.

Alternative Development

The Forest Service developed Alternative G to the proposed action based on response to comments during the public scoping process. The Forest Service also analyzed a no-action alternative (Alternative A). The ID Team, in conjunction with the Responsible Official, developed an alternative to the proposed action in response to the following issue: (1) management activities in watersheds over the Threshold of Concern (TOC).

To provide a clear basis for choice among the alternatives, measurement indicators were identified that respond to the issue listed above. The purpose and need, range of alternatives, environmental effects, and the final decision are discussed throughout this document in terms of the issue and the corresponding measurement indicators. The alternatives developed in addition to the Proposed Action (Alternative G) are described below.

Alternative A (No Action)

Under Alternative A, no fuels treatments, DFPZ construction, group selection or individual tree selection harvests, transportation system improvements, wildlife habitat improvements, or watershed restoration would be implemented to accomplish the purpose and need. The desired condition set forth in the HFQLG Act of an uneven-aged (all-aged), multistory, fire-resilient forest would not be achieved, and the ecological health of the forest would not be improved and maintained. The no-action alternative would not meet the intent of the Forest Plan, as amended by the 1999 Record of Decision on the HFQLG FEIS and the 2004 ROD on the SNFPA *Final Supplemental Environmental Impact Statement*.

Alternative C

This alternative was developed to reduce disturbance in two subwatersheds. The alternative includes modification and/or elimination of proposed activities in one subwatershed exceeding TOC. Proposed action activities were modified only as needed to reduce equivalent roaded area (ERA) below TOC. Alternative C would remove approximately 20 acres of group selection and 5 acres of individual tree selection (ITS) from treatments proposed in Alternative B. It would also change the timber harvesting system of approximately 15 acres of groups, ITS and groups within the ITS matrix from ground-based equipment to a helicopter harvesting system (unit 585). Alternative C would alter DFPZ treatments from Alternative B by converting 125 acres of hand cut-tractor pile to hand cut-hand pile (in portions of unit 901A). Oak enhancement and aspen release treatments would remain the same.

Alternative G

This alternative includes all aspects of Alternative C and an additional six and a quarter miles of roads to be decommissioned which are existing Forest system roads and not included as part of the Off Highway Vehicle (OHV) route designation process.

Summary of Environmental Consequences

The environmental effects of each alternative considered in the Sugarberry Project final environmental impact statement (FEIS) are summarized. The summary focuses on the environmental consequences of each alternative based upon the five project objectives and one issue, raised by the public, as measured by a set of measurement indicators developed to show the differences between the alternatives and provide a clear basis for the decision to be made by the Responsible Official. “Chapter 3: Affected Environment and Environmental Consequences” describes the additional effects on each resource area in detail.

Promote A Healthy All-Aged, Multistoried, Fire-Resilient Forest

Tree Species Composition—Under the no-action alternative (Alternative A), the number of shade intolerant species, such as ponderosa pine or Jeffrey pine and other fire resistant tree species would continue to decrease. The action alternatives would increase the number of shade intolerant species, thereby shifting stands towards historical reference conditions.

Stand Density and Structure—The no action alternative would retain continuous vertical canopy layers (understory to mid-story to overstory ladder fuels) in proposed treatment units with many areas averaging over 1,000 trees per acre. The great majority of these trees are small, shade tolerant trees less than 10 inches dbh. Basal area would average 280 square feet. Under the no-action alternative, canopy cover averages approximately 60 percent.

Alternatives B, C and G would remove most of the understory trees within DFPZ and ITS treatment units and leave approximately 60–100 trees per acre. Nearly all trees less than 10 inches dbh (those trees contributing to ladder fuels) would be removed. Group selections would retain an average of 11 to 12 trees per acre greater than 30 inches dbh in the action alternatives. Alternatives B C and G would reduce basal area to approximately 200–260 square feet in thinning units, and to an average of 120 square feet in group selections. Canopy cover would be reduced to 40 or 50 percent in DFPZ and ITS thinning units. Alternatives B, C and G would have similar silvicultural prescriptions; however Alternative G (the preferred alternative) would exhibit a 20 acre reduction in group selection and a 5 acre reduction of ITS compared to modified Alternative B.

Age Class Distribution—The no-action alternative would maintain stands in the Sugarberry Project area with mid-seral stand characteristics. Alternatives B, C and G would result in reduced canopy cover in DFPZ & ITS thinning units. Thinning to promote tree growth into larger size classes and group selection to regenerate areas would initiate a shift to an all-aged forest. Under the action alternatives there would be a two percent acreage increase to early seral through group selection and a one percent acreage change from mid seral to late seral through DFPZ and ITS.

Contribute to the Stability and Economic Health of Rural Communities

All of the action alternatives would cost money to implement. The total project value, which takes both the timber sale receipts and the service contract costs into consideration, would be approximately $368,464 in Alternative B, versus $356,032 in Alternative C and G. The number of direct and indirect jobs would be higher in Alternative B than Alternative C. Alternative B would create 528 jobs, while Alternative C and G would create 518 jobs. The amount of employee related income would similarly be more with Alternative B. This is in large part due to the amount of group selection and ITS units that would be dropped under Alternative C and G.

Unique Plant Communities— Under the no-action alternative aspen stands and black oak would continue to be encroached on by shade-tolerant conifers and threatened by the build-up of fuels and subsequent stand-replacing wildfires. The Sugarberry Project area would have high conifer encroachment and shrinking aspen stands under the no-action alternative. The number of aspen acres treated would be 0 under the no-action alternative and 20 under the action alternatives. The action alternatives would give aspen stands the potential to increase in size, thereby reducing the risk of losing aspen stands in the Sugarberry Project area. Under the no-action alternative 0 acres of black oak would be treated, versus 100 acres under the action alternatives.

Other Issues

Watershed Condition—Watershed condition is evaluated primarily through the equivalent roaded area (ERA) model for cumulative off-site watershed effects, which sums the amount of disturbance in upland and near-stream watershed sensitive areas and compares it to a TOC. ERA totals in the range of 80 to 99 percent of threshold are considered to be approaching TOC, while ERA totals of 100 percent or greater of threshold equal or exceed the TOC. Under the existing condition, three subwatersheds (11, 13, and 35) approach the TOC and one (19) exceeds the TOC. The subwatersheds that approach or exceed the TOC do so due to: (1) timber harvesting practices on private land; (2) legacy mining activities; and (3) the high-density road network. The ERA model indicates that the proposed action has the potential to increase the risk of off-site CWE in portions of the analysis area. Under Alternative B (the modified proposed action), four subwatersheds (13, 15, 21, and 35) approach, and two subwatersheds (11 and 19) exceed the TOC. Alternatives C and G were designed to reduce the risk of CWE in subwatersheds that exceed the TOC. Under Alternative C and G, five subwatersheds (11, 13, 15, 21, and 35) would approach TOC and one (19) would exceed TOC, and ERA values for ground disturbance.

Under the no-action alternative, 0–25 percent of the area of Gold Run Creek and Fish Meadow would be in a stable or vegetated condition. Less than 50 percent of the Upper Dutch Diggings area would be in a vegetated condition, with an unknown sediment catchment capacity under this alternative. Under all action alternatives, the area of Gold Run Creek and Fish Meadow in a stable or vegetated condition would be greater than 50 percent. More than 50 percent of the Upper Dutch Diggings area would be in a vegetated state and the sediment catchment capacity would increase by 25,000–50,000 cubic yards under the action alternatives. No meadow improvement would be accomplished under the no-action alternative. Under all action alternatives, the condition of 7 acres of meadow would be improved.

Other Resource Issues

Wildlife Concerns—Under the no-action alternative, wildlife species dependent on forested areas to maintain their population would continue to be at a higher risk of stand replacing wildfires. In comparison, the action alternatives created a more fire-resilient heterogeneous forest. Improvement of stream crossings and increased accessibility to streams would result from the action alternatives. The action alternatives would open accessibility to 4.8 miles of stream currently blocked or otherwise inaccessible to fish species. Wildlife habitat including areas in HRCAs, CWHR 4M, 4D, 5M and 5D, and carnivore networks could be reduced slightly across the project area.

Protect Heritage Resources—The no-action alternative would not directly affect heritage resources, although the continued build-up of flammable fuels could negatively affect heritage resources if the

Sugarberry Project area were to burn. Under the action alternatives, heritage resources in the Sugarberry area will be flagged and avoided by all treatment operations.

Protect Threatened, Endangered, or Proposed Species—The Sugarberry Project area does not contain any threatened, endangered, or plants proposed for Federal listing. Therefore, neither the no-action alternative, nor the action alternatives will have any effect on these botanical resources.

Protect Sensitive Plants—The no-action alternative will have no direct effect on the five sensitive plant species in the Sugarberry Project area. However, habitat would become more susceptible to high intensity wildfire, becoming prone to noxious weed invasion as a result of high intensity wildfire under this alternative. The action alternatives will not have direct effects on four of the five sensitive plants in the Sugarberry Project area because they either fall outside of treatment units or they will be protected by controlled areas. The only species that could be affected by the action alternatives is Quincy lupine. Mature plants may be uprooted, buried, or physically damaged in other ways by harvest activities. This project is unlikely to have any negative effects to the Quincy lupine because it is tolerant of moderate to high levels of disturbance and requires openings in the forest canopy to reproduce. Approximately 30 percent of the plants in the analysis area are located in a group selection unit, and they will likely benefit from Alternatives B, C and G. Also, there are four occurrences of Quincy lupine within one mile of the treatment units. In the unlikely event that plants within the treatment unit are killed, the geographic distribution of plants will be maintained.

Prevent the Spread of Non-native Species—The no-action alternative would not have any direct effect on non-native plants. The action alternatives would not adversely affect non-native plants because no high priority species are located within treatment units. However, skeleton weed and yellow starthistle are adjacent to a group selection unit. These two infestations will be flagged and avoided by all project activities. Two weeds that are common in the analysis area are Klamathweed and bull thistle.

Avoid Disturbance of Sensitive Soils—The no-action alternative would allow effective soil cover to remain and develop at its current rate in the Sugarberry Project area. The current soil cover for the Sugarberry Project area serves as the baseline against which the action alternatives can be measured. The continued accumulation of material on the forest floor beyond recommended effective soil cover would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event. If soil cover is reduced to bare soil following a wildfire, the soil type in this area would be more susceptible to erosion.

One of the most important positive cumulative effects for soil with the implementation of the action alternatives is the reduction of future wildfire risk or a modification of any future wildfire behavior and intensity. Wildfire would result in a loss of soil cover and a significant increase in the risk of erosion. The average decrease of soil cover under all action alternatives is estimated at 27 percent.

Under the no-action alternative, no new detrimental compaction (decreased porosity) or displacement of soil would occur as a consequence of activities proposed in the Sugarberry Project. In areas where there had been a decrease in soil porosity as a result of past land management activities, soil porosity would continue to slowly recover to pre-disturbance levels. The benefits from proposed fuel reduction, individual tree selection, and group selection treatments, watershed restoration, and black-oak stand restoration would not occur. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity.

Under the action alternatives, it is expected that the proposed activities will cause the percentage areal detrimental compaction in treatment units to change. This change is expected to range from a 7 percent decrease to as much as a 13.5 percent increase. Detrimental compaction increases in proposed group selection and thinning treatment units result from new skid trails, landings, or temporary roads. It is expected there would be no direct and indirect effects from proposed mastication treatments units since landings and skid trails are not created. Since there is a reduction of proposed treatments under Alternatives C and G, the reduction in soil porosity is expected to be less under Alternatives C and G compared to Alternative B. The same mitigation measures under Alternative B apply to proposed treatment units under Alternatives C and G.

Protect Rural Communities and Forest Ecosystems from High-Intensity Wildfires

There are many uncertainties associated with predicting fire behavior. While models can be used to show a relative difference in predicted fire behavior between the no-action and action alternatives, there are limitations to the models themselves and the coarse-scale data used to predict fire behavior. Although Alternatives B, C and G were modeled reflecting the respective differences in stand conditions, the fire behavior prediction outputs were the same (see Table S-1).

Table S-1. Sugarberry Project Purpose and Need, Issues, and Objectives comparing each alternative and the Proposed Action.

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Purpose and Need				
Protect rural communities and forest ecosystems from high-intensity wildfires				
Fuel loading (tons per acre)	11.1	5.2	5.2	5.2
Fire type (crown or surface)	Crown	Surface	Surface	Surface
Promote a healthy all-aged, multistoried, fire-resilient forest				
Tree species composition	Maintain movement towards increased shade-tolerant species	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Stand density	Long-term increase in stand density	Decrease in stand densities. Removal of most trees <9 inches dbh in ITS and DFPZ units; Removal of trees 9–30 inches in patches in group selection units	Same as Alternative B with the following exceptions: *20 fewer GS acres *5 fewer ITS acres	Same as Alternative B with the following exceptions: *20 fewer GS acres *5 fewer ITS acres
Basal area of specific units	**AVERAGE** **CWHR 4s & 5s:** Average of >1000 TPA <10 inches dbh; Average TPA >10 inches dbh = 100 Basal area = 280 sq. ft.	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60-100 Basal area= 200-260 ft^2 **Group Selection:** TPA>30 inches dbh = 11–12 Basal area=120 sq. ft.	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60–100 Basal area= 200–260 ft^2 **Group Selection:** TPA>30 inches dbh =11–12 Basal area=120 sq. ft.	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60–100 Basal area= 200–260 ft^2 **Group Selection:** TPA>30 inches dbh =11–12 Basal area=120 sq. ft.
Structure (horizontal and vertical arrangement of canopy layers within stand)	Overlapping canopy layers with average canopy cover of 60%; Continuous vertical canopy layers (understory to mid-story to overstory ladder fuels)	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.
Landscape age class distribution	Long-term maintenance of mid-seral stands across the project area; approximately 60% in mid-seral stands	Initiate shift to all-aged forest; 2% increase to early seral through group selection 1% acreage change from mid seral to late seral through DFPZ and ITS	Initiate shift to all-aged forest; 2% increase to early seral through group selection 1% acreage change from mid seral to late seral through DFPZ and ITS	Initiate shift to all-aged forest; 2% increase to early seral through group selection 1% acreage change from mid seral to late seral through DFPZ and ITS
Contribute to the stability and economic health of rural communities				
Number of jobs created	0	528	518	518
Employee related income created (dollars in thousands)	0	$22,698,921.	$22,271,251.	$22,288,021.
Net harvest value (dollars)	0	$368,464.	$356,032.	$356,032.
Promotes the Health of unique plant communities, specifically aspen, and black oak.				
Acres of aspen stands treated	0 Acres 0% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Conifer encroachment of aspen	High encroachment; aspen stand size shrinking 13% of total basal area is aspen Aspen=25% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA
Acres of black oak treated	0	100	100	100
Promote healthy aquatic and riparian ecosystems				
Miles of fish-accessible aquatic habitat in Potosi Creek stream network.	1.2	2.7	2.7	2.7
Miles of accessible aquatic habitat in Pearson Ravine stream network.	1.0	2.0	2.0	2.0
Miles of accessible aquatic habitat in Rock Creek stream network.	5.6	7.1	7.1	7.1
Miles of accessible aquatic habitat in Gold Run Creek stream network.	2.1	2.4	2.4	2.4
Miles of accessible aquatic habitat in Fish Meadow Creek stream network.	1.8	2.3	2.3	2.3
Acres of meadow in improved condition	0	7	7	7
Significant Issue				
Watershed Condition: Avoid moving subwatersheds near or over the Threshold of Concern (TOC) for Cumulative Watershed Effects				
Number of subwatersheds approaching TOC	3	4	5	5
Number of subwatersheds over TOC	1	2	1	1
Minor Issues				
DFPZ Effectiveness				
Flame length (feet)	>6	<4	<4	<4
Canopy base height (feet)	2.5	19.8	19.8	19.8

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Economic Feasibility				
Harvest costs (dollars)	N/A	$5,562,989.	$5,457,516.	$5,457,516.
Non-harvest costs linked to DFPZ construction (dollars)	N/A	-$1,281,250.	-$1,281,250.	-$1,313,750.
Total project value (dollars)	N/A	-$912,786.	-$925,218.	-$957,718.
Aquatic, Riparian and Water Quality				
Percent of Gold Run Creek and Fish Meadow treatment areas in stable or vegetated condition.	0–25	>50	>50	>50
Percent of Upper Dutch Diggings treatment area in vegetated condition	<50	>50	>50	>50
Upper Dutch Diggings sediment catchment capacity in cubic yards.	Insufficient to capture sediment in the Rabbit Creek system	Increase by 25,000 - 50,000 cubic yards	Increase by 25,000 - 50,000 cubic yards	Increase by 25,000 - 50,000 cubic yards
Heritage Resources				
Potential risk to heritage resources in treatment areas	N/A	Low potential; Known sites fully protected	Low potential; Known sites fully protected	Low potential; Known sites fully protected
Wildlife Habitat and Species				
Potential percent reduction of total HRCA acres in Sugarberry Project Boundary	N/A	≤5%	≤5%	≤5%
Potential percent reduction of total CWHR 4M & 4D acres in Sugarberry Project Boundary	N/A	≤3%	≤3%	≤3%
Potential percent reduction of total 5M & 5D acres in Sugarberry Project Boundary	N/A	≤5%	≤5%	≤5%
Potential percent reduction of total carnivore network acres in Sugarberry Project Boundary	N/A	1%	1%	1%
Botanical Resources				

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Potential risks to listed Threatened, Endangered, or Proposed plant species	N/A	No Effect Listed species not present	No Effect Listed species not present	No Effect Listed species not present
Potential risks to US Forest Service, Region 5 listed Sensitive plant habitat and species (acres affected)	N/A	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance
Oak Retention	N/A	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh
Noxious weeds proliferation	N/A	Known sites would be avoided	Known sites would be avoided	Known sites would be avoided
Long-term soil productivity				
Effective soil cover in treatment areas (percent)	All proposed treatment units exceed Forest Plan Standard and Guides.	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation.	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation

Notes:

a. CWHR = California wildlife habitat relationships.

b. TPA = Trees per acre.

c. BA = Basal area.

d. HRCA = Home Range Core Area.

e. dbh = Diameter at breast height (4 ½ feet above root collar)

Environmental Consequences Related to Issues Raised by the Public

The environmental consequences related to the three issues raised by the public are summarized in Chapter 1, “Section 1.8.2: Public Involvement.” Detailed discussions of the effects on each resource area are described in “Chapter 3: Affected Environment and Environmental Consequences.”

Public Comment Period

The FEIS will be distributed in November 2008 for a 45-day comment period.

Tribal Consultation

The following federally recognized tribes and interested and affected tribes were consulted regarding the Sugarberry Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, and the Konkow Valley Band of Maidu Tribe.

Public Involvement

In August 2006, a public meeting was held in La Porte, California, to discuss vegetation management and recreation opportunities for the Sugarberry Project area. Several attendees submitted comments, which were considered during the development of the proposed action and continue to shape the evaluation of the different management scenarios presented in this DEIS. On June 19, 2006, a letter describing the proposed action (the “scoping” letter) was mailed to approximately 400 individuals and organizations including local residents, Native American tribes, and federal, state, and local agencies. The letter was followed by the June 21, 2006, *Federal Register* publication of the Notice of Intent to prepare an EIS for the Sugarberry Project. The Notice of Intent requested that comments on the proposed action be received within 30 days. Since publication of the Notice of Intent, more than 20 comment letters have been received.

Decision Framework

The Responsible Official for this project, Forest Supervisor Alice B. Carlton, will decide whether to implement the Sugarberry Project as identified in the Proposed Action, whether to implement the project based on alternatives to the Proposed Action, or not implement the project at this time.

Timing

The project is scheduled to begin in FY09/10 and completed by 2013. The general treatment schedules for DFPZs, group selection, and ITS are shown in Appendix B.

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CHAPTER 2 — ALTERNATIVES

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CHAPTER 4 — CONSULTATION AND COLLABORATION

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Chapter 1. Purpose and Need for Action

1.1 Changes Between the Draft Environmental Impact Statement and the Final Environmental Impact Statement

Minor changes, corrections, slight modifications to the document structure and supplemental information have been incorporated into the Sugarberry Project Final Environmental Impact Statement (FEIS). A summary of the changes made between the Sugarberry Project Draft Environmental Impact Statement (DEIS) and the FEIS are described by chapter as follows.

Chapter 1-Clarification of document structure, supplemental information regarding the history of public involvement, additional explanation of the Scoping process and public comments received on the Sugarberry Project.

Chapter 2-Further clarification of the process used to generate alternatives, along with the incorporation of Alternative G. The Mitigation Measures section was eliminated and combined under the Design Features, Mitigation Measures and Monitoring section to reduce redundancy. Revisions to Table 2-5: Alternative Comparison were made to clarify predicted effects relative to the Minor Issues, warranting a reorganization of several measurement indicators linked to wildfire protection and community stability purpose objectives. Additionally, economics are updated to reflect current sawlog and biomass market values in Table 2-5.

Chapter 3-Additional clarification to vegetation, fire and fuels, and wildlife affected environment descriptions, as well as supplemental information concerning environmental consequences of Alternative G is provided throughout this Chapter. Economic Project operational costs and revenues are updated to current sawlog and biomass market values.

Chapter 4-Identification of additional Sugarberry Project FEIS contributors and clarification of FEIS distribution process.

Appendices-Incorporation of Alternative G vegetative and road treatment descriptions including alternative maps, updated economic analysis report, and addition of the Response to Comments on the DEIS and National Forest Management Act Finding report.

1.2 Introduction

1.2.1 Document Structure

The U.S. Department of Agriculture (USDA), Forest Service, Plumas National Forest has prepared the Sugarberry Project Final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The Sugarberry Project FEIS discloses the direct, indirect, and cumulative environmental impacts that could result from the proposed action and alternatives.

- *Chapter 1. Purpose and Need for Action:* This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the Agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the Agency's proposed action, as well as alternative methods for achieving the stated purpose. These alternatives were developed based on the Significant Issue and Minor Issues raised by the public and other agencies. This discussion also includes design features, mitigation measures and monitoring. Finally, this section provides a summary table of the environmental consequences associated with each alternative relative to purpose objectives, the Significant Issue and Minor Issues identified, along with a brief supporting narrative linked to purpose objective measurement indicators.

- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area, addressing direct, indirect and environmental consequences linked to the Significant Issue and Minor Issues.

- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development and preparation of the Sugarberry Project Final Environmental Impact Statement.

- *Appendices:* The appendices provide more detailed information to support the analyses presented in the Sugarberry Project Final Environmental Impact Statement.

- *Index:* The index provides page numbers by document topic.

1.3 Proposed Action

1.3.1 Summary

The Sugarberry Project is proposed as part of a broad resource management program to promote the ecological health of lands and economic health and stability of communities in the northern Sierra Nevada, under the authority of the 1998 Herger-Feinstein Quincy Library Group Forest Recovery Act. The USDA Forest Service, Plumas National Forest, Feather River Ranger District proposes to:

- Reduce fire hazards around rural communities by constructing approximately 2,100 acres of Defensible Fuel Profile Zones (DFPZs).

- Harvest trees using Group Selection (GS) silvicultural methods on approximately 1,040 acres and individual tree selection (ITS) silvicultural methods on approximately 155 acres.

- Perform associated road system improvement work: 0.6 mile of new road construction, 25.3 miles of road reconstruction, 21.7 miles of new temporary road construction, and 4.7 miles of road decommissioning.

- Carry out a range of watershed, aquatic and wildlife habitat improvement activities, including: enhancing 2 meadows, 20 acres of aspen and 100 acres of black oak stands, stream stabilization, hydraulic mine restoration and removing or upgrading culverts to provide access to 16.5 miles of aquatic habitat.

1.3.2 Project Location

The Sugarberry Project Area is located within the Feather River Ranger District of the Plumas National Forest in Yuba, Sierra, and Plumas Counties (refer to Figure 1-1). The Project Area lies south and east of Little Grass Valley Reservoir, from Gibsonville Ridge in the north, to the North Yuba River in the south. Treatment units range in elevation from 2,400 to 6,500 feet above sea level.

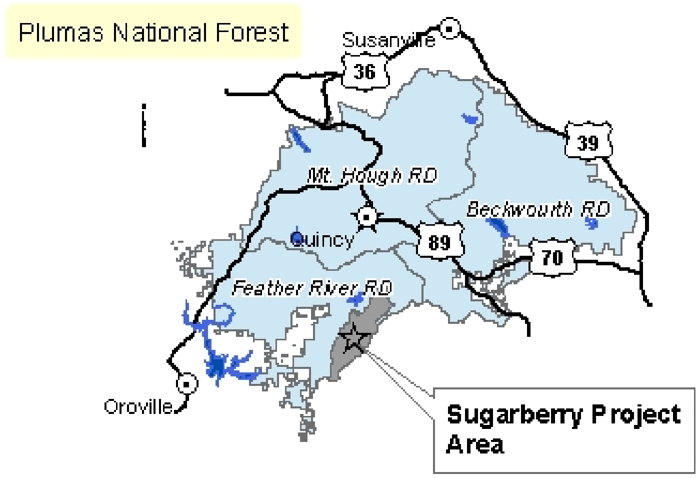


Figure 1-1. Sugarberry Project Vicinity Map.

1.4 Background Information

1.4.1 Relationship of the Sugarberry Project to the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project

Congressman Herger and Senator Feinstein were authors of legislation that was signed into law on October 21, 1998, that provided direction for a Pilot Project to demonstrate management activities championed by the Quincy Library Group. The Quincy Library Group is comprised of interested local citizens who have a commitment to influence the management of the Lassen and Plumas National Forests, and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project activities include fuelbreak construction consisting of a strategic system of DFPZs, GS, and ITS and a program of riparian management and riparian restoration projects. In December 2007, the Consolidated Appropriations Act 2008 (H.R. 2764), Division F - Department of the Interior and Related Agencies Appropriations Act, Section 434 was signed, which extended the HFQLG Pilot Project legislation through 2012.

The Sugarberry Project was developed as part of this Pilot Project. Hence, the Pilot Project land management practices are fundamental to the Sugarberry Project design features.

1.5 Purpose of and Need for Action

1.5.1 Introduction

The Forest Service interdisciplinary team (IDT) developed five primary purpose objectives for the Sugarberry Project to address site-specific, public land resource needs, within the framework of current laws and policies. These objectives led to the development of various land management alternative treatment opportunities, described in detail in Chapter 2, Section 2.2.3. The Action Alternatives are designed to maintain or establish a trend toward desired resource and social conditions.

The following sections list the project objectives, describe the underlying need for taking action, identify pertinent legislation and policy direction, along with measurement indicators used to disclose environmental effects. The measurement indicators are used in the analysis to quantify and describe how well the proposed action and alternatives fulfill the project's purpose objectives and responds to mitigating potential resource effects linked to issues.

1.5.2 Project Objectives and Needs for Action

Objective 1:
Protect rural communities and forest ecosystems from high-intensity wildfires.

Need for Action. *Communities have voiced concern about the potential fire hazard.* There are four communities in or adjacent to the Project Area (La Porte, Strawberry Valley, American House and Clipper Mills). The total population in and adjacent to the Project Area is approximately 400 people, with hundreds of scattered homes and structures in the Wildland Urban Interface (WUI). The La Porte area homeowners voiced concern over the potential fire hazard around their community during a joint Fire Safe Council/Forest Service meeting in September 2005. La Porte, Strawberry Valley, American House and Clipper Mills are all identified as "communities at risk" from the threat of wildfire in their respective County Wildfire Protection Plans.

As part of the Sugarberry Project, approximately 2,100 acres of fuelbreaks known as DFPZs would be constructed along ridge tops and/or roadways. A DFPZ is a strategically located strip of land, approximately ¼ - ½ mile wide, on which fuels, both living and dead, have been modified in order to reduce the potential for sustained crown fire. DFPZs are usually constructed along ridge tops or roads to improve accessibility to firefighters, and are designed to provide fire suppression personnel a safer location from which to take action against a wildfire while providing protection for communities at risk.

Crowded stands are increasing the risk of high-intensity fire. Crowded stand conditions provide more continuous fuel from surface fuels (needle litter, downed branches, and logs) to live fuels (brush, hardwoods, and conifers). In the Project Area, the numbers of thin-barked, shade-tolerant trees (such as white fir, tanoak, and incense cedar) have increased as a result of past fire suppression and management practices, acting as a fuel ladder. This fuel ladder carries surface fires into the crowns or tops of the larger overstory trees producing fires that are difficult to suppress. Reducing the number of trees per acre would increase the crown spacing and canopy base height of residual trees and decrease the probability of crown fire activity, making fire easier to control (see Figure 1-2).

Figure 1-2. Crowded stand in the Queen City area, approximately 2 miles southeast of La Porte.

For example, the Lexington Hill area currently averages around 1,000 trees per acre, of which 90 percent are smaller diameter trees 0 to 9 inches diameter at breast height (dbh). A desired fuelbreak condition would be characterized by well-distributed trees with inter-tree spacing from 18 to 22 feet apart (Figure 1-3). Existing canopy base heights at the stand level in the Project Area average less than 3 feet. Canopy base height is the lowest height above the ground at which there is sufficient canopy fuel to propagate fire vertically through the canopy. The desired canopy base height for reducing crown fire potential is generally greater than 15 feet.

Figure 1-3. Desired condition for fuelbreaks. Treated area near American House, approximately 2 miles southwest of La Porte.

High fuel loading is increasing the probability of wildfire ignition, rate of spread, and intensity. Currently 51 percent of the Project Area is populated by what the Northern Forests Fire Laboratory describes as fuel model (FM) 10. This fuel model type is a mixed conifer forest with heavy timber litter and a dense shade-tolerant understory. Heavy timber litter has a high propensity for fire ignition and rapid spread, while the dense understory acts as a fuel ladder. The fuel loading or amount of combustible material associated with FM 10 for dead and down woody material less than 3 inches in diameter (primary fire carrier) is 12 tons per acre. The desired condition fuel loading is less than 5 tons per acre, which is associated with fuel models 8 and 9.

Current fuels conditions and access make firefighting difficult. Heavy brush and dense timber stands increase flame lengths, slow fireline construction, and limit strategic control points, which are important for efficient wildfire control and firefighter safety. Flame lengths often drive the strategic planning for fighting a wildland fire. The upper limit for direct action by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper limit for direct action taken by mechanized equipment (dozers). Direct attack allows firefighters to attack the edge of the fire by wetting, cooling, smothering, or chemically quenching it or mechanically separating it from unburned fuel. Flame lengths in excess of these limits usually result in indirect action to contain the fire, which increases fire size. Indirect attack is a suppression method in which the control line is mostly located along firebreaks, favorable breaks in topography, or at considerable distance from the fire, and all intervening fuel is consumed by suppression resources.

Applicable Legislation and Policy Direction. 1998 Plumas National Forest (NF) Land and Resource Management Plan (LRMP), as amended by the 1999 HFQLG Final EIS (FEIS) and ROD, the 2003 HFQLG FSEIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) *Final Supplemental Environmental Impact Statement* (FSEIS) and ROD.

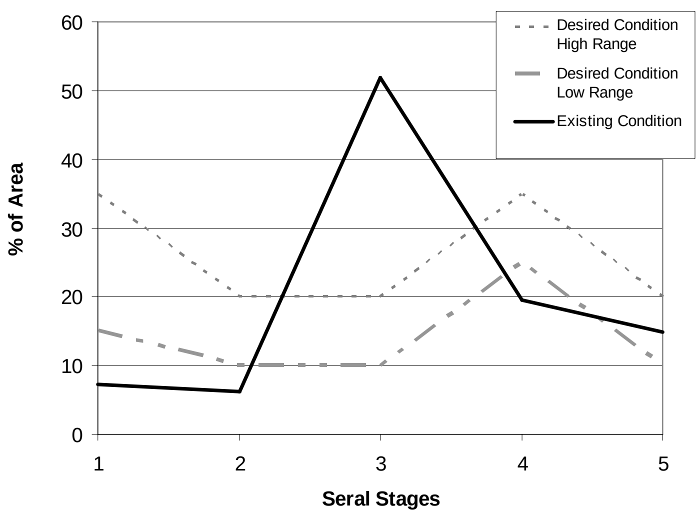
Measurement Indicators. Fuel loading, fire type, flame length, and canopy base height.

Objective 2:
Promote a healthy all-aged, multistoried, fire-resilient forest.

Need for Action. *Forest stands in the Project Area have unnaturally dense understories of shade tolerant hardwoods and conifers.* These crowded stands are less fire resilient and are more susceptible to insect and disease attack due to stress from competition for water, light, and nutrients. Areas identified for action within the Project Area averaged around 1,000 trees per acre, of which approximately 90 percent are small understory trees (less than 9 inches dbh) and 75 percent are shade tolerant species. The desired condition is to have fire and insect resilient stands, including a higher proportion of shade intolerant species in the overstory and reduced crowding in the understory. This condition would also allow plant species that do not germinate in dense stands the opportunity to grow and provide greater biodiversity.

The Project Area has an overabundance of mid-seral stage stands (middle size/age classes) and a deficiency in early (young stands) and late seral (older, multi-layered canopies). Analysis of the distribution of seral stage stands in the Project Area shows a deficiency in young, or “early seral” stage stands (seedlings and saplings) and older, or “late seral” stands (having larger trees).

Figure 1-4 illustrates the deviation of the existing seral stage condition from the desired condition identified in the Slate Creek Landscape Analysis (USDA Forest Service 1999) in the mixed conifer vegetation type. Human disturbances from logging, grazing, and mining approximately 100–150 years ago largely removed later seral stages and the age classes that would have created late seral stages. Trees established after those disturbances have grown into the mid-seral stands that dominate the Project Area today. The desired condition is a more sustainable balance of landscape structural diversity represented by the range shown in Figure 1-4.



Seral Stage	Age/Size Group	Approximate CWHR Size Class
1 (early seral)	Seedling and sapling	1 and 2 (less than 6 inches dbh)
2 (early seral)	Poles	3 (6–11 inches dbh)
3 (mid-seral)	Small trees	4 (11–24 inches dbh)
4 (mid to late seral)	Medium trees	4 and 5 (11–25 inches+ dbh)
5 (late seral)	Multilayered stands	6 (>25 inches dbh with layer of class 3 or 4)

Note: CWHR = California wildlife habitat relationships

Figure 1-4. Seral Stage Diversity (Mixed Conifer Group) for the Sugarberry Project Area. Existing seral stage diversity is compared with the desired condition (shown as a range). Notice the low percentage of early and late seral stages (1, 2, 4 and 5) and the high proportion of mid-seral stages for existing condition compared to the desired condition.

Early-seral stands (seedlings and saplings) have low, dense vegetation, which provide cover, fruit, seeds, and woody browse for wildlife such as deer. Later seral-stage and old growth forest lands provide habitat for species like the California spotted owl, Northern goshawk, and habitat corridors for species, such as the Pacific fisher. In late-seral stands, insects invade old, decaying trees and create potential feeding and nesting, denning, and escape areas for wildlife. Old decaying trees and snags are also a source of large woody material in riparian areas and stream channels, which is an important structural element of stable stream channels and high-quality aquatic habitat.

Applicable Legislation and Policy Direction. 1998 Plumas NF Land and Resource Management Plan (LRMP), as amended.

Measurement Indicators. Tree species composition, stand density, basal area, stand structure (based on horizontal and vertical arrangement of canopy layers within the stand), and landscape age class distribution.

Objective 3:
Contribute to the stability and economic health of rural communities.

Need for Action. *Communities are dependent upon the forest products industry for jobs and revenues.* There are several communities (within reasonable haul distance of the Project Area) that are highly dependent upon the forest products industry for jobs and revenues.

The local factors influencing the economies of Yuba, Sierra, and Plumas Counties include isolation from urban job markets, reliance on natural resource-based industries, and high seasonal fluctuations in employment. In the local environments, forest health and community economic health share interdependent goals. Timely timber sales in Yuba, Sierra, and Plumas Counties contribute a proportional supply of timber to local communities that are highly dependent on the forest products industry.

Applicable Legislation and Policy Direction. 1998 Plumas NF Land and Resource Management Plan (LRMP), as amended.

Measurement Indicators. Jobs created, employee related income generated, net harvest value, harvest costs, non-harvest costs and total project value.

Objective 4:
Promote the health of unique plant communities, specifically aspen, and black oak

Need for Action. *Lack of disturbance is limiting aspen regeneration.* Aspen clones depend on disturbances such as fire to regenerate. Disturbance in aspen stands serves to both stimulate clonal reproduction as well as limit the encroachment of competing coniferous species. Due to a lack of periodic fire, aspen stands throughout northern California are largely senescent (growing old; decaying over time) and are rapidly declining in number and size. Without disturbance, complete loss of aspen from a site may occur as a result of conifer succession (Sheppard et al. 2006).

The Howland Flat area has a high proportion of riparian ecological types (such as seeps and meadows). It appears that conifer invasion has reduced the overall riparian character of the area and has influenced the extent of the meadow-fringe and riparian aspen communities. Conifer encroachment has increased evapo-transpiration and diverted ground water that would be otherwise used by riparian and aspen communities.

Conifers are also shading aspen and limiting light available for aspen regeneration. Removal of all conifers, including large mature conifers, to a distance of 1-1/2 average tree heights is recommended in the Sierra Nevada riparian and meadow fringe aspen communities. This treatment removes conifer shading, thereby increasing soil warming and stimulating aspen suckering (Shepperd et al. 2006). Recent hand removal of small conifers in some areas of the Howland Flat aspen communities appears to have stimulated some aspen suckering. However, in many of these areas the survival of these suckers is doubtful due to remaining high conifer canopy cover of residual trees (Figure 1-5).

Aspen clones in temperate regions of the Northern Hemisphere are up to 12,000 years old and may help provide long-term soil stability in areas with frequent disturbance and short growing seasons. Aspen stands allow filtered sunlight to reach the forest floor, therefore resulting in more diverse and different understory vegetation than the surrounding forest. This provides nesting and foraging habitat for a variety of species, such as songbirds, raptors, and deer. Aspen are rare in the Sugarberry Project Area. The Howland Flat area contains the only aspen communities on public land within the project, representing the western extent of aspen distribution. The ecological importance of maintaining these stands combined with their rarity in the area drives the objective to promote the health of aspen communities and maintain their existence into the future.

Figure 1-5. Conifers invading an aspen stand in the Howland Flat area.

Applicable Legislation and Policy Direction. 1998 Plumas NF Land and Resource Management Plan (LRMP), as amended, Sugarberry Watershed Assessment and Riparian Management Objectives.

Measurement Indicators. Aspen stands treated and conifer encroachment of aspen.

The development and maintenance of healthy black oak stands is limited by competing vegetation and lack of disturbance. Due to the ingrowth of conifers in many parts of the Project Area, black oak in mixed conifer forests are being shaded out by nearby taller coniferous species. Further, pure stands of black oaks in the higher elevations of the Sugarberry Project rarely reach the upper limits of their range. Black oak woodlands that were historically maintained by periodic fire are now being encroached upon by conifers and may slowly disappear. The loss of oak woodlands would affect wildlife habitat and diversity values across the Sugarberry landscape. Large oaks contain nooks, crannies, perches, and passages where animals live, breed, and rest. They provide food, as well as nest sites for species such as the California spotted owl and its prey, the Northern flying squirrel. Oak seedlings, particularly those stressed by competing vegetation, grow slowly and many often die before developing characteristics of value to wildlife. Crowding from conifer invasion creates fuel ladders and also causes stands to become more flammable.

Measurement Indicator. Black oak stands treated and oak retention area.

Objective 5:
Promote healthy aquatic and riparian ecosystems.

Need for Action. *Streambanks and channels on Gold Run Creek, Fish Meadow, and Upper Dutch Diggings are degraded due to human-caused disturbance and associated erosion and sedimentation*. Well-functioning stream channels are generally stable features, in balance with stream flow, sediment inflow and outflow, and the native vegetation. When one or more of these parameters change, the stream channel frequently adjusts its size, shape, or vegetation to accommodate the change. Streams may begin to erode their channels or accumulate large quantities of sediment, degrading aquatic and terrestrial habitat and downstream water quality.

Past logging activities, mining, roads, wildfires, urban development, and hydroelectric facilities have greatly modified the overall watershed condition, and consequently affected streambank and stream channel conditions in the Project Area. For example, an undersized culvert on Fish Meadow cannot accommodate peak stream flow, leading to accelerated streambank erosion up and downstream of the crossing. On Gold Run Creek, a failing historic debris dam is diverting stream flow and eroding the meadow that has formed on the sediment impounded behind the dam. Sediment eroding from the face of an old hydraulic mine pit at Upper Dutch Diggings is degrading water quality and aquatic habitat in Rabbit Creek.

The Slate Creek Landscape Analysis (LA) established a desired condition for streambank stability based on habitat suitability information for fish. Based on that information, the desired condition is that 75 percent to 100 percent of streambanks are in stable condition (greater than 50 percent vegetation or bedrock). The existing condition per the LA is that nine of thirteen sample reaches do not meet this desired condition. Overall aquatic habitat quality is also not within the desired condition across most of the Slate Creek landscape, based on measures of aquatic habitat conditions such as cover from predators and sediment particle size (Slate Creek LA 1999).

Measurement Indicators. Gold Run Creek and Fish Meadow treatment areas in stable or vegetated condition, Upper Dutch Diggings treatment area in vegetated condition and Upper Dutch Diggings sediment catchment capacity improved.

Undersized or inadequately engineered stream crossings on Potosi, Pearson Ravine, Rock, Gold Run, and Fish Meadow Creeks are impeding fish and aquatic wildlife passage and adversely affecting aquatic and riparian habitat. There are five known stream crossings within the Project Area that are preventing movement of fish and other aquatic species to nearly 5 miles of suitable upstream habitat (see Figure 1-6).

The ability to move throughout different parts of a stream or watershed is necessary for many species to complete their life cycles, such as when different life stages require separate habitat types.

Figure 1-6. Gold Run Creek culvert on road 20N95. This elevated culvert blocks fish from reaching upstream areas, and the unnatural substrate is poor for aquatic insects. Notice that it has also been undermined.

In addition to restricting movement of individuals, barriers also fragment populations, resulting in decreased productivity and jeopardize their long-term persistence in a particular stream. Some of the stream crossings are failing or damaged, causing streambank erosion, sedimentation, and impairing establishment and growth of riparian vegetation. This riparian habitat provides food, shelter and shade for fish and other aquatic species.

Measurement Indicators. Fish-accessible aquatic habitat in Potosi, Pearson Ravine, Rock, Gold Run, and Fish Meadow Creek and associated stream networks.

Conifer invasion and landscape disturbances are resulting in a decline of meadow area and habitat quality. There are currently 64 acres of meadow on National Forest System lands within the Sugarberry project boundary. Conifers are invading these meadows due to fire exclusion and lowering water tables. Disturbances such as timber harvest operations, roads, and off-road vehicle travel in and near meadows have caused streams to cut more deeply, so water remains confined to the channel rather than periodically inundating the meadow. This causes meadow surfaces formerly saturated by groundwater to become drier and less able to support riparian species. The desired condition is to maintain or enhance existing meadow area, in order to maintain the viability of wildlife species dependent on meadows and meadow-conifer ecotones for some portion of lifecycle.

Measurement Indicators. Improved meadow conditions. Condition ratings are based on presence or absence of invading conifers, compaction, loss of vegetation, channelization resulting from off road vehicle travel and percent of streambanks either vegetated or otherwise stable.

Applicable Legislation and Policy Direction. National Forest Management Act; Federal Clean Water Act (PL 92-500); 1988 Plumas NF LRMP, as amended, Porter-Cologne Water Quality Control Act (State of California), Water Quality Management for National Forest System Lands in California – Best Management Practices (USDA Forest Service 2000).

1.6 Laws, Regulations, EISs, and Other Direction that Influence the Scope of this EIS

1.6.1 The Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act of 1998

On October 21, 1998, the President of the United States signed the *Department of the Interior and Related Agencies Appropriations Act*, including Section 401—the HFQLG Act. The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project (the HFQLG Pilot Project) for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest. The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain resource management activities in meeting ecologic, economic, and fuel-reduction objectives. For example, full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of Group Selection across the Pilot Project Area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency. The proposed Group Selection prescriptions for the Sugarberry Project would contribute toward achieving the goals listed above.

1.6.2 HFQLG EISs and Records of Decision (1999 and 2003)

The HFQLG FEIS was completed on August 17, 1999, and the ROD was signed on August 20, 1999 (USDA Forest Service 1999a). The ROD amended the Land and Resource Management Plans (LRMP) for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The ROD for the HFQLG FSEIS addressing DFPZ maintenance was adopted July 31, 2003 (USDA Forest Service 2003a). In December 2007, the Consolidated Appropriations Act 2008 (H.R. 2764), Division F - Department of the Interior and Related Agencies Appropriations Act, Section 434 was signed, which extended the HFQLG Pilot Project legislation through 2012.

1.6.3 Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS (2004)

In January 2004, the Regional Forester signed the SNFPA Final Supplemental Environmental Impact Statement (FSEIS) Record of Decision (ROD), which replaced the SNFPA FEIS/ROD of 2001 and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act.

The 2004 ROD on the SNFPA FSEIS provided for implementation of the HFQLG Forest Recovery Act Pilot Project, consistent with the HFQLG Forest Recovery Act. The 2004 ROD relies on a network of land allocations and has an associated set of desired conditions, management intents, and management objectives. These three elements provide direction to land managers for designing and developing fuels and vegetative management projects. In designing the strategic layout of treatments, managers ensure that treatment area patterns and prescriptions are consistent with desired conditions, management intents, and management objectives for the relevant land allocations.

Desired condition is a statement describing a common vision for a specific land area. These statements are made in present tense indicating a condition that management will be designed to maintain or mover toward in each land allocation. Statements of desired condition take into account the natural range of variability typical for the Sierra Nevada landscape, the uncertainty of natural disturbances, effects of past management, unique features or opportunities that the Sierra Nevada national forests can contribute, and human uses and uses of the land (2004 SNFPA ROD, pgs. 11 and 36).

1.6.4 Plumas NF LRMP

The 1988 LRMP, as amended by the 1999 HFQLG FEIS/ROD, 2003 HFQLG FSEIS/ROD and as amended by the 2004 SNFPA FSEIS/ROD guides the proposed action and alternatives. The 2004 SNFPA ROD (p. 68) displays the standards and guidelines applicable to the HFQLG Pilot Project Area.

The standards and guidelines for fuels and vegetation management activities for the Sugarberry Project Area are shown in Table 2 of the 2004 SNFPA ROD. Table 2 includes direction for designing and implementing fuel and vegetation management activities within each of the various land allocations applied to the HFQLG Pilot Project. Proposed treatments are consistent with the direction provided in Table 2, as follows:

- No timber harvesting, road building, DFPZ construction, or riparian management involving road construction is proposed within lands designated as Off Base and Deferred.

- No timber harvesting, DFPZ construction or riparian restoration projects are proposed within lands designated as California spotted owl Protected Activity Centers (PACs) or Spotted Owl Habitat Areas (SOHAs).

1.6.5 Upper and Lower Slate Environmental Assessments (2001)

The Upper and Lower Slate Environmental Assessments (EAs) analyzed the need for the construction of DFPZs in the vicinity of Slate Creek to improve protection of rural communities and forest ecosystems from high-intensity wildfire. As the Sugarberry Project Area overlaps with the areas analyzed in the Upper and Lower Slate EAs, the analyses are incorporated by reference as pertinent to the Sugarberry Project EIS.

To date, implementation of approximately 2,100 acres of Defensible Fuel Profile Zones (DFPZs) included in the Upper and Lower Slate Projects have not been accomplished. Hence, these areas are proposed for further analysis under the Sugarberry Project to determine an appropriate level of treatment to achieve desired conditions within the framework of current management direction, regulations and policies.

1.6.6 Slate Creek Landscape Assessment (1999)

The Slate Creek Landscape Assessment (LA) identifies opportunities to enhance existing conditions in the Sugarberry Project Area. Several of the objectives for the Sugarberry Project were derived from opportunities identified in this LA, incorporated by reference as relevant to the Sugarberry Project EIS.

1.7 Decision Framework

The Responsible Official for this project will decide whether to implement the Sugarberry Project as identified in the Proposed Action, implement the project based on alternatives to the Proposed Action, or not implement the Project at this time.

1.8 Project Schedule

Project activities would be completed within approximately 5 years, beginning with transportation-related improvements to provide safe access for subsequent treatment activities.

1.9 Public Involvement

1.9.1 Scoping Process

An extensive public involvement process was conducted for the Sugarberry Project. The Forest Service used a variety of methods to solicit input and issues from members of the public, other public agencies, Tribes, adjacent property owners and organizations.

The Forest Service met with representatives of the La Porte Homeowner's Association at a Fire Safe Council/Forest Service hosted meeting in September 2005, to solicit public issues. The Sugarberry Project was also presented in the Plumas National Forest's Schedule of Proposed Actions, October, 2005 edition.

A Notice of Intent (NOI) to prepare an EIS for the Sugarberry Project was published in the Federal Register on June 21, 2006. A legal ad was posted in Quincy's newspaper, the *Feather River Bulletin*, and Oroville's newspaper, the *Mercury-Register* on June 21, 2006. Letters inviting comment on the Proposed Action were sent to Native American entities including tribal governments and tribal groups currently applying for federal recognition on June 23, 2006.

On June 19, 2006, invitation-to-comment letters were distributed to 1,200+ interested individuals, groups, residents, and relevant federal, state, and county land management agencies. The Project was also presented at a Plumas, Yuba and Sierra Counties Fire Safe Council's meeting, discussed with Soper-Wheeler Company and Sierra County Public Works (focused on the Potosi Creek crossing proposal, subsequentially deferred) in spring/summer 2006. Thirty-three comments were received from agencies, landowners and organizations.

Public meeting invitation letters were mailed on July 20, 2006, along with public meeting flyers (posted at 10 local store and realty offices on July 21, 2006), inviting those interested in attending a Forest Service-hosted public meeting scheduled for August 19, 2006. Fifty-four people attended the August 19, 2006 meeting, held at the Firehouse in the town of La Porte, to solicit comments on the Sugarberry Project.

On May 29, 2007, the Sugarberry DEIS was distributed to aforementioned individuals and organizations. The Sugarberry DEIS includes a modified Proposed Action (Alternative B), analyzed in detail, to respond to public concerns expressed during Scoping and new information identifying additional resource issues and treatment constraints. The DEIS addresses the original Proposed Action as Alternative F, Considered but Eliminated from Detailed Study. On June 15, 2007, the Notice of Availability for the May 2007 Sugarberry Project DEIS was posted in the Federal Register to initiate the 45-day comment period. The comment period on the DEIS ended July 30, 2007. Letters received during the 45-day comment period on the Sugarberry DEIS were submitted by the Sierra Forest Legacy, John Muir Project, Sierra Pacific Industries, the Environmental Protection Agency and the Quincy Library Group.

During Scoping and review of the Sugarberry DEIS, public concerns reflected a broad range of views related to the proposed action and analyses of alternatives. The Forest Service's responses to comments are included in Appendix H of the Sugarberry Project FEIS.

Upon review of public comments on the modified Proposed Action (Alternative B) and Alternative C disclosed in the Sugarberry DEIS, the Forest Service developed Alternative G. Alternative G includes all proposed treatments in Alternative C, while incorporating 11.5 miles of road decommissioning to further reduce the potential for cumulative watershed effects and road density-related habitat fragmentation. An informational and request for comment letter describing Alternative G was circulated to interested individuals and organizations on December 18, 2007. No comments were received. A detailed record of public comments along with issue identification and classification is contained in the Sugarberry Project Record, available for public review.

1.9.2 Scoping Issues

Issues are points of discussion, debate, or dispute about the potential environmental impacts of a proposed action. As such, issues influence the design and evaluation of alternatives to the proposed action. Issues were identified through an interdisciplinary process involving a team of resource specialists working in coordination with the Responsible Official. The Interdisciplinary Team (IDT) looked at internal issues (brought up by the Forest Service resource specialists) and external issues (received from other agencies and publics) to provide a basis for the analysis of environmental effects.

For the purposes of this analysis, issues have been categorized as either being Significant, Minor or Issues Not Analyzed in Detail as defined below.

Significant Issues represent unresolved conflicts with the Proposed Action. Impact is predicted to be severe and highly noticeable. The Significant Issue identified for the Sugarberry Project provides the basis for formulating alternatives considered in detail and making a decision. This Issue is identified in this FEIS, Section 1.9.2.1.below, with associated environmental effects disclosed in Sections 2.7 and 3.9.

Minor Issues involve measurable or noticeable effects at a low level to affect alternative design and/or range of mitigation measures. Minor issues also function to display environmental effects required by law or policy. The Minor Issues identified for the Sugarberry Project highlight potentially affected resources and aid in the comparison of alternatives as depicted in this FEIS, Sections 2.7, and Sections 3.2 through 3.11, or were addressed under Section 2.6, Alternatives Considered but Eliminated from Detailed Study.

Issues Not Analyzed in Detail have been determined to have no relevance to the decision or the predicted effects are considered to be inconsequential to the decision. Hence, no further disclosure of these issues is incorporated into this FEIS. The review documentation regarding Issues Not Analyzed in Detail is included in the Sugarberry Planning Record, available for public review.

To narrow the focus of the environmental analysis, the ID Team focused on the Significant and the Minor Issues based upon measurement indicators deemed effective to provide a concise evaluation of probable increases or decreases in ecosystem trends, relative to the proposed action and alternatives considered in detail. Issues analyzed for the Sugarberry Project are summarized below, along with document reference(s) and/or associated measurement indicator(s). Measurement indicators are also displayed in FEIS, Section 2.7.

1.9.2.1 Significant Issue

WATERSHED CONDITION

Issue Statement: Project activities could result in cumulative watershed effects, including siltation and impacts to aquatic species. Consider alternatives which avoid or minimize Group Selection harvests and extensive roadwork in watersheds that exceed the Threshold of Concern (TOC) for cumulative watershed effects (refer to FEIS, Section 3.9).

Project effects, in combination with existing and foreseeable post-Sugarberry impacts, may exceed TOC beyond which unacceptable downstream degradation to aquatic and riparian ecosystems may occur to further degrade watershed conditions in the short-term.

Watershed conditions represent the overall state of disturbance within a hydrologic drainage network. The evaluation of human-based and natural disturbances is considered in context of probable hydrologic response inter-relationships of stream channel and upland factors. The condition of the channel network is influenced by previous flow regimes, geologic and physiographic features. Upland influences include climate regimes, vegetative cover and the extent of impervious surfaces such as roads and urban infrastructures (USDA Forest Service 1990).

Watersheds and stream channels have natural capacity to absorb various levels of land disturbance without major adjustment to their function and condition. However, when this capacity is exceeded, the effects of land disturbances begin to substantially impact downstream stability and water quality. This upper estimate of watershed “tolerance” to land use is described as the threshold of concern (TOC).

Presently, of the 44 subwatersheds analyzed (ranging from 510 – 2350 acres in size), 6 near-stream sensitive areas are approaching the TOC and 14 exceed the TOC. Proposed Sugarberry Project mechanical ground-based logging practices, in-stream restoration and transportation improvements could increase stream channel erosion and sedimentation. Therefore, the issue of increasing cumulative watershed effects is classified as significant, due to the intensity of interest and potential for resource conflicts associated with municipal and other California state and local beneficial uses.

Measurement Indicators. Subwatersheds approaching Threshold of Concern (number); subwatersheds over Threshold of Concern (number).

1.9.2.2 Minor Issues

DEFENSIBLE FUEL PROFILE ZONE EFFECTIVENESS

Issue Statement: Current proposal does not treat Rabbit Creek drainage along SC791 road and so does not provide an effective fire break for La Porte (refer to FEIS, Section 2.6.3).

Issue Statement: It is not necessary to remove trees up to 30” dbh or reduce canopy cover to 40% to reduce the risk of catastrophic fire or promote fire-resilient forests. Fire objectives can be met by maintaining 50% canopy cover and not removing trees greater than 20” dbh (e.g., 2001 ROD). Such an alternative would also reduce impacts to species like the spotted owl and marten (refer to FEIS, Sections 2.6.1, 3.3 and 3.11).

Measurement Indicators. Flame length and canopy base height.

ECONOMIC FEASIBILITY

Issue Statement: High treatment costs may make the proposed action prohibitively expensive to implement (refer to FEIS, Sections 2.7, 3.5 and Appendix D).

Issue Statement: Proposed 120-foot spacing between skid trails may be too restrictive for mechanical logging and unnecessarily adds additional costs (refer to FEIS, Appendix E).

Issue Statement: Requiring the removal of non-merchantable material from landings could be very costly depending on the market and distance to market (refer to FEIS, Sections 2.7, 3.5 and Appendix D).

Measurement Indicators. Number of jobs created, employee related income created, net harvest value, harvest costs, non-harvest costs and total project value.

AQUATIC, RIPARIAN AND WATER QUALITY

Issue Statement: Project activities could result in direct or indirect effects to riparian areas, including siltation and impacts to aquatic species (refer to FEIS, Sections 2.7 and 3.9).

Issue Statement: Runoff from proposed treatment for units 590 and 584 could exacerbate existing sedimentation in Deacons Long Ravine/Slate Creek caused by Gardners Point and Pioneer Mine Placer Diggings, two existing mines on private land (refer to FEIS, Sections 2.7 and 3.9).

Issue Statement: Project activities could pose higher short term risks to aquatic resources, because the 2004 ROD prescribes larger amounts of mechanical treatments and greater treatment intensities in riparian areas (refer to FEIS, Sections 2.7 and 3.9).

Measurement Indicators. Percent of Gold Run, Fish Meadow and Upper Dutch Diggings treatment areas in stable or vegetated condition, and Upper Dutch Diggings sediment catchment capacity in cubic yards.

HERITAGE (CULTURAL) RESOURCES

Issue Statement: Implementation of hazardous fuels reduction, aquatic and riparian restoration, and silvicultural forest health and diversity treatments may affect archaeological or historic sites and/or current Native American values, particularly in the Rabbit Creek drainage along Road SC791 (refer to FEIS, Sections 2.7 and 3.6).

Measurement Indicator. Potential risk to heritage resources in treatment areas.

WILDLIFE HABITAT AND SPECIES

Issue Statement: Proposed treatments could alter or degrade habitat utilized by old-forest dependent species (refer to FEIS, Sections 2.6, 2.7 and 3.11).

Issue Statement: Proposed activities in suitable nesting, foraging, roosting, and travel habitat may affect species, including denning and resting habitat, as a result of decreasing the number and density of medium and large trees (including hazard trees >30” in diameter), fragmentation, lower canopy closure, and modifications to ecosystem structural components such as less large down wood, forest structure simplification and loss of snags (refer to FEIS, Sections 2.6, 2.7 and 3.11).

Issue Statement: Project activities, including logging of medium to large trees (trees 20” dbh and larger), reduction in canopy cover, removal of large snags and down wood, road construction and reconstruction, and logging within owl PACs, owl HRCAs, old forest emphasis areas, and areas of concern may degrade owl nesting and foraging habitat and threaten the owl’s viability (refer to FEIS, Sections 2.6, 2.7 and 3.11).

Issue Statement: Project activities, including logging of medium to large trees (trees 20” dbh and larger), reduction in canopy cover, removal of large snags and down wood, road construction, and logging within old forest emphasis areas and the southern Sierra fisher conservation area, may degrade fisher denning, resting, and foraging habitat and further threaten the fisher’s viability (refer to FEIS, Sections 2.6, 2.7 and 3.11).

Issue Statement: Project activities, including reduction in basal area without a canopy cover limit in eastside pine types, higher canopy cover, and simplification of stand structure could adversely affect goshawk habitat (refer to FEIS, Sections 2.6 and 3.11).

Issue Statement: Reducing the number of large trees and snags and reducing canopy cover could significantly reduce habitat value for the pileated woodpecker by removing nest and roost sites, foraging habitat, and cover (refer to FEIS, Sections 2.6 and 3.11).

Measurement Indicators. Potential percent reduction of total HRCA acres in Sugarberry Project boundary, potential percent reduction of total CWHR 4M & 4D acres in Sugarberry Project boundary, potential percent reduction of total 5M & 5D acres in Sugarberry Project boundary, potential percent reduction of total carnivore network acres in Sugarberry Project boundary (refer to FEIS, Sections 2.6, 2.7 and 3.11).

BOTANICAL RESOURCES

Issue Statement: Implementation of hazardous fuels reduction, aquatic and riparian restoration, and silvicultural forest health and diversity treatments may affect Threatened, Endangered, and Proposed species, Forest Service Region 5 listed Sensitive species, Plumas National Forest Special Interest species and Management Indicator Species (refer to FEIS, Sections 2.7 and 3.4).

Issue Statement: Implementing Group Selection practices could undermine the enhancement of oak within the treatment areas (refer to FEIS, Sections 2.7 and 3.3.6.4).

Issue Statement: Project activities could increase the potential for noxious weed proliferation (refer to FEIS, Sections 2.7 and 3.4.7).

Measurement Indicators. Potential risk to threatened, endangered, and proposed plant species, Forest Service Region 5 listed Sensitive plant habitat and species affected; basal area in square feet per acre for oak >9 inches dbh; potential risk for spreading non-native species.

SOIL RESOURCES

Issue Statement: Implementing hazardous fuels reduction may lower organic matter levels, potentially affecting soil cover and long-term soil productivity (refer to FEIS, Section 3.10).

Measurement Indicators. Effective soil cover in treatment units; compliance with Plumas LRMP Standards and Guidelines.

1.10 Permits, Licenses, and Other Consultation Requirements

In accordance with 40 CFR 1502.25 (b), the Environmental Impact Statement is to list all Federal permits, licenses, or other entitlements that must be obtained in implementing the proposal.

State requirements, based on federal laws, and administered by the County Agricultural Commissioner for air quality management will be followed. These requirements include burning only on permitted burn days or receiving a special variance prior to ignition. Smoke permits are required from the Northern Sierra and Feather River Air Quality Management Districts prior to any understory or pile burning.

Timber Harvest Activity Waivers are required from the California Regional Water Quality Control Board.

The Forest Service consulted with federal and state agencies, including U.S. Fish and Wildlife Service and California Department of Fish and Game, during development of this EIS. The California Department of Fish and Game requires a 404 permit for fish passage restoration.

In addition, the Forest Service consulted with the following Native American entities: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, and Chico Band of Mechoopda Indians.

Chapter 2. Alternatives

2.1 Introduction

This chapter presents a description of all alternatives considered, so as not to foreclose prematurely any reasonable options to "avoid or minimize adverse impacts or enhance the quality of the human environment" (excerpt 40 CFR 1502.1., 2). A No-action alternative and three "action" alternatives consisting of unique treatment combinations and/or design features, were fully developed and analyzed in detail, to provide a reasonable range of land management options within the Sugarberry Project Area.

The chapter begins with a description of the process used by the Forest Service interdisciplinary team (IDT) to generate the alternatives. The next section provides a disclosure of all alternatives considered during the analysis. A more detailed description of the No-action alternative and the action Alternatives B, C and G, along with associated design features, mitigation measures and monitoring is included. The following section describes the alternatives considered, but eliminated from detailed study and the rationale for the determination. The final section includes a table summarizing the predicted environmental consequences by measurement indicator(s) organized by alternative. Measurement indicators are used to depict effects in context of how each alternative responds to fulfilling the purpose objectives, addressing the needs, and mitigating effects linked to the Significant Issue and Minor Issues.

2.2 Description of the Alternatives

2.2.1 Process Used to Generate the Alternatives

The Council of Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) require federal agencies 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 Code of Federal Regulations [CFR] 1502.14). All alternatives incorporate applicable laws, regulations, and policies that govern land use on National Forest System lands.

The Forest Service Interdisciplinary Team (IDT) reviewed public comments, current research and pertinent field data to develop alternative methods for managing the Sugarberry Project Area, while furthering HFQLG Pilot Project objectives aimed at promoting the ecological health of lands and economic health and stability of communities in the northern Sierra Nevada. The IDT then generated various, unique treatment combinations to achieve hazardous fuels reduction, healthy forests, economic health of rural communities, ecosystem biodiversity of unique plant communities and watershed restoration purpose objectives. Central to the alternative development process, was devising treatment practices to lower potential risks for cumulative watershed effects, particularly in subwatersheds already classified as being at moderate to high risk.

2.2.2 The No-action Alternative

This Alternative takes no action at this time to implement provisions of the HFQLG Act on this part of the Plumas National Forest. On-going activities such as routine road maintenance, fire suppression and recreation would still occur in this area. This alternative serves as a baseline against which to compare the action alternatives.

2.2.3 The Action Alternatives

This section presents the action alternatives considered in detail. A description of explicit management practices applicable to all action alternatives is included under Alternative B. Unique design features and listing of treatment practices are described separately under each action alternative. A comprehensive listing by treatment by unit number, along with treatment acres, prescriptions by management zone and by California Wildlife Habitat Relationship (CWHR) size and density classes is included in the Sugarberry Project FEIS, Appendix A. A comprehensive description of applicable mitigation measures and alternative maps are provided in this FEIS, Appendices E and G respectively. As summarized in Table 2-1, this concise listing of treatment practices functions to display the similarities as well as differences between alternatives.

Table 2-1. Total treatment acres by prescription for each action alternative (Alternatives B, C, and G).

Treatment Method	Alternative B (Proposed Action)	Alternative C	Alternative G (Preferred)
Underburn	370	370	370
Hand Cut, Tractor Pile, Pile Burn	375	250	250
Hand Cut, Hand Pile, Pile Burn	30	155	155
Masticate	750	750	750
Mastication & Underburn	205	205	205
Thin & Biomass Removal— Removal to 40% Canopy Cover	170	170	170
Thin (50% Canopy Cover), Biomass Removal & Underburn	80	80	80
Plantation Thin & Masticate	120	120	120
Total Acres of Defensible Fuel Profile Zones (DFPZ) Fuels Treatment Acres	**2,100 acres**	**2,100 acres**	**2,100 acres**
Group Selection (GS)	1,040	1,020	1,020
-% GS ground-based harvesting systems	70%	70%	70%
-% GS skyline harvesting systems	25%	25%	25%
-% GS helicopter harvesting systems	5%	5%	5%
Individual Tree Selection and Biomass Removal	155	150	150
-% Individual Tree Selection (ITS) Mechanical Thin (not including GS)	100%	90%	90%
-%ITS Helicopter Thin (not incl. GS)	0	10%	10%
Aspen Regeneration	20	20	20
-% Conifers Removal 1-9.9 inches DBH	100%	100%	100%
-% Conifers Removal >10 inches DBH	50%	50%	50%
Oak Enhancement (Hand Thin Conifers <10 inches DBH)	100	100	100
Total Acres of Other Vegetation Treatments	**1,315 acres**	**1,290 acres**	**1,290 acres**
Sporax Application Acres (DFPZ & ITS)	325	320	320
Road Decommissioning (miles)	4.7	4.7	11.5

Treatment Method	Alternative B (Proposed Action)	Alternative C	Alternative G (Preferred)
New Road Construction (miles)	0.6	0.6	0.6
Road Reconstruction (miles)	25.3	25.3	25.3
Temporary Road Construction (miles)	21.7	21.0	21.0
Stream Crossing Upgrades (accessible aquatic habitat miles)	16.5	16.5	16.5
Stream Stabilization Projects (number)	2	2	2
Meadows Restored (number)	2	2	2
Hydraulic Mine Sites Restored (number)	1	1	1

Note: Harvesting system for Group Selection and Individual Tree Selection harvests are listed where appropriate. All other tree removal, including Defensible Fuel Profile Zones (DFPZ) harvesting will be harvested with ground-based systems. For a complete list of units, refer to Table A-3 in Appendix A of this DEIS. Proposed aquatic and riparian ecosystem restoration treatments for all action alternatives are described in "Section 2.2.2: Alternative B: Proposed Action."

2.2.4 Alternative B: Proposed Action (Modified)

Extensive field work accomplished during mid-2006 led IDT members to modify the Proposed Action, as described in the June 2006 Notice of Intent, legal notices and Scoping letters. Resource issues and/or treatment constraints warranted modifications to prescriptions, avoidance mitigation and elimination of treatment units from further consideration. The IDT also developed additional treatment units to respond to public concerns and/or resource needs identified. Because of the extent of these changes, the Sugarberry DEIS and FEIS address the initial Proposed Action as Alternative F, alternatives considered but eliminated from further detailed study. Refer to Alternative F for a detailed description of the rationale and extent of the modifications to the initial Proposed Action (Section 2.6.3). The modified Proposed Action is disclosed in the Sugarberry DEIS and FEIS as Alternative B, analyzed in detail.

The U.S. Department of Agriculture (USDA) Forest Service, Plumas National Forest, Feather River Ranger District proposes the following actions (Section 1.3).

- Construct fuelbreaks known as Defensible Fuel Profile Zones (DFPZs) on approximately 2,100 acres.
- Harvest trees using Group Selection (GS) silvicultural methods on approximately 1,040 acres.
- Harvest trees using Individual Tree Selection (ITS) silvicultural methods on approximately 155 acres.
- Enhance approximately 100 acres of black oak stands and 20 acres of aspen stands.
- Perform road improvements as follows: approximately 4.7 miles of road decommissioning, 25.3 miles of road reconstruction, 0.6 mile of new classified road construction, and 21.7 miles of new temporary spur construction.
- Carry out a range of watershed, aquatic and wildlife habitat improvement activities, including: enhancing 2 meadows, 20 acres of aspen and 100 acres of black oak stands, stream stabilization, hydraulic mine restoration and removing or upgrading culverts to provide access to 16.5 miles of aquatic habitat.

2.2.4.1 Construct Defensible Fuel Profile Zones

As part of the Sugarberry Project, approximately 2,100 acres of fuelbreaks known as Defensible Fuel Profile Zones (DFPZs) would be constructed along ridge tops and roads (see FEIS, Appendix G). Approximately 60 percent of these acres are located in the Wildland Urban Interface. DFPZs would be approximately ¼ - ½ mile wide, on which fuels, both living and dead, would be modified in order to reduce the potential for sustained crown fire.

The DFPZs in this project would be part of a larger, strategic system of DFPZs on the Plumas, Lassen, and Tahoe National Forests, along with fuel reduction treatments on adjacent private timber lands. Sugarberry DFPZs would connect with other fuelbreaks constructed as part of the Bald Onion, Upper and Lower Slate, South Fork, and Slapjack Projects on the Feather River Ranger District (refer to Appendix G -Sugarberry Project Maps).

Timber Harvest (thin) and Biomass Removal. Ladder and canopy fuels would be removed by a "thin from below", in other words, removing the smallest trees first. This would reduce potential fire intensity by increasing canopy base height and spacing between tree crowns. This type of harvest would emphasize removal of suppressed, intermediate and co-dominant trees with crowns underneath and adjacent to healthy large trees. These less dominant trees are more prone to fire damage and provide a route for fire to climb into the crowns of large healthy trees. Thinning in DFPZs would reduce canopy cover to approximately 40 to 50 percent in the California Wildlife Habitat Relationships (CWHR) system Size Class 4 stands (trees 11–24 inches dbh) and Size Class 5 stands (greater than 24 inches dbh) where it presently exceeds that amount.

Conifers ranging from 9.0 to 29.9 inches dbh would be removed as necessary to obtain 40 to 50 percent canopy cover, and processed as sawlogs. Harvested hardwoods less than 29.9 inches dbh, and vegetation 3.0 to 8.9 inches dbh are considered biomass and would be piled and burned or removed from units and processed at appropriate facilities. All trees 30 inches dbh or larger would be retained, unless incidental removal is required for operability.

Sporax would be applied to approximately three DFPZ thinning units with evidence of annosus root rot (*Heterobasidion annosum*) in or surrounding the treatment area. In these units, Sporax would be applied to all harvested stumps 14 inches dbh or greater.

Species preference for the residual trees are shade intolerant species where they exist. Shade intolerant species prefer full, open sunlight on the forest floor to establish and grow and are often fire adapted. Order of preference would be ponderosa pine, black oak, Jeffrey pine, sugar pine, Douglas-fir, incense-cedar, true fir and tree-form tanoak. Where California black oak is present in treatment units, direction is to retain an average basal area of 25 to 35 square feet per acre of oaks over 15 inches dbh. In units where basal area retention of oaks greater than 15 inches dbh is lacking, oaks greater than 12 inches dbh would be retained. Smaller oaks less than 12 inches dbh and greater than 9 inches dbh would be retained where existing if determined necessary for future recruitment.

Residual spacing of conifers outside of plantations would be a mosaic of even and clumpy spacing depending on the characteristics of each stand prior to implementation. Timber harvest unit layout and mark would achieve approximately 25 feet (±25 percent), residual spacing of conifers.

In units with larger size trees, spacing may be wider, but 40 percent canopy cover would be retained where already existing. This would avoid the creation of large openings and allow retention of the healthiest, largest, and tallest trees and a minimum 40 percent canopy cover in California Wildlife Habitat Relationships (CWHR) Size Class 4 stands (11–24 inches dbh). CWHR Size Class 3 stands (averaging 6–11 inches dbh) and plantations would not have any canopy cover restrictions and would be thinned to residual spacing of approximately 18 to 22 feet (±25 percent), depending on average residual tree size and forest health conditions, to allow retention of the healthiest, largest, and tallest conifers and black oaks.

Whole-tree, ground based logging systems may be considered as one method of mechanized thinning and biomass removal in DFPZ units. Whole-tree yarding removes most limbs and tree tops from the stand, effectively reducing the need for post-project slash pile fuels treatments. Machinery would not be allowed in Riparian Habitat Conservation Areas (RHCAs) except in plantations where Riparian Management Objectives (RMOs) are met. After thinning, pile burning would be used to treat residual slash and pre-existing fuels and shrubs where necessary. A secondary underburn treatment (described below) may occur if post-treatment fuels objectives were not met.

Mastication. Mastication re-arranges fuels by grinding woody shrubs or trees and then scattering the material on the harvest site. Shrubs would be masticated, as would trees less than 9 inches dbh unless needed for proper canopy cover and spacing. Most trees masticated would be less than 6 inches dbh.

Spacing of residual conifers and black oaks would range from 18 feet (±25 percent) in smaller tree size aggregations to approximately 22 to 25 feet (±25 percent) in medium tree sizes. In non-plantation units with larger size trees, spacing may be wider, but 40 percent canopy cover would be retained where already existing. This would allow retention of the healthiest, largest, and tallest conifers and black oaks and avoid creating openings. Mechanical ground based equipment would be used for mastication.

Hand Cutting and Tractor Piling of Trees and/or Shrubs, and Pile Burning. This treatment involves manual cutting of: (1) shrubs; (2) trees 1 to 9 inches dbh from beneath overstory trees; and/or (3) thinning aggregations of 1 to 6 inches dbh conifers or plantation trees. Most trees removed would be 1–6 inches dbh. Cut trees, shrubs, and existing slash would be gathered into piles with a tractor containing a brush rake head and burned. Spacing of residual conifers and black oaks would be approximately 18–22 feet (±25 percent) to allow retention of the healthiest, largest, and tallest conifers and black oaks and avoid creating openings.

Hand Cutting and Hand Piling of Trees and/or Shrubs, and Pile Burning. Hand cutting and pile burning would be used to reduce fuels in units located in Riparian Habitat Conservation Areas (RHCAs) and other areas where mechanical equipment is not allowed. This treatment involves manual cutting of: (1) shrubs; (2) trees 1 to 6 inches dbh from beneath overstory trees; and/or (3) thinning aggregations of 1 to 6 inches dbh conifers or plantation trees. Cut trees, shrubs, and existing slash would be gathered into piles and burned. Spacing of residual conifers and black oaks would be approximately 18 feet (±25 percent) to allow retention of the healthiest, largest, and tallest conifers and black oaks and avoid creating openings. Hardwoods and riparian vegetation would be retained. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching.

In RHCAs (protective buffers applied to streams, lakes, ponds, wetlands, and landslides), conifers from one to six inches in diameter would be hand-thinned where appropriate. Hardwoods and riparian vegetation would be retained. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching.

Underburning. Underburning is a prescribed burn carried out under an existing canopy of trees (hardwoods or conifers) that is designed to consume excess live and dead vegetation on the forest floor and some of the existing canopy. After burning, residual surface fuels less than 3 inches diameter would not exceed 5 tons per acre. An average over the treatment unit of 10–15 tons per acre of large down wood would be retained, where it exists. An average of 4 snags per acre would be retained where existing. In units that are only treated with underburning, multiple burn entries may be required to achieve the desired condition. Underburn units that encompass Group Selection units would not be burned until the harvesting of trees has been completed. In RHCAs, ignition would be avoided, however fire would be allowed to back downslope into them.

- Specific treatments and prescribed burn objectives would depend upon terrain and existing surface and ladder fuel conditions in each unit and would meet design criteria in Appendix J of the 1999 *Herger-Feinstein Quincy Library Group* (HFQLG) *Environmental Impact Statement* (EIS) and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (2004 ROD). This type of burning is initiated when fuel moistures are low enough to carry fire and still be within prescription parameters. Burning can only be initiated on "Burn Days" designated by the State Air Quality Control Board. Firelines would be constructed around underburn units to prevent fire escape. Firelines would be constructed by mechanical or manual methods.

2.2.4.2 Group Selection

Group Selection timber harvest would occur within and adjacent to DFPZ and ITS treatment units throughout the Sugarberry Project boundary (see Alternative B map in Appendix G). The Group Selection prescription includes the harvest of trees less than 30 inches dbh from designated units dispersed throughout the project area. These groups range in size from ½ to 2 acres and average about 1½ acres. Approximately 1,040 acres of groups are proposed in Alternative B.

The Sugarberry Project is designed to implement the first phase of Group Selections on the landscape and initiate the conversion to an all-aged, multistoried, fire-resilient forest. The re-entry harvest interval for Group Selection units is approximately 20 years. In DFPZ units, Group Selections would not exceed 10 percent of the total unit area. Outside DFPZ units, Group Selection would not exceed 20 percent of the total unit area.

The initial treatment in Group Selection units would be the harvest of trees less than 30 inches dbh. Undamaged, healthy, and shade intolerant regeneration (young trees) would not be removed. To promote forest health, rust resistant sugar pine less than 30 inches dbh may be retained where found. Trees larger than 30 inches dbh may be removed on an incidental basis to allow operability, when approved by the Forest Service. Where possible, black oaks would be avoided in the placement of the groups.

Ground-based, skyline, and helicopter logging systems may be used to conduct Group Selection harvest depending on terrain and accessibility. Tractor logging may be used on slopes less than 35 percent, while skyline logging or helicopters could potentially be used to harvest steeper ground or inaccessible areas. After harvest of trees less than 30 inches dbh, the groups would receive a series of post-harvest treatments. Post-harvest treatments in Group Selection units include: (1) site preparation, followed by (2) seedling planting, and (3) seedling release. These post-harvest activities are described below:

- Machine piling and pile burning would be used to treat residual slash, pre-existing fuels, and shrubs within Group Selection areas on slopes less than 35 percent. Hand piling and pile burning would be used on skyline or helicopter ground (greater than 35 percent slope). Depending on the burn and harvesting schedule, Group Selections within DFPZ units may be underburned (if burning occurs before post-harvest planting) or protected from underburning by handlines (if underburning occurs after planting). After burning, residual fuels (less than 3 inches diameter) would not exceed 5 tons per acre. Where down logs exist, an average over the treatment unit of 10–15 tons per acre of large down wood would be retained.

- Seedlings of various conifer species would be planted by hand (artificial regeneration) or would be established naturally from existing seed sources (natural regeneration). A combination of natural and artificial regeneration would be used in groups to achieve desired stocking levels of new stands. Artificial regeneration would focus on establishing shade-intolerant, fire-resilient species such as ponderosa pine, Douglas-fir, Jeffrey pine, and rust-resistant sugar pine.

- Release treatments would ensure survival of seedlings by controlling vegetation that is competing with planted and naturally regenerated trees. Release would consist of hand-grubbing or hand-cutting brush and competing trees. To be effective, release treatments need to remove vegetation from a five-foot radius around each tree.

2.2.4.3 Individual Tree Selection (Area Thinning)

Individual Tree Selection (ITS), also called area thinning, would be conducted on approximately 155 acres surrounding some Group Selections in the planning area (see Alternative B map in Appendix G). Logging methods would be tractor, skyline, or helicopter. Units designated for ITS would be treated by cutting diseased or otherwise unhealthy trees (sanitation cut) combined with a thinning from below. This treatment is designed to prevent the spread of insect and disease and reduce overstocking. By removing the diseased and suppressed trees immediately around Group Selections, the stand would become more vigorous. Sporax would be applied to ITS units with evidence of annosus root rot in or surrounding the treatment area. In these units, Sporax would be applied to all harvested stumps 14 inches dbh or greater.

The ITS prescriptions would be designed to meet Plumas NF LRMP Standards and Guidelines set forth in the 2004 Sierra Nevada Forest Plan Amendment ROD (p. 69). This includes retaining 50 percent canopy cover after treatment, averaged within the unit, and retaining all live trees 30 inches dbh and greater except as needed for operability.

- Slash resulting from harvesting would be treated by underburning or machine/hand piling and burning. Biomass removal of material 3 to 8.9 inches dbh would occur on stands where appropriate. Sporax would be applied to units with evidence of annosus root rot.

- Where California black oak is present, retain an average basal area of 25 to 35 square feet per acre. Oaks less than 15 inches dbh would be retained where site specific planning has determined the feasibility of and specific needs for future recruitment.

2.2.4.4 Black Oak Enhancement

Approximately 100 acres of oak enhancement are proposed within the Sugarberry Project Area (see Alternative B map in Appendix G). Thinning would be designed to reduce conifer encroachment into oak stands, reduce fuels, and increase the overall growth of remaining oak. Thinning will remove primarily brush and small conifers 1–10 inches dbh (though generally less than 4 inches dbh). Smaller oaks (generally less than 4 inches dbh) may be hand-thinned in the oak enhancement units if needed to reduce overstocking. Larger oaks would be retained. Slash created from hand cut material would be piled and burned. Some piles may be retained for wildlife. As shown on Alternative B map in Appendix G, most of the oak enhancement units lie in the northern portion of the project, along Portwine Ridge between Poverty Hill and Queen City.

2.2.4.5 Aspen Stand Enhancement

Aspen enhancement is proposed in the Howland Flat area (Alternative B map in Appendix G). Proposed aspen enhancement would remove encroaching conifers, including large trees greater than 30 inches dbh to increase water, growing space, and light available for young aspen.

Treatment would consist of:

- Removal of conifers from the aspen stand. The aspen stand is defined as the area with visible aspen trees and the aspen root zone that extends past the aspen trees. The root zone beyond the visible aspen trees outlines the historical footprint of the aspen stand. Conifer removal in the entire aspen stand will increase light and moisture to the stand which will release existing aspen and cause root suckering to increase the size of the aspen stand to its historical size.

- In unit SBA-1, conifers greater than 9 inches dbh would be removed with ground-based harvesting systems. In units SBA-3, SBA-4 and SBA-5, conifers greater than 9 inches dbh would be removed by helicopter. Conifers less than 9 inches dbh would be hand cut. Some conifers may be retained if deemed to be performing critical hydrologic services (for example, contributing to channel stability or riparian conditions).

- In unit SBA-2, no trees greater than 10 inches dbh would be removed. Trees less than 10 inches dbh would be removed by hand-cutting to protect archeological sites where ground disturbance is prohibited.

- In unit SBA-5, approximately one acre with extensive evidence of deer browse would be fenced using material cut in the area and additional material as needed. Conifers not used for the fence would be removed from the aspen stand.
- Snags will be retained wherever possible; however, due to operability and safety concerns, some snags may be removed.
- In all units, logging (including tops and limbs) and hand-cut slash would be manually piled and burned. Piles to be burned would generally be located away from aspen root systems to minimize scorching of roots.
- The layout of the Sugarberry aspen units involves small patches of aspen trees in riparian corridors or thinly distributed along the fringe of wet meadows adjacent to the conifer forest. Layout of aspen units generally extends out from the visible aspen trees to incorporate the root zone. Not all acres within aspen units would be treated, due to the absence of conifer trees in wet areas or meadows. Of the total 20 acres of aspen treatment, large conifers would be removed on approximately 12 acres and approximately 150–180 trees greater than 30 inches dbh are expected to be removed.

2.2.4.6 Transportation System Improvements

The proposed transportation system improvements would (1) provide needed access for completion of timber harvest and fuel reduction activities, and (2) contribute to watershed restoration, meadow enhancement, fish passage improvement, and streambank stabilization.

The following activities are proposed to allow access to treatment units for completion of DFPZ construction, Group Selection, and Individual Tree Selection harvest (see Roads, Transportation, Riparian and Aquatic Ecosystem Restoration map in Appendix G):

- Approximately 0.6 mile of new classified system road would be constructed.
- Approximately 25.3 miles of existing system roads would be reconstructed prior to project use. Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed.
- Approximately 21.7 miles of temporary spur roads would be constructed. All temporary spurs would be decommissioned after the project is completed; all re-opened spurs would be closed with barriers and allowed to revegetate.
- Harvest landings in Group Selection units and DFPZs would be constructed or reconstructed as needed. It is estimated there is a need for up to 191 additional landings, in addition to the existing 62 landings, in order to implement the Sugarberry Project. Landings would be subsoiled upon project completion, except where sensitive aquatic or riparian areas might be negatively affected.

The following activities are proposed to contribute to watershed restoration, meadow enhancement, fish passage improvement, and streambank stabilization activities (see Roads, Transportation, Riparian and Aquatic Ecosystem Restoration map in Appendix G):

- Approximately 4.7 miles of unauthorized roads would be decommissioned (restored to a natural condition). The roadbed would be stabilized or removed, culverts would be pulled, and stream crossings would be stabilized.

- In November 2005, the Forest Service revised its travel management regulations to require designation of roads, trails, and areas for motor vehicle use. As part of this process, the Plumas National Forest completed an inventory of all roads, trails, and areas currently receiving wheeled vehicle use, including off-highway vehicles (OHV). Roads proposed for restoration under the Sugarberry Project were not identified during the inventory process. All other roads and user-developed OHV routes in the Sugarberry Project Area would be considered during the travel management process. For more information about the travel management process, visit the Plumas National Forest website at: http://www.fs.fed.us/r5/plumas/projects/ohv/.

2.2.4.7 Aquatic and Riparian Ecosystem Restoration

The Sugarberry Project includes the following restoration activities to improve aquatic and riparian ecosystem conditions in the Project Area (see FEIS, Appendix G).

Stream Crossing Improvements. Five stream crossings in the Project Area have been identified for upgrades to provide fish access to upstream habitat (Table 2-2). Crossing structures currently in place are blocking upstream movement of fish and other aquatic species either because culvert outlets are perched above the outlet stream grade or culverts are undersized and the concentration of streamflow creates a velocity barrier. In addition, some of the crossing structures are failing and causing streambank erosion and channel degradation. Improvements would consist of installing new and generally larger structures compatible with the configuration, grade, and flow of the stream. Larger-diameter culverts pass water at lower velocity, accommodate larger flows and debris during flood events, and cause less up- and downstream disruption of the streambanks and channel. In addition to providing access to additional suitable habitat, crossing improvements would reduce the risk of washouts and associated sediment delivery during flood events.

Table 2-2. Proposed stream crossing improvements in the Sugarberry Project Area.

Stream Crossing Location	All Action Alternatives
1. Potosi Creek T22N, R10E, Sec 32 SE ¼ SIE800 road crossing	Culvert replacement
2. Pearson Ravine T22N, R10E, Sec 32 NE ¼ SIE800 road crossing	The crossing will be improved using one of three options: 1. Bottomless arch culvert 2. Vented ford (low water crossing with a channel) 3. Low water crossing to stabilize road (concrete slab in current crossing location)
3. Fish Meadow T20N, R8E, Sec 24, NE 1/4 20N20 road crossing	Replace or modify the weir and culvert. Streambank stabilization up- and downstream of the crossing at the time the culvert is replaced.
4. Rock Creek T20N, R9E, Sec 16, NW 1/4 20N95 road crossing	Replace the culvert or modifying the crossing
5. Gold Run T20N, R9E, Sec 5, SW 1/4 21N90 road crossing	Culvert replacement

Stream Stabilization. Two stream restoration projects are proposed to improve channel characteristics. Major improvements would be performed with heavy equipment such as an excavator. Follow-up restoration, including surface restoration and re-vegetation would be performed by hand. Stream stabilization would be performed in coordination with Forest botanists to ensure rare aquatic lichens found in several streams in the Project Areaare protected.

Gold Run Dam modification (Gold Run Creek, T20N, R9E, Section 5, SW ¼) —The proposed action is to modify the dam (a historic structure) to allow Gold Run Creek to assume its previous course and return to a more natural gradient. The channel would be reconstructed to a step-pool configuration using heavy equipment. The diverted channel reach is on private land, so a cooperative agreement with the landowner would be required to complete the restoration.

Fish Meadow, 20N20 road crossing (T20N, R8E, Section 24, NE 1/4)—As described above in the section on fish passage, streambank stability would be restored up- and downstream of the road crossing using rock, coir (coconut fiber) logs, and vegetation.

Meadow Enhancement. The following opportunities for meadow enhancement have been identified:

- *Onion Creek Meadow* (T21N, R8E, Sections 25 and 36)—Headcuts and unstable channel and streambanks that are destabilizing the meadow channel system would be stabilized using rock or coir logs. Invading conifers up to 9 inches dbh would be removed by hand-cutting, and roads and skid trails adjacent to the meadow and a tributary stream would be closed or obliterated and revegetated. Vehicle access to the meadow surface would be blocked, and old fence material that is no longer needed would be removed.

- *Gibsonville Meadow* (T22N, R9E, Section 19, SW 1/4)—Barriers (rocks) would be placed to block vehicle access to the northern portion of the meadow, and rocks, logs, coir (coconut fiber) logs and/or revegetation would be used to stabilize channels.

Meadow enhancement would be performed in coordination with Forest botanists and archaeologists to ensure rare plants and cultural resources are protected.

Hydraulic Mine Site Restoration. An opportunity to improve watershed condition in the Sugarberry Project Area by restoring portions of a historic hydraulic mine site has been identified at Upper Dutch Diggings, on Rabbit Creek north of La Porte (T21N, R9E, Section 9, SW 1/4). One or more settling ponds would be built to capture sediment eroding from the face of an old hydraulic pit, and stream diversions that are eroding roadbeds would be corrected. Work would be performed with an excavator, followed by revegetation by hand. Adjacent portions of the mine site on private timberlands may also be restored under a cooperative agreement with the landowner.

2.2.4.8 Alternative C: Reducing Disturbance in Watersheds over Threshold

Alternative C was developed by the Forest Service to be responsive to the purpose and need and to address risks for increasing cumulative watershed effects. The reduced scope of Alternative C is designed to protect on-site and downstream aquatic and riparian beneficial uses and values, by lowering the risk of inducing cumulative watershed effects (CWEs) in one subwatershed classified as exceeding the Threshold of Concern (TOC), and in one subwatershed that would exceed TOC under Alternative B. TOC disturbance was calculated using the Region 5 Equivalent Roaded Area (ERA) model for each subwatershed, and TOC assigned was based on the sensitivity ratings for HFQLG watersheds (HFQLG FEIS, Appendix N, Table N-8).

Alternative C would remove approximately 20 acres of Group Selection and 5 acres of ITS from treatments proposed under Alternative B. It would also change the timber harvesting system on approximately 15 acres of ITS and groups within the ITS matrix from ground-based equipment to a helicopter harvesting system in unit 585. Alternative C would alter DFPZ treatments from Alternative B by converting 125 acres of hand cut-tractor pile to hand cut-hand pile in portions of unit 901A. Oak enhancement and aspen release treatments would remain the same. Aquatic, riparian and wildlife habitat improvement activities would be the same.

Alternative C proposes the following actions:

- Construct fuelbreaks known as Defensible Fuel Profile Zones (DFPZs) on approximately 2,100 acres.
- Harvest trees using Group Selection (GS) silvicultural methods on approximately 1,020 acres.
- Harvest trees using Individual Tree Selection (ITS) silvicultural methods on approximately 150 acres.
- Enhance approximately 100 acres of black oak stands and 20 acres of aspen stands.
- Perform road improvements as follows: approximately 4.7 miles of road decommissioning, 25.3 miles of road reconstruction, 0.6 mile of new classified road construction, and 21.0 miles of new temporary spur construction.
- Carry out a range of watershed, aquatic and wildlife habitat improvement activities, including: enhancing 2 meadows, 20 acres of aspen and 100 acres of black oak stands, stream stabilization, hydraulic mine restoration and removing or upgrading culverts to provide access to 16.5 miles of aquatic habitat.

2.2.4.9 Alternative G (Preferred Alternative)

Alternative G was developed to more aggressively reduce the potential for inducing cumulative watershed effects and habitat fragmentation. This Alternative includes all components of Alternative C, plus 11.7 miles of roads decommissioning. These roads are a part of the existing Forest roads system, but are not included as part of the OHV (Off Highway Vehicle) route designation process. The roads proposed for decommissioning include three miles determined to be causing egregious resource damage and four miles of dead end spurs or routes that show no evidence of OHV use. These system roads meet the criteria to decommission roads during the OHV route designation process as established by the Forest Supervisor on May 31, 2005.

Alternative G proposes the following actions:

- Construct fuelbreaks known as Defensible Fuel Profile Zones (DFPZs) on approximately 2,100 acres.
- Harvest trees using Group Selection (GS) silvicultural methods on approximately 1,020 acres.
- Harvest trees using Individual Tree Selection (ITS) silvicultural methods on approximately 150 acres.
- Enhance approximately 100 acres of black oak stands and 20 acres of aspen stands.
- Perform road improvements as follows: approximately 11.5 miles of road decommissioning, 25.3 miles of road reconstruction, 0.6 mile of new classified road construction, and 21.0 miles of new temporary spur construction.
- Carry out a range of watershed, aquatic and wildlife habitat improvement activities, including: enhancing 2 meadows, 20 acres of aspen and 100 acres of black oak stands, stream stabilization, hydraulic mine restoration and removing or upgrading culverts to provide access to 16.5 miles of aquatic habitat.

2.5 Design Features, Mitigation Measures, and Monitoring

The following sections describe design features, mitigation measures, and monitoring linked to the action alternatives, aimed at avoiding, minimizing, or rectifying predicted resource impacts. Their purpose and effectiveness is described in specific resource sections in Chapter 3.

2.5.1 Design Features and Mitigation Measures

Mitigation measures are common to all action alternatives, unless otherwise noted. A summary of mitigation measures is presented below by resource. A detailed description of project mitigations can be found in Appendix E of this FEIS.

Air Quality

Specific air quality mitigations for prescribed burning would include number of acres burned daily, preferred wind directions for smoke dispersal, and desired weather conditions. These mitigations would be agreed upon with appropriate Air Quality Districts, and addressed in the Smoke Management portion of the Burn Plans developed for the Sugarberry Project.

Hydrology

Applicable Best Management Practices (BMPs) and Scientific Analysis Team (SAT) guidelines would be implemented before and during timber harvest, DFPZ construction, road decommissioning and watershed restoration.

SAT Guidelines. The SAT guidelines for delineating RHCAs were defined for the Northwest Forest Plan, and adopted for the HFQLG FEIS and ROD. RHCAs are zones within which ground-based mechanical equipment use is curtailed for the protection of riparian and aquatic resources. In general, standards and guidelines prohibit activities in RHCAs that are not specifically designed to improve the structure and function of the RHCA and benefit fish habitat.

Management activities proposed within RHCA boundaries must meet RMOs; (HFQLG FEIS Appendix L). The RMOs focus on maintaining or restoring critical elements of riparian ecosystems. Site-specific prescriptions for achieving these objectives are defined in Appendix A of the Sugarberry “Hydrology Report” and Appendix E of the FEIS. These prescriptions are based on conditions described in the Slate Creek Landscape Analysis [LA], the Sugarberry Watershed Analysis, and on subsequent field observations.

RHCA widths applied to the Sugarberry Project are 300 feet for fish-bearing streams and lakes; 150 feet for perennial non-fish bearing streams, lakes and ponds, and wetlands greater than one acre; and 100 feet for intermittent or ephemeral streams, and wetlands less than one acre; or to the extent of landslides and landslide-prone areas. The RHCAs would be defined and marked onsite when DFPZ units are laid out. Group Selection units would be laid out to avoid RHCAs.

Stream Management Zones (SMZs). Ephemeral streams and swales without annual scour, which are not protected as RHCAs under the SAT guidelines, would be protected by applying minimum buffer widths of 0 to 50 feet depending on channel and side slope stability, but always include the extent of riparian vegetation. A SMZ Plan (in the “Hydrology Report” of the Sugarberry project file, available at the Feather River Ranger District) establishes resource objectives and requirements for any vegetation activities within SMZs.

Best Management Practices. These are practices designed to minimize or eliminate non-point sources of pollution from timber harvest and other management activities, by prohibiting or limiting types of ground disturbance that are likely to discharge sediment and negatively affect water quality. Applicable BMPs and the units where they would be applied are listed in Appendix E of this FEIS.

Forest Service Region 5 Listed Sensitive Plants

When necessary, populations of sensitive or special interest plants would be avoided during treatments, or the treatments would be modified to meet these plants' ecological requirements. Populations within or adjacent to project units would be protected by flagging and control area tags and designated as controlled areas both on the ground and on the sale area map. Limited operating periods would be applied to protect sensitive plants, as needed.

Noxious Weeds

Noxious weeds would be controlled through the use of integrated management practices. Prevention measures would be implemented to reduce the introduction and spread of noxious weeds (FSM 2081.2) Also, the overall risk that this project poses to the spread of noxious weeds has been analyzed in a Noxious Weed Risk Assessment as outlined in Appendix G of the HFQLG FEIS and Sugarberry Project File.

Soils

Applicable Best Management Practices (BMPs) would be followed during implementation of all activities of the Sugarberry Project.

BMPs. BMPs would be implemented throughout timber harvest, DFPZ construction, road decommissioning and watershed restoration to ensure appropriate erosion and sedimentation protection in disturbed areas and to protect long term soil productivity. The applicable BMPs are listed in full and tabulated on a unit-by-unit basis in Appendix E of this FEIS.

Additional Mitigations. Forest-wide standards and guidelines are established in the Forest Plan and mitigations used to meet Forest Plan standards and guides on a unit-by-unit basis are included in Appendix E of this FEIS. The Forest Service Handbook (Soils Management Handbook, Washington Office Amendment, FSH 2509.18-91-1; Soil Management Handbook, Region 5 Supplement, FSH 2509.18-95-1) establishes National and Regional direction for soil quality analysis. All mitigations would be specified in the Sugarberry Project timber sale contract and in the service contracts and adhered to for any work performed for the project.

Wildlife

Alternatives would be implemented in compliance with all rules and regulations governing land management activities, including the use of the appropriate Limited Operating Periods (LOPs) identified in Table 2-3. LOPs are listed in the HFQLG FEIS, page 2-8, Table 2.3 and 2004 SNFPA ROD, pages A-54, A-58, A-60, A-61 and A-62.

Table 2-3. Expected or Potential LOPs for the Sugarberry Project. Dates listed represent when project operations and activities are not allowed.

Species	Location	Limited Operating Period
California spotted owl	Within 1/4 mile of a protected activity center boundary	March 1–August 15
Goshawk	Within 1/4 mile of territory or active nest site	February 15–September 15
Marten den	100 acre den site buffer	May 1–July 31
Fisher den	700 acre den site buffer	March 1–June 30
Willow flycatcher	Within occupied willow flycatcher sites	Breeding Period (June 1–August 15)
Pallid bat and Townsend's big-eared bat	Within 1/4 mile of maternity and other roosts	April 1–October 31
Western red bat	Within RHCAs with cottonwoods	May 20–August 21
Mountain Yellow-legged Frog	Aspen units SBA-2 and SBA-5	October 15 or the first wetting rain greater than ¼ inch – April 15

Vegetation

All standard contract practices would be applied (timber sale contract B-provisions) as would some additional C-provisions and site specific prescription recommendations (FEIS, Appendix E). Recommended mitigations associated with vegetation management would be designed to reduce logging damage to residual trees, reduce fuels, and reduce opportunities for infection of trees by fungal disease or insect attack. Recommended mitigations include: (1) minimizing logging in the Spring when bark is loose and trees are more susceptible to logging wounds; (2) removal of small trees damaged beyond repair in harvesting operations, particularly in thinning units; (3) no chainsaw thinning in plantations from January through July to minimize bark beetle (*Ips* spp.) attack. After this period, treat activity slash promptly to control beetle (*Ips* spp) population growth; (4) no removal of specially-identified trees (e.g., marked survey trees, superior gene trees, and proven rust resistant sugar pine).

2.5.2 Project Monitoring

Two stages of monitoring are discussed in this section: implementation and effectiveness. Implementation monitoring determines the degree and extent to which application of standards and guidelines and mitigation measures meets management direction and intent. Effectiveness monitoring is used to determine the degree to which implemented resource management activities met objectives. The effectiveness of standards, guidelines, or mitigations cannot be assessed without first confirming that those standards and guidelines were actually implemented. Information from monitoring would help guide future activities and/or adjust current management practices. Two stages of monitoring are discussed in this FEIS, Appendix E: implementation and effectiveness.

Overall goals of monitoring activities would be to:

- Provide information useful to managers applying the principles of adaptive management.
- Assist the public in gauging the success of implementing the resource management activities as designed.

- Assess the effectiveness of the resource management activities in achieving resource objectives.

- Programmatic HFQLG monitoring would occur at the same time as project-specific monitoring (HFQLG FEIS 1999). Since the HFQLG monitoring sites are determined randomly, it is not known how many sites might be monitored as part of the programmatic effort.

Monitoring of Botanical Resources

Implementation Monitoring. Baseline data collection would begin prior to project implementation and continue through implementation. The objective would focus on two issues related to botanical resources under the HFQLG Monitoring Plan (1999): (1) were Threatened, Endangered, and Sensitive (TES) plants surveyed and protected? and (2) were noxious weed introductions prevented and existing infestations suppressed?

Effectiveness Monitoring. Effectiveness monitoring would begin prior to project implementation. The objective would be to answer the following questions from the HFQLG Monitoring Plan (1999):

- How do TES plant species respond to resource management activities? Randomly selected units without TES plants would also be selected to determine if any new TES plant occurrences have occurred in response to management activities.

- Were existing infestations of noxious weeds eliminated or contained?

A sample pool of botanical sites would be developed to address each of the above questions. The number of sites in each sample pool is limited to thirty and if that limit is exceeded then the sites to be monitored would be chosen randomly. If the limit is not reached then every site in the pool would be monitored. The monitoring would be done by Forest Service botanists who would conduct field visits and record and analyze the results.

Implementation Monitoring for Canopy Cover Retention

Canopy cover would be measured during project implementation (by the sale administrator or harvest inspector,) to confirm a minimum of 40 percent canopy cover in DFPZs (CWHR Size Classes 5M, 5D, and 6) and 50 percent canopy in Individual Tree Selection areas (CWHR Size Classes 4D, 4M, 5D, 5M, and 6).

Defensible Fuel Profile Zone Monitoring

Forest-wide DFPZ Monitoring. A DFPZ monitoring program would be completed at 2- to 3-year intervals for the Sugarberry Project Area until the DFPZ is no longer needed or funding is no longer available. The Forest Service would fully comply with the Council on Environmental Quality (CEQ) regulations for implementing *National Environmental Policy Act* (NEPA) requirements prior to conducting any maintenance activities.

Project-level DFPZ Effectiveness Monitoring. DFPZ monitoring would not begin for approximately 5 years after construction has been completed, depending upon funding, because DFPZ effectiveness would not be seriously reduced for approximately 5 to 10 years in plantations and 10 to 20 years in older stands.

DFPZ Site-Specific Monitoring Criteria. When both surface fuels (needles, twigs, branches) and fuel ladders (shrubs, brush, understory trees) exceed predetermined levels (Table 2-4), then DFPZ maintenance treatments may be evaluated and scheduled on a site-specific basis. The priorities for DFPZ treatment are (1) stands that meet both surface fuels and fuel ladder criteria, (2) stands that meet the surface fuel criteria, and (3) stands that meet the fuel ladder criteria

Table 2-4. DFPZ maintenance monitoring criteria.

Surface Fuels	Treat If Surface Fuels Exceeds:	Retain After Treatment
0–3 inch diameter	Greater than (>) 7 tons per acre	Approximately 5 tons per acre
Large down wood	> 15 tons per acre	10–15 tons per acre
Fuel Ladder	**Treat if Fuel Ladder Exceeds:**	**Fuel Height**
Shrubs/brush	> 25 percent ground cover	> 5 feet
Understory trees	> 15 percent canopy cover	> 8 feet

Monitoring for Prescribed Fire

Photo Plot Implementation and Effectiveness Monitoring. Some plots would be placed in RHCAs and near areas of special botanical resource concern. The remaining plots would be placed in random areas in units with high fuel loading to show fire behavior, consumption, and retention. Plots would also be established in random units throughout the DFPZ to show effectiveness of all the different fuel treatments and mastication. Different treatments include; thinning /underburn, handcut/pile and burn.

A global positioning system would be used to mark and establish plots for photo monitoring. Photos would be taken as the flaming front is passing through the plot area. Different angles might be taken to best illustrate fire behavior. Plots would be revisited one to two days after ignition to compare and contrast consumption and scorch. Revisits to plots would occur one, three, and five years after ignition. Photos would be taken to illustrate scorch, mortality, and regeneration.

- Features that would be recorded with photos: (1) pre-burn to show existing fuel conditions; (2) photos during ignition to show fire intensity/behavior; (3) 1–2 days after ignition to show burn accomplishments (e.g., consumption, scorch); and (4) 1, 3, and 5 years after ignition to show accomplishments and effects of fire behavior (e.g., scorch, mortality, regeneration).

Heritage Resources Monitoring

Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of standard protection measures.

Monitoring for Cumulative Watershed Effects (CWEs)

Monitoring of BMP implementation and effectiveness is required for the Sugarberry Project to satisfy several different regulatory agencies and Forest Service requirements.

Central Valley Regional Water Quality Control Board (CVRWQCB)

The CVRWQCB requires, as of 2006, that all BMPs related to skid trails, landings, stream crossings, and temporary roads be tracked and recorded. This tracking constitutes implementation monitoring. It would be performed under the timber sale administration process, and recorded on the timber sale administration report (Form R-5-2400-181).

- The data collected would be submitted to the CVRWQCB as part of an annual report from the Forest. The effectiveness monitoring performed for the Region and HFQLG reporting requirements (see below) would also be reported to the CVRWQCB. The CVRWQCB may also request additional monitoring above and beyond these requirements, particularly if project watersheds have Equivalent Roaded Area (see Cumulative Watershed Effects section in Chapter 3) values exceeding TOC.

Region 5 and the HFQLG Pilot Project.

Implementation and effectiveness monitoring for CWEs are currently accomplished in Region 5 through the BMP Evaluation Program. Forests within the HFQLG pilot project, including the Plumas National Forest, monitor BMPs through a similar program. On-site evaluations of projects are the core of the BMP monitoring protocol, and are assigned for each Ranger District on an annual basis. At least one in-channel evaluation of the effectiveness of BMPs in protecting beneficial uses of water is scheduled annually on each National Forest. Administrative evaluations by on-Forest Program Review Teams that review water quality for entire projects may be scheduled as needed.

Sampling Design. Sites to be evaluated are identified by random or non-random sampling selection procedures. The process for randomly selecting sites to monitor begins by developing a sample pool of recently completed projects throughout the HFQLG Pilot Project. From this pool, units are randomly selected for evaluation of the implementation and effectiveness of 29 procedures that correspond to specific BMPs. Randomly identified sites are very important for drawing statistical conclusions about the implementation and effectiveness of BMPs. Sugarberry units would be included in the random sample pool for one or more years following the completion of project activities, and it is possible that several Sugarberry units would be chosen for random BMP monitoring.

Sites that are selected non-randomly allow direct monitoring of management practice effectiveness in sensitive areas or areas that may be approaching or exceeding the TOC. Non-random selected sites are clearly identified and kept separate from the randomly selected sites by the District Hydrologist during data storage and analysis.

Non-random selected sites are identified in various ways:

- Identified as part of a monitoring plan prescribed in an environmental assessment, EIS, or a land and resource management plan.
- Identified as part of a settlement or negotiated agreement.
- Part of a routine site visit.
- Sites that are of particular interest to site administrators, specialist and/or management due to their sensitivity, uniqueness, and so forth.
- Selected for a particular reason specific to local needs.

Selected post-treatment BMP monitoring would occur in units in watersheds that are approaching or exceeding TOC.

Watershed Restoration Projects. Watershed restoration projects that are implemented for the Sugarberry Project would be monitored for several seasons following their construction to determine their degree of success, and to modify or repair them as needed. Monitoring and adaptation as necessary provide insight into the factors influencing project success or failure, as well as ensuring that watershed values are protected and enhanced as intended.

Soils Monitoring

Proposed Group Selection and DFPZ treatment units have been evaluated prior to treatment, based on Forest Plan standards and guides and the Region 5 soil quality analysis guidelines. Mitigation measures were designed to ensure compliance with the Forest Plan. All proposed treatment units meet or exceed Forest Plan standards and guides (“Section 3.10.6: Existing Condition”) and are expected to meet or exceed Forest Plan standards and guides following treatment if all mitigation measures are applied (“Section 3.10.7: Environmental Effects”).

Sampling Design. Post-treatment monitoring conducted by a soil scientist would only occur as requested by timber sale administrator as part of contract compliance (i.e., mitigation measures listed in Appendix E were not met by the operator). Soil resource measure would be assessed using the method strategy outlined in “Section 3.10.5.3: Field Data Collection.”

BMP Evaluation Program monitoring as described in the CWEs monitoring section would address soil properties under several of the evaluation procedures, such as those for skid trails (T02) and timber sale administration (T05).

Wildlife Adaptive Management and Monitoring

Proposed oak enhancement is an opportunity to facilitate healthy oak communities to improve forest ecosystem health, thereby enhancing suitable habitat for wildlife. The objective is to reduce competition around suppressed oak trees. The desired outcome of the treatment is recruitment of oak saplings and/or increase tree size, resulting in more fire resistant stands.

Sampling Design. Sites to be evaluated are identified by random or non-random sampling selection procedures. The random selection process for monitored sites involves looking at projects on the Feather River Ranger District.

Monitoring would occur by field reviews and photo points of the area to compare and evaluate the outcome of reduced competition. Photos would be used to record pre and post-treatment conditions.

Monitoring Frequency. Monitoring type and frequency is as follows: (1) visual monitoring at the time of treatment, (2) visual monitoring post-treatment, (3) visual comparison before and after treatment, and (4) continue post-treatment monitoring annually for a minimum of 3 years.

2.6 Alternatives Considered but Eliminated from Detailed Study

Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and resolving the need for action. Several alternatives suggested internally and by the public were considered but eliminated from detail, as they did not meet the purpose and need for the project as summarized below.

2.6.1 Alternative D

During the scoping period for the Sugarberry Project, one commenter suggested analyzing an alternative that would fully implement the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) ROD. The commenter stated that maintaining 50 percent canopy cover and not removing trees greater than 20 inches dbh—as called for by the 2001 ROD—would meet fire objectives and reduce impacts to species like the spotted owl and marten. In response to the commenter's concern, the IDT developed an alternative that would:

- Apply the standards and guidelines of the 2001 ROD for fuel treatments within 1.5 miles of communities at risk, an area that roughly corresponds with the Wildland Urban Interface established by the 2001 ROD.

- Retain a minimum of 50 percent canopy cover in DFPZ thinning units, as established by the 2001 ROD for several land allocations, including the General Forest Zone and Wildland Urban Interface Threat Zone (area from 0.25 to 1.5 miles from structures). Canopy would not be reduced more than 20 percent within urban zones and General Forest, and 10 percent within Home Range Core Areas (HRCAs), Old Forest Emphasis Area, and Stands of Large Trees with Moderate to Dense Canopy Cover (CWHR 5M, 5D and 6).

- Retain trees 20 inches dbh and larger in DFPZ and ITS thinning units, as established by the 2001 ROD for several land allocations, including the General Forest Zone and Wildland Urban Interface Threat Zone.

- Retain trees 12 inches dbh and larger in Old Forest Emphasis Areas, HRCAs, and Stands of Large Trees with Moderate to Dense Canopy Cover (CWHR 5M, 5D and 6) outside urban areas or defense zones.

- In DFPZs (areas within ¼ mile of urban areas), retain trees greater than 30 inches dbh with no canopy cover restrictions.

- Drop all Group Selection treatments in the project area.

The Sugarberry IDT recommended that this alternative be eliminated from detailed consideration because it would not fully meet the purpose or resolve the need for the project. This recommendation is based on the following:

- Retaining 50 percent canopy may potentially place the forest ecosystems and communities at increased risk of high intensity fires. The communities at risk within the Project Areainclude scattered residences in or adjacent to La Porte, Strawberry Valley, American House and Clipper Mills. Canopy would not be reduced more than 20 percent within these urban zones.

- Diameter limits of 20 inches dbh and below may not contribute to healthy all-age, multistoried, stands. The Project Area has an overabundance of mid-seral stage stands (middle size/age stands) and a deficiency in early and late seral stage. The desired condition would be a more diversified balance of landscape structure to include a higher proportion of shade intolerant species in the overstory and reduced crowding in the understory.

- Retaining trees over 12 inches dbh and larger within Old Forest Emphasis Areas, HCRAs and stands of large trees with dense canopy cover to preserve habitat for species with late seral requirements may be putting these areas at risk. The desired condition is to have insect and fire resilience and allow plant species that do not germinate in a dense stand the opportunity to grow and provide greater floral diversity.

- There are several communities within the Sugarberry Project Area reliant on forest products for jobs and revenues. Communities within Yuba, Sierra and Plumas Counties are isolated from urban job markets and depend on natural resource-based industries. Within the Sugarberry Project Area, forest health and community economic health share interdependent goals.

Several projects planned under the standards and guidelines of the 2001 SNFPA are currently being implemented on the Feather River Ranger District. As these projects are implemented, fire managers are finding that the restrictions on upper diameter limits, canopy minimum limits, and canopy cover reduction are limiting their ability to construct effective DFPZs in some cases. In order to retain 50 percent canopy, for example, fire managers have had to leave trees that connect fuels on the forest floor to the tree crowns.

These are often trees located beneath the drip lines of larger trees or immediately adjacent to the canopies of other trees which could increase the probability of crown fire behavior. Additionally, fuels prescriptions under the 2001 Framework projects were designed to burn with an average flame length of 6 feet or less if the stand were to burn under 90th percentile weather, except in the defense zone (1/4 mile from areas with a high density of residences) where it was 4 feet or less (SNFPA ROD 2001). The upper limit for direct attack by firefighters is 4 feet flame lengths and 6 foot for mechanized equipment, such as dozers and engines. Desired flame length condition for DFPZs is 4 feet or less under 90th percentile weather conditions regardless of location.

2.6.2 Alternative E

During the public comment period for the Sugarberry Project several commenters were concerned that proposed treatments would alter habitat components and reduce habitat suitability for the California spotted owl and other sensitive wildlife species. Several modifications of Alternative E were analyzed, specifically to look at how the treatments proposed would affect habitat suitability for the spotted owl, Northern goshawk, and carnivores. Variations considered modified treatments in suitable habitat types to reduce impacts to those species of concern. Three variations were analyzed; the first would have reduced removal of medium to large trees through the elimination of Group Selection in CWHR 5M and 5D habitat types across the project. The second would have reduced impacts in spotted owl HRCAs through the elimination of Group Selection in these habitat areas. The third would have eliminated Group Selection in both CWHR 5M and 5D habitat types and spotted owl HRCAs. All three variations would have retained 50 percent canopy cover across treatment units in the project where existing. All other treatments would remain the same as proposed in Alternative B. The differences in each variation as compared to Alternative B are shown below.

- **Variation 1. Elimination of Group Selection in CWHR 5** — Group Selection would not be implemented in stands dominated by medium to large trees (greater than 24-inches dbh) with moderate to dense canopy cover (CWHR stands 5M and 5D). Group Selection would be limited to approximately 615 acres. Canopy cover of units 905A and 905B would be reduced to 50 percent.

- **Variation 2. Elimination of Group Selection in spotted owl HRCAs** — Group Selection would not be implemented in stands located within HRCAs. Group Selection would be limited to approximately 475 acres. Canopy cover of units 905A and 905B would be reduced to 50 percent.

- **Variation 3. Elimination of Group Selection in CWHR 5 and HRCAs** — Group Selection would not be implemented in stands dominated by medium to large trees (greater than 24-inches dbh) with moderate to dense canopy cover (CWHR stands 5M and 5D) or in stands within HRCAs. Group Selection would be limited to approximately 295 acres. Canopy cover of units 905A and 905B would be reduced to 50 percent.

The variations of these alternatives were considered, but eliminated from further analysis because of reasons stated in Section 2.6.1 as well as the conclusion of cumulative effects presented in the 1999 HFQLG FEIS and assessed in the 2004 SNFPA FSEIS. This concluded that habitat changes would not result in the loss of viable California spotted owl habitat or other species of concern.

Group Selection harvest acres within CWHR Size Class 5 and HRCAs in Alternative B (the alternative with the greatest acreage of Group Selection harvest proposed) would consist of less than 5 percent of the total CWHR Size Class 5 and HRCA acres on public land within the Sugarberry Project area. Moreover, the U.S. Fish and Wildlife Service has concluded that owl populations in the Sierra Nevada are stable or increasing. Furthermore, analysis of the Sugarberry Project Area indicated that there would be little difference in owl habitat, at both a landscape or Project Area level, in treating stands to 40 percent versus 50 percent residual canopy cover. This is in part because the two units proposed for thinning to 40 percent canopy were not within HRCAs or stands dominated by CWHR Size Class 5M and 5D. The Sugarberry IDT recommended that this alternative be eliminated from detailed consideration because it would not fully meet the purpose or resolve the need for the project. This recommendation is based on the following:

- Layout challenges would likely further reduce total Group Selection acreage available from the northeastern portion of the Sugarberry Group Selection units which has extensive HRCAs while the southern half of the Project Area is covered by both HRCAs and CWHR 5M and 5D. By removing CWHR 5M, 5Ds and HRCAs, stands would often be broken into smaller areas. Most stands are already segmented into smaller pieces from protected areas including RHCAs, archeological and botanical controlled areas, and Northern goshawk and spotted owl Protected Activity Centers (PACs). Land available for Group Selection is limited in these areas.

- Additionally, acreage would likely be reduced from the above estimates due to the logistics required to do helicopter logging. It is estimated that one million board feet is generally required to implement a helicopter timber sale due to the expense of bringing in the machinery and the added expenses of logging by helicopter. The Sugarberry Project under Alternatives B and C currently has less than one million board feet of potential helicopter harvest, primarily between Howland Flat and Gibsonville. Lands in HRCAs, CWHR 5M and CWHR 5D cover much of the area planned for Group Selection helicopter logging. The reduced acres under the three variations of Alternative E may reduce timber volumes to a point making helicopter logging economically unfeasible. Although the aspen enhancement units are not within HRCAs or CWHR 5M/5D, their completion is unlikely without the added Group Selection volume required to have a helicopter sale.

- Implementation of biomass removal to treat existing fuels and activity-generated slash can be very costly, depending on the commercial value at the time of implementation and hauling costs (distance to market).

- There would be little change in habitat with this alternative due to the minor amount of nesting habitat acres affected by Group Selection in any of the variations proposed. It is estimated that the Alternatives B and C and G would impact less than 5 percent of total HRCA, and CWHR 5M and 5D habitat. Under Alternative B an estimate of 745 acres of Group Selection would lie within the 11,799 acres of HRCAs and CWHR 5M and 5D on public land. Additional habitat acres exist in the form of PACs (there are 22 spotted owl PACs in the Project Area). The variations of Alternative E would not greatly reduce impacts to owl habitat due to the small amount of harvest planned and the quantity of existing habitat in the area.

2.6.3 Alternative F

Alternative F represents the Proposed Action, as described in the June, 2006 Notice of Intent, legal notices and Scoping letters requesting public comment. The following proposed activities were included:

- Construct approximately 2,100 acres of DFPZ using mastication (300 acres), underburning (1,400 acres), hand cutting and pile burning (30 acres), and mechanical thinning and biomass removal (400 acres).

- Harvest 1,300 acres of Group Selection and 300 acres of area thinning in addition to the mechanical thinning in the DFPZs.

- Road improvements including reconstruction (27 miles), construction of new classified roads (3 miles), construction of temporary spurs (12 miles), and decommissioning unauthorized roads (4 miles).

- Improve health of unique plant communities: black oak enhancement (100 acres) and aspen enhancement (20 acres).

- Restore and enhance aquatic and riparian habitat by replacing six culverts, restoring meadows, stabilizing stream channels, and constructing one sediment settling pond.

A summary of the review and Forest Service responses to public issues are provided below:

- Total acres of DFPZ construction remains at approximately 2,100 acres. However, public comments and field verification of the areas proposed for treatment led to the following:

  – New units are proposed for fuel reduction around the town of La Porte (units LP1 and LP2) and along road SC 690 (units 914B and 914C) in response to concerns about existing fuel conditions near the community.

  – Treatment of approximately 850 acres was changed from underburning to mechanical treatment (e.g., mastication or hand cut tractor pile). These changes are recommended because available burn windows often do not allow fire managers sufficient time to complete scheduled prescribed burning. Use of mechanical treatments in these areas would achieve desired fuels objectives and allow greater flexibility during implementation.

  – Lack of volume and canopy cover on approximately 150 acres of the DFPZ thinning units led the IDT to change the prescription in these units to mastication and hand cut tractor pile.

- Acres of area thinning decreased from 300 to 155 acres to avoid impacts to archaeological resources, Forest Service Region 5 listed Sensitive plants, or riparian areas.

- Acres of Group Selection decreased from 1,300 to 1,040 acres because:
  - Field review indicated that some areas were not suitable for Group Selection due to the number of large trees or placement constraints.
  - Dropping groups was necessary to avoid impacts to archaeological resources, rare plants, or riparian areas.
- Two initially proposed culvert replacements and one streambank stabilization project were dropped from further consideration because field review indicated that the areas had healed naturally and were not in need of restoration.
- Field review identified a fish barrier on Pearson Ravine; replacement of this structure has been added to the proposal.

Because of the extent of these changes, the IDT eliminated Alternative F from further detailed study. Determinations made during the evaluation of this alternative aided in refining the range of treatments included under Alternative B, described in the Sugarberry Project DEIS and 2008 FEIS.

2.7 Comparison of Alternatives Considered in Detail

2.7.1 Summary of Environmental Consequences Related to Project Objectives and Issues

The environmental effects of each alternative disclosed in the Sugarberry Project Final Environmental Impact Statement (FEIS) are summarized below in Table 2.5. The summary presents the predicted environmental consequences of each alternative relative to the purpose objectives, the Significant Issue and the Minor Issues considered effective to depict similarities and differences between the alternatives to provide a clear basis for a Federal decision. A comprehensive description of environmental consequences is described in Chapter 3.

Table 2-5. Comparison of Alternatives Considered in Detail

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Purpose and Need				
Protect rural communities and forest ecosystems from high-intensity wildfires				
Fuel loading (tons per acre)	11.1	5.2	5.2	5.2
Fire type (crown or surface)	Crown	Surface	Surface	Surface
Promote a healthy all-aged, multistoried, fire-resilient forest				
Tree species composition	Maintain movement towards increased shade-tolerant species	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions	Initiate shift towards increased shade intolerant species; shift towards healthy forest conditions

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Stand density	Long-term increase in stand density	Decrease in stand densities. Removal of most trees <9 inches dbh in ITS and DFPZ units; Removal of trees 9–30 inches in patches in Group Selection units	Same as Alternative B with the following exceptions: *20 fewer GS acres *5 fewer ITS acres	Same as Alternative B with the following exceptions: *20 fewer GS acres *5 fewer ITS acres
Basal area of specific units (Trees per acre [TPA])	**AVERAGE** **CWHR 4s & 5s:** Average of >1000 TPA <10 inches dbh; Average TPA >10 inches dbh = 100 Basal area = 280 sq. ft./acre	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60-100 Basal area per acre= 200-260 $ft^{2/}$ **Group Selection:** TPA>30 inches dbh = 11–12 Basal area per acre=120 sq. ft.	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60–100 Basal area per acre= 200–260 ft^2 **Group Selection:** TPA>30 inches dbh =11–12 Basal area per acre=120 sq. ft.	**DFPZ and ITS CWHR 4s & 5s:** Most TPA <10 inches dbh removed; TPA >10 inches dbh= 60–100 Basal area per acre= 200–260 ft^2 **Group Selection:** TPA>30 inches dbh =11–12 Basal area per acre=120 sq. ft.
Structure (horizontal and vertical arrangement of canopy layers within stand)	Overlapping canopy layers with average canopy cover of 60%; Continuous vertical canopy layers (understory to mid-story to overstory ladder fuels)	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.	Reduce canopy cover to 40–50% in DFPZ & ITS thinning units; reduce understory layers in all DFPZ units by removing trees <9 inches dbh.
Landscape age class distribution	Long-term maintenance of mid-seral stands across the project area; approximately 60% in mid-seral stands	Initiate shift to all-aged forest; 2% increase to early seral through Group Selection 1% acreage change from mid seral to late seral through DFPZ and ITS	Initiate shift to all-aged forest; 2% increase to early seral through Group Selection 1% acreage change from mid seral to late seral through DFPZ and ITS	Initiate shift to all-aged forest; 2% increase to early seral through Group Selection 1% acreage change from mid seral to late seral through DFPZ and ITS
Contribute to the stability and economic health of rural communities				
Number of jobs created	0	528	519	518
Employee related income created (dollars in thousands)	0	$22,698,921.	$22,271,251.	$22,288,021.
Net harvest value (dollars)	0	$368,464	$356,032	$356,032
Promotes the Health of unique plant communities, specifically aspen, and black oak.				
Acres of aspen stands treated	0 Acres 0% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area	20 Acres 100% of total aspen acres in Sugarberry Project Area

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Conifer encroachment of aspen	High encroachment; aspen stand size shrinking 13% of total basal area is aspen Aspen=25% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA	Potential to increase aspen stand size; risk of stand loss reduced 71% of total basal area is aspen Aspen=85% of total TPA
Acres of black oak treated	0	100	100	100
Promote healthy aquatic and riparian ecosystems				
Miles of fish-accessible aquatic habitat in Potosi Creek stream network.	1.2	2.7	2.7	2.7
Miles of accessible aquatic habitat in Pearson Ravine stream network.	1.0	2.0	2.0	2.0
Miles of accessible aquatic habitat in Rock Creek stream network.	5.6	7.1	7.1	7.1
Miles of accessible aquatic habitat in Gold Run Creek stream network.	2.1	2.4	2.4	2.4
Miles of accessible aquatic habitat in Fish Meadow Creek stream network.	1.8	2.3	2.3	2.3
Acres of meadow in improved condition	0	7	7	7
Significant Issue				
Watershed Condition: Avoid moving subwatersheds near or over the Threshold of Concern (TOC) for Cumulative Watershed Effects				
Number of subwatersheds approaching TOC	3	4	5	5
Number of subwatersheds over TOC	1	2	1	1
Minor Issues				
Defensible Fuel Profile Zone Effectiveness				
Flame length (feet)	>6	<4	<4	<4
Canopy base height (feet)	2.5	19.8	19.8	19.8

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Economic Feasibility				
Harvest costs (dollars)	N/A	$5,562,989	$5,457,516	$5,457,516
Non-harvest costs linked to DFPZ construction (dollars)	N/A	-$1,281,250	-$1,281,250	-$1,313,750
Total project value (dollars)	N/A	-$912,786	-$925,218	-$957,718
Aquatic, Riparian and Water Quality				
Percent of Gold Run Creek and Fish Meadow treatment areas in stable or vegetated condition.	0–25	>50	>50	>50
Percent of Upper Dutch Diggings treatment area in vegetated condition	<50	>50	>50	>50
Upper Dutch Diggings sediment catchment capacity in cubic yards.	Insufficient to capture sediment in the Rabbit Creek system	Increase by 25,000 - 50,000 cubic yards	Increase by 25,000 - 50,000 cubic yards	Increase by 25,000 - 50,000 cubic yards
Heritage Resources				
Potential risk to heritage resources in treatment areas	N/A	Low potential; Known sites fully protected	Low potential; Known sites fully protected	Low potential; Known sites fully protected
Wildlife Habitat and Species				
Potential percent reduction of total HRCA acres in Sugarberry Project Boundary	N/A	≤5%	≤5%	≤5%
Potential percent reduction of total CWHR 4M & 4D acres in Sugarberry Project Boundary	N/A	≤3%	≤3%	≤3%
Potential percent reduction of total 5M & 5D acres in Sugarberry Project Boundary	N/A	≤5%	≤5%	≤5%
Potential percent reduction of total carnivore network acres in Sugarberry Project Boundary	N/A	1%	1%	1%

Measurement Indicators	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C	Alternative G
Botanical Resources				
Potential risks to listed Threatened, Endangered, or Proposed plant species	N/A	No Effect Listed species not present	No Effect Listed species not present	No Effect Listed species not present
Potential risks to US Forest Service, Region 5 listed Sensitive plant habitat and species (acres affected)	N/A	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance	Potential for physical damage to *Lupinus dalesiae* (Quincy Lupine) on 0.2 acres. High disturbance tolerance
Oak Retention	N/A	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh	Residual Basal Area = 25 to 35 sq. ft. per acre for oaks >9” dbh
Noxious weeds proliferation	N/A	Known sites would be avoided	Known sites would be avoided	Known sites would be avoided
Long-term soil productivity				
Effective soil cover in treatment areas (percent)	All proposed treatment units exceed Forest Plan Standard and Guides.	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation.	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation	Soil cover reduced 9-27%, except in unit 908 (41%) All proposed treatment units would exceed Forest Plan Standard and Guidelines with mitigation

Notes:

a. CWHR = California wildlife habitat relationships.

b. TPA = Trees per acre.

c. BA = Basal area.

d. HRCA = Home Range Core Area.

e. dbh = Diameter at breast height (4 ½ feet above root collar)

1. Protect Rural Communities and Forest Ecosystems from High-Intensity Wildfires

There are many uncertainties associated with predicting fire behavior. While the models can be used to show a relative difference in predicted fire behavior between the No-action and action alternatives, there are limitations to the models themselves and the coarse-scale data used to predict fire behavior. Although Alternatives B, C and G were modeled reflecting the respective differences in stand conditions, the minor differences in treatment extent and method are not sufficient to demonstrate unique alternative fire behavior prediction outputs. All action alternatives would act to reduce fuel loading by approximately 50 percent compared to existing conditions. All action alternatives would also modify fire type from the existing crown type to surface type post-operations, with corresponding reductions in flame length from >6 feet to <4 feet and a 13 percent increase in canopy base heights.

2. Promote a Healthy All-Aged, Multi-storied, Fire-Resilient Forest

Tree species composition. Under the No-action alternative (Alternative A), the presence of shade intolerant species, such as ponderosa pine or Jeffrey pine and other fire resistant tree species would continue to decrease. Both action alternatives would increase the number of shade intolerant species, thereby shifting stands towards historical reference conditions.

Stand density and structure. The no action alternative would retain continuous vertical canopy layers (understory to mid-story to overstory ladder fuels) in proposed treatment units with many areas averaging over 1,000 trees per acre (TPA). Basal area would average 280 square feet. Under the No-action alternative, canopy cover averages approximately 60 percent.

Alternatives B, C, and G would remove most of the understory trees within DFPZ and ITS treatment units and leave approximately 60–100 trees per acre. Group Selections would retain an average of 11 to 12 trees per acre greater than 30 inches dbh in the action alternatives. Alternatives B, C and G would reduce basal area to approximately 200–260 square feet in thinning units and to an average of 120 square feet in Group Selections. Canopy cover would be reduced to 40 or 50 percent in DFPZ and ITS thinning units respectively. Alternatives B, C and G would have similar silvicultural prescriptions. However, Alternatives C and G would exhibit a 20 acre reduction in Group Selection (GS) and a 5 acre reduction of ITS compared to Alternative B.

Landscape age class distribution. The No-action alternative would maintain stands in the Sugarberry Project Area with mid-seral stand characteristics. Alternatives B, C and G would result in reduced canopy cover in DFPZ & ITS thinning units. Thinning to promote tree growth into larger size classes and Group Selection to regenerate areas would initiate a shift to an all-aged forest. Under all of the action alternatives there would be a 2 percent acreage increase to early seral through Group Selection and a 1 percent acreage change from mid-seral to late seral through DFPZ and ITS.

3. Contribute to the Stability and Economic Health of Rural Communities

The number of direct and indirect jobs created would be higher in Alternative B than Alternatives C or G. Alternative B would create 528 jobs. Alternative C would create 519 jobs, and Alternative G would create 518 jobs. The amount of employee related income would similarly be more with Alternative B, estimated to generate $22,698,000. This is largely due to the amount of Group Selection and ITS acres that would be dropped under Alternatives C and G.

4. Promote the Health of Unique Plant Communities, especially Aspen, and Black oak

The Sugarberry Project Areawould continue to experience high conifer encroachment and shrinking aspen and black oak stands under the No-action alternative. The number of aspen acres treated would be 0 acres under the No-action alternative and 20 acres under the action alternatives. The action alternatives would give aspen stands the potential to increase in size, thereby reducing the risk of this unique and uncommon ecotype and habitat in the Sugarberry Project Area. Under the No-action alternative 0 acres of black oak would be treated, versus 100 acres under the action alternatives.

5. Promote Healthy Aquatic and Riparian Ecosystems

Under the No-action alternative, 0–25 percent of the area of the Gold Run Creek and Fish Meadow restoration sites would be in a stable or vegetated condition. Less than 50 percent of the Upper Dutch Diggings area would be in a vegetated condition, with an unknown but insufficient sediment catchment capacity. Following the successful implementation of either action alternative, the area of the Gold Run Creek and Fish Meadow sites in a stable or vegetated condition would be greater than 50 percent. More than 50 percent of the Upper Dutch Diggings area would be in a vegetated state and the sediment catchment capacity would increase by 25,000–50,000 cubic yards under the action alternatives. No meadow improvement would be accomplished under the No-action alternative. Under all action alternatives, the condition of 7 acres of meadow would be improved and 16.5 miles of aquatic habitat would become accessible.

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This Chapter summarizes the physical, biological, social, and economic environments within the Sugarberry Project Area, along with the potential for environmental effects linked to each alternative. Chapter 3 also presents the scientific and analytical basis for comparison of the alternatives presented earlier in the Sugarberry Project FEIS, Chapter 2.

Each resource section below provides a summary of the project-specific reports, assessments, and input prepared by Forest Service specialists, incorporated by reference as pertinent information to this Final Environmental Impact Statement (FEIS). The following reports and memoranda are incorporated by reference: Botanical Biological Evaluation, Botany Report, and Noxious Weed Risk Assessment; Biological Assessment / Biological Evaluation (BA/BE) for Fish and Wildlife; Management Indicator Species Report; Neotropical Species Report; Human Health and Safety Risk Assessment, Hydrology Report; Silviculture Appendices; Soils Report; Fire and Fuels Report; Recreation, Visuals, Lands, and Minerals Report; Roads Analysis Assessment; Economic and the Heritage Resources Reports. These reports or memoranda are part of the Sugarberry Project Record, on file at the Feather River Ranger District in Oroville, California.

3.1.1 Scope of Analysis

The "Affected Environment" section under each resource topic describes the existing, or baseline condition against which environmental effects were evaluated and from which progress toward the desired condition can be measured. Environmental consequences form the scientific and analytical basis for comparison of alternatives, including the proposed action, through compliance with standards set forth in the 1988 *Plumas National Forest Land and Resource Management Plan* (LRMP) (also referred to as the "Forest Plan"), as amended, and a summary of monitoring required by NEPA and *National Forest Management Act of 1976* (within Silviculture appendices on file at the Feather River Ranger District). The environmental consequences discussion centers on direct, indirect, and cumulative effects, along with applicable mitigation measures. Effects can be neutral, beneficial, or adverse. These terms are defined as follows:

- **Direct effects** – caused by the action and occur at the same place and time as the action.
- **Indirect effects** – caused by the action and are later in time, or further removed in distance, but are still reasonably foreseeable.
- **Cumulative effects** – those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.
- **Irreversible commitments of resources** – permanent or essentially permanent resource use or losses. They cannot be reversed, except in the extreme long term. Examples include mineral extraction or loss of soil productivity.
- **Irretrievable commitments of resources** – losses of productivity or use for a period of time. One example is road construction on suitable timber lands. Timber growth on the land is irretrievably lost while the land is used as a road, but the timber resource is not irreversibly lost because the land could grow trees again in the near future.

3.1.2 Description of Alternatives

The following are brief descriptions of the alternative management scenarios analyzed for this proposal.

- **Alternative A** (the No-action alternative) addresses the NEPA requirement to analyze a No-action alternative and the potential effects of taking no action.

- **Alternative B** (the Proposed Action) calls for the reduction of fire hazards around rural communities by constructing approximately 2,100 acres shaded Defensible Fuel Profile Zones (DFPZs), including 375 acres of hand cut, tractor pile and pile burning. Alternative B would harvest trees from an estimated 1,040 acres using group selection and 155 acres using individual tree selection (ITS) silvicultural methods. Associated road system improvement work including 0.6 miles of new road construction, 25.3 miles of road reconstruction, 21.7 miles of new temporary road construction, and 4.7 miles of road decommissioning would be performed. This Alternative includes a range of aquatic and wildlife habitat improvement activities, including enhancing 7 acres of meadows, 20 acres of aspen and 100 acres of black oak stands, and removing or upgrading culverts to provide for fish passage.

- **Alternative C** would modify the Sugarberry Proposed Action to reduce disturbance in watersheds over Threshold of Concern (TOC), and in one subwatershed that would exceed TOC under the proposed action. Alternative C calls for the reduction of fire hazards around rural communities by constructing approximately 2,100 acres of DFPZs, including 250 acres of hand cut, tractor pile and pile burning. Alternative C would use group selection on approximately 1,020 acres (20 acres less than Alternative B), and individual tree selection on about 150 acres (5 acres less than Alternative B). It would also change the timber harvesting system of 15 acres of ITS and groups within the ITS matrix from ground-based equipment to a helicopter harvesting system. Associated road system improvement work including 0.6 miles of new road construction, 25.3 miles of road reconstruction, 21.0 miles of new temporary road construction, and 4.7 miles of road decommissioning would be performed. Black oak and meadow enhancement, aspen release treatments, and fish habitat improvements are identical to Alternative B.

- **Alternative G** includes identical activities and management practices as Alternative C, with one exception. Alternative G incorporations 11.5 miles of road decommission (6.8 miles more than Alternatives B and C) to further reduce risks of disturbance in watersheds over Threshold of Concern (TOC).

3.1.3 Cumulative Effects Analysis

The cumulative effects analysis area varies for each resource. Past activities are considered part of the existing condition and are discussed in the “Affected Environment (Existing Conditions)” and “Environmental Consequences” section under each resource. Appendix G, Map 6 “Planned EM Projects” depicts the DFPZ projects on the Feather River Ranger District that are in progress, planned, or proposed. The analysis of cumulative effects is consistent with the direction provided in the Council on Environmental Quality's (CEQ) June 24, 2005, memorandum titled, “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis.”

In the memorandum, the CEQ provides guidance on the extent to which federal agencies are required to analyze the environmental effects of past actions when they describe the cumulative environmental effects of a proposed action in accordance with Section 102 of the NEPA and the CEQ regulations for implementing the procedural provisions of NEPA, 40 Code of Federal Regulations (CFR) parts 1500-1508. The CEQ memorandum is hereby incorporated by reference.

3.2 Air Quality

3.2.1 Introduction

Prescribed fire is one of the primary activities proposed for the Sugarberry Project that would have a direct impact on air quality. Prescribe burning would be conducted during fall, spring, or winter—the most favorable times in terms of smoke dispersion. A secondary source of impacts on air quality would be from dust and internal combustion engine emissions during project harvest, mastication, and road construction activities.

3.2.2 Regulatory Framework

Air quality is managed through a complex series of federal, state, and local laws and regulations. The U.S. Environmental Protection Agency (EPA) has the primary federal role of ensuring compliance with the requirements of the *Clean Air Act*. The EPA issues national air quality regulations, approves and oversees State Implementation Plans, and conducts major enforcement actions. State and local Air Pollution Control Districts and Air Quality Management Districts (AQMDs) have the primary responsibility of carrying out the development and execution of State Implementation Plans, which provide for the attainment and maintenance of air quality standards.

The original *Air Quality Act* was passed in 1963. This act was followed by the *Clean Air Act* and its amendments of 1970, 1977, and 1990. The *Clean Air Act* is the primary legal instrument for air resource management. It requires the EPA to identify pollutants that have adverse effects on public health and welfare, and to establish air quality standards for each pollutant. The EPA has issued National Ambient Air Quality Standards for sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, lead, and particulate matter (PM) that is 10 microns (PM_{10}) in diameter or smaller. If the National Ambient Air Quality Standards are violated in an area, that area is designated as “non-attainment” for that pollutant, and the state must develop a plan for bringing that area back into “attainment.” Title 17 of the California Air Pollution Control Laws sets similar standards for these pollutants as follows:

The 1977 *CleanClean Air Act* amendments set up a process to designate Class I and Class II areas for air quality management (referred to as airsheds). Class I areas receive the highest levels of protection under the Prevention of Significant Deterioration program, which regulates air quality through application of criteria for specific pollutants and use of the Best Available Control Methods. Class I areas include international parks, national parks larger than 6,000 acres, and national wilderness areas larger than 5,000 acres.

The 1990 amendment of the *Clean Air Act* published the General Conformity Determination. It states that in federal non-attainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination that the emissions will not exceed a *de minimis* (threshold) level measured in tons per year must be made. If the action exceeds the *de minimis* level, then a conformity determination is required to document how the federal action will not (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below *de minimis* levels, the project would be considered exempt from conformity determination with the State Implementation Plan.

Activities that may affect air quality in the project area are (1) prescribed burning on National Forest System lands for reforestation, hazard reduction, and wildlife habitat improvement; (2) dust from construction and use of unpaved roads and harvest activities; and (3) wildfire occurrences.

On the Plumas National Forest, the 1988 *Plumas National Forest* LRMP (also referred to as the "Forest Plan," p. 4-46), the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS), and the 1999 *Herger-Feinstein Quincy Library Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) Final Environmental Impact Statement (FEIS) provide direction for coordination and cooperation with local AQMDs.

The following operating procedures are directed by the HFQLG Act FEIS (1999) and the SNFPA FEIS (2004):

- Mitigate dust from project activities by including standard dust abatement requirements in sale and project contracts.
- Conduct prescribed burns when favorable smoke dispersal is forecasted, especially near sensitive Class I areas.
- Use appropriate smoke modeling software to predict smoke dispersion.
- Minimize smoke emissions by following Best Available Control Methods.
- Avoid burning on high visitor use days and notify the public before burning.
- Consider alternatives to burning.
- Incorporate burn plan data into appropriate modeling software.
- Comply with Title 17 of the 2004 California Air Pollution Control Laws and interim air quality policy and local smoke management programs.
- Follow the Memorandum of Understanding on prescribe burning with the California Air Resources Board (CARB) and the U.S. Department of Agriculture (USDA) Forest Service, Pacific Southwest Region.

3.2.3 Methodology for Assessing Impacts on Air Quality

3.2.3.1 Scope of the Analysis

The analysis for the Sugarberry Project uses one indicator for air quality: criteria pollutant totals required for compliance with federal, state, and local laws and regulations.

The air quality analysis area has the potential to be affected by smoke emissions, fugitive dust, and emissions from proposed treatments. This includes both the project area and the air basins in which the project area is located. The project area lies entirely within the Mountain Counties Air Basin (see Figure 3-1) which is administered by local AQMDs with oversight regulation by the CARB (see Figure 3-2). The Sugarberry Project is located in the Northern Sierra and Feather River AQMDs.

The air quality analysis for activities associated with each alternative includes the identification of adjacent and downwind air basins of concern (class one and non-attainment areas), comparison of the amount of smoke and PM to be produced as a result of fuels treatment and other project activities in DFPZ, group selection and ITS units, and a discussion of the consequences of wildfire produced emissions compared to prescriptive fire.

3.2.3.2 Analysis Methods and Assumptions

The predicted emissions from prescribed burning and harvest emissions in the proposed project area have been estimated using emission factors from EPA Document 42 and are based on an estimated 90 percent consumption of machine and hand piles and 85 percent of surface fuels for underburning. Underburning would be done over a period of 5 years; the amount of particulates is based on approximately 500 acres burned annually. The prescribed fire would be done in the spring, fall, or winter months because these are the best times of year for dispersion. Each year the burning would take place over a period of months, with treated areas spread throughout the project area.The following are the assumptions used for determining emissions from timber operations and prescribed burns:

- The emission factors used to determine effects from the project were taken from EPA Document 42 (EPA 1995) for prescribed burning, and from the *National Environmental Policy Act Air Quality Desk Reference Guide* (CH2M Hill 1995; Table 3.3.2-1 for timber harvest operations).
- All harvest thinning equipment will be diesel powered, and thinning treatments will occur over a 3-year period.
- Harvest operations include harvesting, processing, skidding, loading, hauling, and road construction.
- Slash piles are constructed free of dirt, with 90 percent consumption.
- The emissions from burning will result from burning approximately 500 acres annually on a 5-year plan and would not be continuous (i.e., separated by space and time).
- There will be emissions from daily burning on approximately 100 acres.

3.2.4 Existing Conditions

The Sugarberry Project area is located in three counties Plumas, Sierra, and Yuba counties, California. The project has approximately 1,340 acres in Plumas, 853 acres in Sierra and 632 acres in Yuba County. The Plumas and Sierra counties are in the Northern Sierra AQMD. Yuba County is in the Feather River AQMD. Currently all three counties are in attainment status of the National ambient air quality standards for ozone, PM_{10}, carbon monoxide, sulfur dioxide, lead and nitrogen dioxide. Hence, the general conformity rule does not apply to the Sugarberry project.

Climatic conditions in the project area are governed by a combination of large- and small- scale factors. Among the large-scale factors are the latitude, prevailing hemispheric wind patterns, and extensive mountain barriers to the east. Large-scale airflow is generally westerly throughout much of the year.

Small-scale or local factors include drainages as well as vegetation cover (Schroder and Buck 1970). During the summer, winds over the proposed project area are typically southwest from the Sacramneto River Delta. Temperature inversions are rare. When they do occur, they are usually in the early morning, breaking up by mid-morning. Local upcanyon, up valleywinds are prevelant during the remaining months with occasional (less than 20 % of the time) northerly and easterly winds. These surface air flow patterns account for pollution transport between the Sacramento Valley and Sierra foothills and mountains.

The community of Strawberry Valley lies one mile west, Clipper Mills is three miles southwest, and Challenge lies approximately six miles southwest from the Sugarberry project boundary. The nearest school is in the community of Challenge. The communities of La Porte and American House are within the project boundary. La Porte is a high-use recreation area in both summer and winter months. The nearest air quality monitoring stations are in the communities of Quincy, approximately 15 miles north, and Portola, approximately 25 miles east of the project area. Air quality is good most of the year in these communities, although some areas are affected by wood smoke in the winter months.

Lassen National Park, approximately seventy miles north of the Sugarberry project area, is the closest Class 1 airshed. No previous prescribed burns on the Feather River Ranger District have had an impact on the air quality of the Park or result in smoke complaints.

Air quality can be severely impacted by PM and other pollutants during large wildfire events. Impacts from the 1999 Pendola Fire on the Plumas and Tahoe National Forests affected air quality 60 miles away in Sacramento, California. Fugitive dust caused by construction and use of unpaved roads can produce PM_{10} in quantities great enough to impair the visual quality of the air. These effects are localized and can be mitigated by effective dust abatement methods. Dust generated by skidding, loading, and site preparation activities also contributes to fugitive dust; however, the level contributed by these activities is unknown.

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Source: California Air Resources Board, http://www.arb.ca.gov/maps/adistbw.pdf

Figure 3-1. California air basins and counties.

Source: California Air Resources Board, http://www.arb.ca.gov/maps/adistbw.pdf

Figure 3-2. California AQMDs and counties.

3.2.5 Environmental Consequences

3.2.5.1 Alternative A (No Action)

Direct and Indirect Effects. Under this alternative, no increase in ozone precursors or PM_{10} emission levels would be produced from prescribed burning of activity-generated fuels, harvest operations, or understory burning. Alternative A would not result in a reduction of surface fuels, so the potential for substantial degradation of air quality from future wildfire would not be reduced. The no-action alternative would not provide any opportunities for reducing existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a wildfire, air quality degradation can exceed federal and state standards. Plume-dominated wildfires frequently occur under very stable atmospheric conditions, which tend to disperse smoke. These occurences can not be regulated by local AQMDs. The potential ozone precursors from a wildfire are shown in Table 3-1.

Table 3-1. Potential ozone precursors and PM10 from wildfire emissions for a 500 acre wildfire.

Nitrogen Oxides	Volatile Organic Compounds	Particulate Matter (PM_{10})
37 tons	104.9 tons	239.3 tons

Cumulative Effects. Under Alternative A, the project area would be subjected to long-term deposition of surface fuels. Forest fuels would continue to increase as biomass production out-paces decomposition rates in this climate. Due to the continuous accumulation of forest fuels, there is an inevitable probability of long-term chronic effects from wildfires by potentially creating higher PM_{10} emissions due to large areas of exposed soil and ash in the aftermath of a high-intensity wildfire.

3.2.5.2 All Action Alternatives

Direct Effects. Two methods of prescribed burning would be used to accomplish fuel load reduction: underburning and pile burning (piles created by machine and by hand). Underburning would be used to reduce both natural and activity-generated fuels where it is neither cost effective nor physically practical to pile and burn. The objective of underburning would be to reduce fuel loadings while protecting the residual overstory trees from damage caused by heat, flames or equipment. Pile burning would produce less PM per acre than underburning because piled material can be ignited with lower fuel moistures, which ensures complete and efficient consumption.

The release of PM into the air during prescribed burning can have adverse effects on visibility and public health. As described above, the volume of PM is related to which burning method is used and the extent of the burning. Particulate concentrations in the Sacramento Valley air basin (see Figure 3-1 above) are influenced by climatic conditions and other emission-generating activities carried out in the air basin. Particulate concentrations are regulated through compliance with the CARB and local AQMDs.

The prescribed burning proposed in all action alternatives would be used to reduce fuel loadings to an acceptable level. Under favorable smoke-dispersal conditions, the smoke would likely affect air quality during ignition and for approximately three days following ignition. Another impact of all action alternatives would be the emissions and dust caused by project activities. Emissions from burning and equipment used for other project activities (such as thinning and road construction) may be occurring at the same time, which would elevate PM_{10}. By following the burn plan and AQMD requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the two AQMDs. The prescribed fire proposed for the Sugarberry Project would produce a total of 34.03 tons of volatile organic compounds, 12.0 tons of nitrogen oxides, and 77.61 tons of PM_{10} annually (see Table 3-2).

The annual criteria pollutant totals for timber operations (emissions from trucks and other equipment) would vary according to the acres of treatments performed each year (Table 3-2). Table 3-4 presents the total criteria pollutants for prescribed burning and timber operations. The Sugarberry Project is exempt from conformity determination. Emission levels are not mandated in the project area because Plumas, Sierra, and Yuba Counties are in attainment for all air pollutants.

Table 3-2. Annual criteria pollutant totals (prescribed burning [approximately 500 acres annually]).

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	12.0	34.03	77.61
2	12.0	34.03	77.61
3	12.0	34.03	77.61
4	12.0	34.03	77.61
5	12.0	34.03	77.61

Table 3-3. Criteria pollutant totals, timber operations (by alternative).

Alernative	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
B	57.65	2.94	3.66
C	56.43	2.88	3.58
G	56.49	2.88	3.58

Table 3-4. Annual criteria pollutant totals for timber operations and prescribed burning combined.

Year	Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
	Tons		
1	26.05	29.22	78.65
2	26.05	29.22	78.65
3	26.05	29.22	78.65
4	10.5	28.36	77.61
5	10.5	28.36	77.61

Table 3-5 shows estimated emissions from the burning in the project area that would be done on a daily basis, at any given time. The assumption is that no more than 100 acres would be burned on any given day; this is based on previous burning experience on the Feather River Ranger District.

Table 3-5. Daily criteria pollutant total (prescribed burning [approximately 100 acres daily]).

Nitrogen Oxides	Volatile Organic Compounds	PM_{10}
Tons		
2.40	6.81	15.52

Indirect Effects. In the event of a wildfire, the stands in the Sugarberry Project area that were treated by mastication, pile burning, or underburning would produce less PM emissions than untreated areas outside the project area.

Cumulative Effects. The volatile organic compounds, nitrogen oxides, and PM_{10} emissions from all action alternatives would contribute to PM loading locally and regionally. Local effects include cumulative emissions from prescribed burning resulting from past practices, natural surface fuel buildup, and activities on federal, state, and private lands near the Sugarberry Project area. The PM_{10} atmospheric concentrations currently do not exceed national standards; however, emissions could exceed CARB standards if (1) weather conditions predicted by CARB meteorologists do not prevail, or (2) emissions do not disperse as predicted, and/or (3) emissions from other AQMDs adversely impact air quality in local districts. Forest Service and CARB smoke-dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework.

3.2.6 Past, Present, and Reasonably Foreseeable Future Actions

Past prescribed burning projects in and around the Sugarberry Project area would have no effect on current air quality because of the temporal effects of dead and live biomass combustion. There are other prescribed burning projects planned on the Plumas National Forest that would be occurring during implementation of the Sugarberry Project. The local AQMDs would regulate prescribed burning on private property and on other National Forest System lands that are close enough to impact and/or worsen emissions in the two Air Basins during Sugarberry Project implementation. Any cumulative effects from burning in the Sugarberry Project area would be temporary and, when performed in accordance with AQMD regulations, would not violate any air quality standards.

3.2.7 Summary of Cumulative Effects

Without considering the possibility of future wildfires, the no-action alternative would have no cumulative effects on PM and visibility. The action alternatives would have cumulative effects on air quality in the project area and local air basin (Sacramento Valley), but the effects would be within the regulatory standards of the CARB. Dust and emissions from project activities would be mitigated by requiring that standard operating procedures be included with timber sale or service contract packages. The cumulative effect of all action alternatives is that PM10 and PM2.5 would contribute to PM loading locally, regionally as well as up to 60 miles around the project area itself.

Emissions could possibly reach areas such as Feather Falls, Strawberry Valley, La Porte and other smoke sensitive areas. These effects would be reduced by using the nine operating procedures mentioned in the regulatory framework as well as by working with the local AQMDs. Local effects include cumulative emissions from prescribed burning conducted on Federal, State and private lands near the Sugarberry Project Area. The PM_{10} and $PM_{2.5}$ atmospheric concentrations currently do not exceed national standards. However, emissions could exceed CARB standards if: (1) weather conditions predicted by CARB meteorologists do not prevail, (2) emissions are not dispersed as predicted, and/or (3) emissions from other AQMDs adversely impact air quality in local districts. Forest Service and CARB smoke dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework. Without considering the possibility of future wildfires, the no-action alternative would have no cumulative effects to PM and visibility. The action alternatives could have cumulative effects to air quality in the project area and local air basins (Sacramento Valley and possibly Mountain Counties air basin), but these impacts would be managed within CARB regulatory standards. Dust from the project activities would be mitigated by standard operating procedures through sale and other project contracts.

3.3 Vegetation, Fire and Fuels

3.3.1 Introduction

The Sugarberry Project proposes to reduce fire hazards around the rural communities of Strawberry Valley, American House, Clipper Mills, and La Porte. These communities have been identified as being at risk of wildland fire in Yuba, Plumas, and Sierra Counties' Community Wildfire Protection Plans, which were developed through a collaborative effort among state, local, and federal agencies with fire protection responsibilities, and with other interested stakeholders. Fire hazards would be reduced by constructing DFPZ shaded fuelbreaks using a variety of fuel manipulation techniques, such as tree harvest and biomass removal; mastication; manual hand cutting, tractor and hand- piling, and burning piles; and prescribed underburning. Other activities proposed for the Sugarberry Project are tree harvesting in the group selection and ITS units in order to achieve an uneven-aged management strategy to regenerate fire-resilient species; aspen regeneration treatments, oak habitat enhancement treatments, road system improvement and closure work that would aid fire suppression resources in accessing future wildland fires; and aquatic habitat improvement activities and meadow enhancement.

3.3.2 Regulatory Framework

The Sugarberry Project would contribute to fulfilling the long-term goals of the National Fire Plan of protecting communities at risk from wildfire and restoring ecological health on federal lands. The Feather River Ranger District has been collaborating with private land owners and the Fire Safe Councils in Yuba, Plumas, and Sierra Counties to design and implement fuel reduction projects on private lands, with the intent of improving connectivity of fuels treatments in the Sugarberry Project Area.

The Sugarberry Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest LRMP, as amended by the 1999 Record of Decision (ROD) HFQLG Act FEIS, and the 2004 ROD SNFPA FSEIS. Additionally, Table 2 of the SNFPA ROD includes direction for designing and implementing fuel and vegetation management activities within each of the various land allocations applied to the *Herger-Feinstein Quincy Library Group* (HFQLG) Pilot Project. Hence, the standards and guidelines for fuels and vegetation management activities stated in Table 2 of the SNFPA ROD are incorporated as design criteria for the Sugarberry Project. In addition to the abovementioned regulations, the Sugarberry Project would comply with the *National Forest Management Act* of 1976.

3.3.3 Methodology for Assessing Impacts on Vegetation, Fire and Fuels

3.3.3.1 Scope of Analysis

The geographic analysis area used to analyze the direct, indirect and cumulative impacts of proposed vegetation, fire and fuels treatments encompasses the area near Wambo Bar to the south, the Canyon Creek drainage to the east, Delahunty Lake to the north and the Lost Creek drainage to the west. The approximate 62,000 acre analysis area includes five watersheds (hydrologic unit code [HUC] 6 watersheds, or HUC 6; see glossary for definition): Little Grass Valley Reservoir, Lewis Flat, Canyon Creek, Slate Creek, and New Bullards Bar Reservoir. The analysis considers these five watersheds because they include all proposed vegetation treatments, bounded by major topographic features including ridgetops and drainages. These features were incorporated as they would influence fuelbreak effectiveness in the case of a wildfire. Incorporating proposed treatment areas and important topographic features allows for landscape-level analyses of the relations between vegetation, fire and fuels.

Ecologically, the dynamics between vegetation and fire and fuels are inherently linked; vegetation treatments (and absence thereof) have profound effects on fuel loading and fuel arrangement. These elements influence fire behavior. Similarly, fire has a profound effect on vegetation establishment and development. This allows for a congruent analysis of forest vegetation, fuels, and fire at the stand and landscape levels.

The temporal scale for this analysis is based on current cumulative vegetation conditions, including existing vegetation types, fuel treatments, burned areas, past harvest, and plantations. It is assumed that the current vegetation conditions reflect the sum of all past actions that have occurred within the Project Area. For the purpose of this analysis, current vegetation structure and composition are considered an indication of historical management regimes. See Appendix F of this FEIS for a list of specific past, present and reasonably foreseeable future actions.

The temporal boundary of the vegetation effects analysis extends 20 years into the future. The western slope of the Sierra Nevada in the Plumas National Forest has a rapid rate of vegetation establishment and growth due to high annual precipitation and highly productive forest soils. Within this timeframe, vegetation generally has sufficient opportunity to increase canopy closure, basal area, and tree density to a point where subsequent thinning would be needed again to maintain stand vigor, health, and growth. This timeframe is also expected to encompass the time period for DFPZ effectiveness (approximately 10 to 20 years) and potential re-entry harvest interval for group selection harvests (approximately 10 to 20 years). The potential fire behavior and effects of alternatives were modeled pre-treatment and post-treatment, with the latter reflecting treatments after completion. It is important to note that unknown or unanticipated future wildfires, disease outbreaks, or mortality may occur within the project area prior to completion of implementation of this project—these potential future events are not included as part of this analysis.

3.3.3.2 Analysis Methods

Vegetation. Field inventories were conducted in DFPZ areas, group selection, and ITS areas to measure attributes of existing vegetation to ensure silvicultural prescriptions are consistent with the amended Forest Plan. Data was used to determine site quality, timber volume and basal area, number of trees per acre, tree growth, species present, and tree condition. The extent of inventory analysis was based on the degree to which proposed activities would reduce canopy closure or basal area. Extensive inventories were conducted in units proposed for thinning, where proposed activities are designed to reduce canopy cover and basal area.

Additional analyses included using 2000 Vestra datasets in GIS to determine dominant vegetation type, size class, and density. California wildlife habitat relationships (CWHR) vegetation types, size classes and densities were used from the Vestra coverages. Other GIS coverages were used to determine land classification and allocation. Silvicultural prescriptions were based on desired future stand condition, direction from the LRMP and 2004 SNFPA ROD, stand exam data, Forest Vegetation Simulator projections, aerial photograph interpretation, and field review.

Group Selection Layout. The HFQLG Act includes expectations for treating 0.57 percent of the Pilot Project acreage annually using group selection methods. Based on that expectation, approximately 8,700 acres of the Pilot Project would be treated annually through group selection (HFQLG FEIS, Appendix E). This rate of group selection harvests represents an average rotation age of 175 years. The intent is to vary the rate according to site capability—managing poorer sites for 200-year-old trees and more productive sites for 150-year-old trees. Table 3-6 displays acres available for group selection harvest in the Sugarberry Project Area (not the more extensive vegetation, fire and fuels analysis area described above) on an annual 10-year and 20-year reentry interval. Another environmental analysis would be completed before re-entry in 10 or 20 years.

As shown below in Table 3-6, there are approximately 21,670 acres available for group selection in the Sugarberry Project Area. However, this total does not take certain land allocations into account, meaning that implementation of group selection may not be possible on all available acres. Group selection harvest units would not be located in:

- Recreation sites
- Riparian Habitat Conservation Areas (RHCAs) and Stream Management Zones (SMZs) (including inner gorge and landslide-prone areas);
- Rocky outcrops or areas unsuitable for planting due to mine tailings;
- Cultural resource areas
- Threatened, Endangered, or Sensitive plant populations

Table 3-6. Determination of group selection acres in the Sugarberry Project area and watersheds based on HFQLG Act annual expectations (0.57 percent of Pilot Project acreage).

	Acres	Annual Treatment	10-Year Re-Entry	20-Year Re-Entry
Vegetation, Fire and Fuels Analysis Boundary	62,140			
Sugarberry Project Boundary Area	48,130			
Private Land within Project Boundary Area	10,920			
Net National Forest System Lands in Project Area	**37,210**	**212**	**2,121**	**4,242**
Unsuitable Acres in Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs)	6,470			
Unsuitable Acres in Late-Successional Old-Growth 4 and 5	0			
Unsuitable Acres in Offbase-deferred	280			
Unsuitable Acres in Goshawk PACs	2,630			
Not Capable Barren, Rock or Water Acres	680			
Not Capable Grass, Meadow or Shrubfields	2,040			
Not Capable Hardwoods	2,200			
Not Capable California wildlife habitat relationships (CWHR) Size Class 2	1,240			
Total Unsuitable or Not Capable	15,540			
Total Net Suitable and Capable	**21,670**	**124**	**1,235**	**2,470**

The SNFPA 2004 ROD includes additional requirements that may affect the number of groups implemented under the Sugarberry Project. The standards and guidelines in Table 2 (SNFPA 2004 ROD) specify that maintaining specific basal area and canopy cover requirements for CWHR 5M, 5D, and 6 Size Class stands in DFPZs and area thinning (ITS) treatment units would have the greatest effect on group layout. Supplemental criteria considered during the layout of group selection units are listed below.

- Harvest no more than 20 percent of any individual stand or 2 acres, whichever is larger.
- Disperse groups throughout the stand.

- Leave enough space between groups to allow creation of future groups.
- Avoid placing groups in black oak areas where possible.
- Avoid placing groups in areas that contain more than 20 trees per acre of trees with a dbh of 30 inches.

Fire and Fuels. The modeling of potential fire behavior was done under 90th percentile weather conditions (see Table 3-7) that were calculated using the fuel model "Fire Family Plus" (Main et al. 1990). The Fire Management Analyst (FMA) software program (Carlton 2005) was used to model and assess the effects of different treatments on potential canopy bulk density, fuel loading and canopy base height at the stand level. Site-specific vegetation characteristics were extracted from Forest Inventory Analysis data and entered into the FMA.

Table 3-7. Parameters used for stand-level modeling under 90th percentile weather conditions.

Weather Parameter	Observations
Air Temperature	92ºF
Duff	60 percent
Relative humidity	14 percent
1-hour fuel moisture	4 percent
10-hour fuel moisture	5 percent
100-hour fuel moisture	7 percent
1,000-hour fuel moisture	8 percent
20-foot wind speed	7 mph
Herbaceous fuel moisture	33 percent
Live woody fuel moisture	48 percent
Live fuel moisture	100 percent

The current Northern Forests Fire Laboratory (NFFL) fuel models were determined from Plumas National Forest GIS fuel model database and field reviews of the areas proposed for treatment. The NFFL fuel models (FMs) 8, 9 and 11 were used for all post-treatment fire behavior analysis. Although FM 11 has a greater fuel load than the desired condition, it is often used to model masticated fuels and may slightly over-predict fire behavior in those areas. Fuel conditions in the Sugarberry Project Area were calculated using ArcMap 9.0 from data stored in the Plumas National Forest GIS library and ground-truthed with personal observation. Fuel models used in this analysis are summarized in Table 3-8 in the "fire and fuels indicators" section below.

Of the stands analyzed, proposed treatment units within the DFPZ were selected to show pre- and post-treatment canopy base height and fuel loading for the analysis of effects. These stands were selected based on proximity to communities at risk, elevation, and proposed treatment for each stand, fuel type, and sensitive habitat. The results of all data runs are contained in the Sugarberry Project file, available for viewing at the Feather River District Office.

The software "FlamMap" (Finney et al. 2005) was used to predict fire type (surface, passive crown or active crown fires) and flame length spatially at a landscape scale. FlamMap has been used to assess landscape level fire hazard in published studies (Stratton 2004).

Outputs from FMA and professional judgment were used to form post-treatment condition of fuel loading as estimated by fuel model, canopy bulk density, and canopy base height. It is important to note the results were based on outputs of an empirical fire model. The output data reflect fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the Forest Inventory Analysis plots. Although FlamMap differentiates between passive and active crown fire, all of the fire type tables in the effects section of this analysis combine both types of crown fire into one. Reasons for combining crown fire types are: (1) underprediction of active crown fire in FlamMap compared to observed conditions is common; and (2) model limitations in predicting transition of passive crown fire into active crown fire (Stratton 2004).

Weather data used in fire modeling was obtained from the Pike County Weather Station, which is south of the analysis area. Weather conditions at the station are recorded on a ridge top virtually devoid of canopy cover, reflecting “worst case” localized weather conditions. For stand-level modeling in the Fuels Management Analyst program, wind speeds were adjusted using the wind speed reduction factor (Rothermel 1983) to mimic local conditions. Dead fuel moistures were adjusted within FlamMap based on the topography, shading, and weather (Finney 2005).

Fire History. The Feather River Ranger District has detailed information on fire ignitions since 1965, but only limited information is available for fires before that time. The history of large fires was derived from the Plumas National Forest GIS database that tracks both Forest Service and California Department of Forestry large fires from 1909 to 2003. It is understood that this data may not contain all records of the fires that actually occurred, due to such reasons as lack of reporting, differing priorities over the decades, or loss of records. However, data is considered sufficient to indicate wildland fire is an important, cyclic environmental disturbance agent affecting the approximate 62,000-acre fire and fuels analysis area.

Indicators For Alternatives B, C and G (the action alternatives), effects are discussed in terms of the prescriptions proposed for each treatment type. The prescriptions for Sugarberry treatments are broken down into four groups for the effects analysis:

- Overstory mechanical thinning and biomass removal (includes DFPZ thinning and ITS).
- Understory thinning (includes mastication, hand cut tractor pile, hand cut pile burn and prescribed underburning).
- Group selection (includes harvest, site preparation, reforestation and release).
- Aspen and oak enhancement.

Fuels indicators do not differentiate between overstory and understory thinning. Therefore, alternative impacts are discussed in context of the understory thinning treatment type. Aspen and oak enhancement would also fall into this category of the fuels analysis. Thermal treatments such as pile burning and underburning are discussed separately where appropriate.

Vegetation Indicators

The measurement indicators for potential treatment effects on vegetation include tree species composition, stand density and structure, forest health, and landscape age class distribution. These indicators are described below. The effects of the Sugarberry Project by indicator are summarized in this chapter.

- **Tree species composition**—Species composition is the percentage of species within individual stands, charcterized by dominant vegetation types. The Sugarberry Project evaluates tree species composition distributed across the landscape. Effects are measured by the impact treatments have on reaching the desired, or reference species composition within to the Slate Creek Landscape Assessment. The Slate Creek Landscape Assessment addresses management opportunities to increase pine species back to historical levels.

- **Stand density and structure**—Stand density and structure is analyzed using three measures of stocking and density: trees per acre and their distribution by diameter class, square feet of basal area per acre, and percent canopy cover. These indicators function to display the average vertical profile within individual stands, including the understory, mid-story and overstory layers. These three attributes also aids in the assessement of overall stand structure by providing insight into number, size and positioning of trees vertically and horizontally within a forest stand. Desired stand structures may vary with individual stands across the landscape, depending on management objectives. In general, lower stand densities tend to be associated with reduced risk of high intensity wildfires and disease or insect attack.

- **Forest health**—Forest health effects are discussed by treatment type. Normal and endemic forest health issues are generally discussed in the affected environment section, while diversions from these trends are discussed in the alternatives discussion.

- **Landscape age class distribution**—Landscape age class distribution is the indicator used to measure cumulative effects to vegetation across the Project Area. It is measured by calculating the distribution of relative successional (seral) stages on the landscape. The percent change of seral stage and canopy density created by proposed treatments is calculated to measure change on the landscape structure. The distribution of seral stages on the landscape is an important indicator because it is also used as a measure of landscape diversity. CWHR size class and density class (Mayer and Laudenslayer 1988) is used as a proxy for seral stages to calculate the distribution of relative seral stages. Unlike stand vertical profile measured within stands in the "stand density and structure" indicator, CWHR classifications represent dominant stand characteristics at a horizontal profile across the landscape. This allows for a congruent analysis of effects on forest vegetation and wildlife habitat.

Fire and Fuels Indicators

The measurement indicators for potential treatment effects on potential fire behavior and severity include flame length, fire type, fuel loading and canopy base height. These indicators are described below.

- **Flame length (feet)**—The length of flame measured in feet. Flame length is influenced in part by fuel type and weather conditions. The upper limit for direct action taken by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper limit for direct action taken by mechanized equipment (dozers). Flame lengths in excess of these limits usually result in indirect action taken to contain the fire. Desired flame lengths in a DFPZ are four feet or less.

- **Fire type (surface, passive crown or crown fires)—**Fire type is described in four ways. Three will be measured in this analysis. The first type is a surface fire, which burns only the fuels at or near the surface without torching the trees above—this is the desired condition. The second type is the passive crown fire, which torches out individual or small groups of trees as the surface fuels burning under them provide the convective heat to ignite the above-ground fuels. The third type is crown fire, where fire is spread from tree to tree in conjunction with the convective heat of the surface fuels burning under them. The fourth is the independent or running crown fire—this is a very rare occurrence in which the fire is spread from tree to tree independent of the burning surface fuels. This type of crown fire requires extreme weather conditions and contiguous heavy tree canopy and is not modeled in this analysis. Fire types will also be discussed in general terms of fire severity as affected by fuel loading, measured by estimated tree mortality expected with wildfire.

- **Fuel Loading (tons per acre)**—Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread, and its intensity. Fuel loading can slow the suppression efforts of firefighters if there are large accumulations of dead and down fuel. Fuel loading in this analysis is estimated with fuel models that simulate conditions within the Sugarberry Project Area. Table 3-8 describes fuel models used in the analysis, initial attack production rates by fuel model, where fuels models 8 and 9 represent desired conditions. Desired fuel loading (less than 3 inches in diameter) would not exceed 5 tons per acre post-treatment. However, where down logs exist, 10 to 15 tons per acre of the largest down logs, having diameter greater than 12 inches, would be retained.

- **Canopy Base Height (feet)**—For the purpose of this analysis, canopy base height is the lowest height above the ground at which there is sufficient canopy fuel to propagate fire vertically through the canopy (Scott and Reinhardt 2001). Desired canopy base heights are greater than 15 feet.

Eight environmental measures, or indicators, were examined in the vegetation, fire and fuels analysis. Section 3.3.4 provides a description of the existing condition, or affected environment for each indicator. Other pertinent information is supplemented where necessary. Section 3.3.5 and 3.3.6 summarizes the potential direct and indirect effects of each alternative. Section 3.3.7 and 3.3.8 discusses cumulative effects of the alternatives.

3.3.4 Affected Environment (Existing Conditions)

Tree Species Composition. The dominant vegetation types in the Sugarberry Project Area include mixed conifer forests and white fir dominated stands. The mixed conifer forest type consists of the following species: white fir (Abies concolor), ponderosa pine (Pinus ponderosa), sugar pine (Pinus lambertiana), Douglas-fir (Psuedotsuga menziesii) and incense cedar (Calocedrus decurrens). Tanoak (Lithocarpus densiflora) is a common understory component of mixed conifer stands at the lower elevations. Red fir (Abies magnifica) and Jeffrey pine (Pinus jeffreyi) begin to replace white fir and ponderosa pine at higher elevations. Lodgepole pine (Pinus contorta), western white pine (Pinus monticola), and black oak (Quercus kelloggii) may be minor associates in this forest type. White fir dominated stands consist of the same species, but have higher proportions of true fir species.

Table 3-8. Fuel models used in the vegetation, fire and fuels analysis.[a]

Fuel Model	Typical Fuels Type	Fuel Loading Material <3 inches Diameter (tons per acre)	Initial Attack Production Rates (chains[b] per hour) Type 1 Crew (20 person)	Initial Attack Production Rates (chains[b] per hour) Type 3 Engine (5 person)	Fuel Model Description
4	Brush–6 feet	13	5	20	Mature shrubs >6 feet in height; higher percentage of dead fine woody material in the crowns of the shrubs than other brush fuel models Fires can burn with high intensity and rapid rates of spread due to the higher percentage of dead woody material associated with this fuel model Deeper litter layer may also hamper suppression efforts in this fuel model
5	Brush–2 feet	3.5	6	20	Shrub and sapling fuel types indicative of some type of disturbance Fires generally are not intense due to the low surface fuel loadings Only under late summer conditions and/or extreme weather condition do live fuels in FM 5 pose a threat of becoming large fires
6	Dormant brush, hardwood slash	6	6	20	Wide range of shrub conditions Shrubs may be older in FM 6 than FM 4 but may not be tall and/or have the dead woody component seen in FM 4 Fires may carry better through FM 6 than FM 5; however, a moderate wind (greater than 8 mph) is required Fires will drop to the ground in lesser wind speeds or at openings in the stand
8	Closed timber litter	5	40	24	Fuel Models 8 and 9 are single-story, early-to-mid successional stands with little dead and down material or ladder fuels Fires burn with low intensity with little spread or tree mortality Initial attack in these fuel types is highly successful Only under extreme fire conditions (such as high wind speeds) do these fuel types pose a resistance to control
9	Hardwood litter	3.5	40	22	
10	Timber–litter and understory	12	20	20	Decadent late-stage succession, characterized by multistoried stands with ladder fuels and a significant component of dead and down materials Due to the heavy down fuel component and presence of ladder fuels, fires in FM 10 burn with a high intensity Common spotting, torching, and crowning in overstory trees Fires are difficult to control under initial attack conditions
11	Light logging slash	11.5	15	20	Light logging slash as could be represented by light thinning slash or masticated fuels Spacing of fuels, light fuel loads or aging of fine fuels may limit fire potential

Sources: Anderson 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service Gen. Tech. Report INT-122; Fireline Handbook NWCG Handbook 3, 1998.

Notes: a. Fuel models are used to reflect fuel loading and depths in this analysis. Fuel models 8 and 9 represent desired conditions for forested stands. Brush, timber and logging slash models that reflected actual Sugarberry Project conditions were used in the Sugarberry analysis. General fuel loading of small material is estimated by model, as are the speed fire fighters are able to advance against wildfires. The latter is estimated by two types of fire fighting units. Finally, details of average fire behavior and the ability of fire fighters to combat fires in each model are described.

b. Chain is a measurement of distance; one chain = 66 feet.

Current species composition within stands has been altered from historical conditions over the last century. Cutting began in the 1850's in support of community and mine development. Throughout the beginning of the 1900s the oldest, largest trees were harvested for timber throughout the Sugarberry Project Area. As a result, there are fewer large (greater than 30 inches dbh) ponderosa pine, Jeffrey pine, incense cedar, sugar pine, and Douglas-fir trees than existed historically. Most of these old, large trees were thick-barked, fire-resistant species able to survive through regular fire cycles. Sugar pine abundance has been reduced due to mortality from white pine blister rust (*Cronartium ribicola*), especially the younger trees. Finally, fire suppression and lack of other types of disturbance over the last century favored germination and survival of a higher density of small, shade-tolerant trees (particularly white fir, tanoak, and incense-cedar) in the understory. Without disturbance, these shade-tolerant species have grown into multiple layers of vegetation or ladder fuels, in effect, limiting the ability of shade-intolerant species to regenerate. The ingrowth of shade tolerant species is also limiting the health and growth of shade-intolerant hardwoods including aspen and black oak.

The desired condition for both mixed conifer and white fir dominated stands in the Sugarberry Project Area is the "reference condition" in the Slate Creek Landscape Assessment (1999) and would involve moving toward historical pre-settlement stand conditions. In the Sugarberry Project area, this would involve increasing the percentage of basal area of pines across vegetation types, and particularly in the white fir type. In sampled CWHR Size Class 4 and 5 stands across the project area, combined average basal area of ponderosa and Jeffrey pine averages only 7 percent of the total average basal area. These species contribute to only 2 percent of the average total trees per acre.

Montane hardwoods or mixed conifer-hardwood forests are minor vegetation types in the analysis area and may consist of black oak and the above-mentioned conifers. Tanoak (*Lithocarpus densiflora*) and live oaks (*Quercus spp.*) are present in lower elevations. Black cottonwood (*Populus balsamifera*), dogwood (*Cornus nuttallii*), aspen (*Populus tremuloides*), alder (*Alnus* spp.) and hazelnut (*Corylus cornuta*) exist in higher elevation riparian areas. Throughout the vegetation types, primary understory shrubs and montane chaparral shrubs species include shrubform tanoak (*Lithocarpus densiflora*), manzanita (*Arctostaphylos* spp.), ceanothus (*Ceanothus* spp.), shrubform oaks (*Quercus* spp.), bush chinquapin (*Chrysolepis sempervirens*), mountain misery (*Chamaebatia foliolosa*) and gooseberry (*Ribes* sp.).

Black oak and aspen are two vegetative communities addressed in the Sugarberry Project objectives. Due to the lack of wildfire disturbance in the Project Area, which would normally remove conifer ingrowth and stimulate black oak and aspen regeneration, high levels of the shade tolerant species are present today. The black oak component within stands and across the landscape is decreasing in higher elevations, being shaded out by overtopping conifer tree canopies. On public lands within the Sugarberry Project, aspen exist only in the Howland Flat area (see "Section 3.4: Botanical Resources and Noxious Weeds" for detailed description of aspen affected environment), and face the same fate as black oak. Overtopping conifers in the Howland Flat area are changing hydrologic conditions into systems unfavorable for riparian vegetation, and are creating shaded conditions which slow aspen adult growth. Shade also inhibits successful aspen regeneration by limiting habitat for aspen suckers to grow and by suppressing auxin stimulation to cause suckering. Aspen will sucker in small quantities in partial shade, although survival rates of these suckers tend to be minimal, since they cannot compete for canopy space when surrounded by taller conifers species. Maximum suckering requires full sunlight and warm soils (Shepperd et al. 2006). Finally, aspen regeneration is compounded by deer browsing in some areas. The objectives and desired conditions of the project are to promote the health and long-term maintenance of these more unique hardwood communities.

Stand Density and Structure. CWHR Size Classes 4 and 5 on average contain large numbers of small trees (approaching greater than 1,000 trees less than 10 inches dbh). Average canopy cover is classified as CWHR "moderate" (40–60 percent), though overlapping in canopy layers is present. See Table 3-9 for average trees per acre, basal area and canopy cover in Sugarberry CWHR Size Class 4 and 5 stands.

Table 3-9. Average trees per acre, basal area and canopy cover across tree diameter classes in CWHR Size Class 4 and 5 stands.

	0–1	1–10	10–20	20–30	>30	Total
	(depth at breast height)					
Trees per acre	650	445	67	25	11	1198
Basal Area	1	37	77	79	86	280
Canopy Cover	N/A	13*	25	19	18	57 *(75% overlapping)*

Note: * Includes canopy cover data greater than 6 inches dbh only. Sums of canopy cover by size do not sum to "Total" because of overlapping. Overlapping canopy exists when canopy of one size class overlaps with canopy cover in another size class in different canopy layers. This is condition creates fuel ladders discussed below.

Forest Health. The Sugarberry Project area contains normal endemic insect top kill and whole tree mortality within the analysis area. This damage is related to attacks by bark beetles such as, *Scolytus ventralis* in white and red fir, *Ips* spp. in ponderosa, Jeffrey, sugar, western white and lodgepole pine, *Dendroctonus ponderosae* in ponderosa, sugar, western white and lodgepole pine, *Dendroctonus brevicomis* in ponderosa pine and *Dendroctonus jeffreyi* in Jeffrey pine. Beetle caused mortality is generally associated with crowded stand conditions and environmental stresses such as drought. There has not been significant drought in the past few years limiting recent beetle-caused mortality.

Similarly, diseased trees are endemic throughout the area, but are most frequently found in overcrowded stands. Crowded stands containing a large percentage of true fir almost always contain some amount of annosus root disease (*Heterobasidion annosum*) in the fir. Annosus has specifically been noted in the area around Lexington Hill and Little Grass Valley Reservoir (the latter is not within the project area, however could act as a source of spores). This disease decays tree roots. When the roots die faster than they can regenerate due to slowed growth from inter-tree competition, the tree will fall over and/or die. Incense cedar, ponderosa, Jeffrey, sugar, western white and lodgepole pine are resistant to the strain that infects white and red fir. Historically the forest contained proportionally more of these resistant species.

White pine blister rust is present in the analysis area. This disease is specific to the five needle pines: sugar and western white pine. Infections are scattered throughout the area and occurs in all tree sizes. The disease often kills infected younger trees, and may kill tops or reduce growth and vigor of older trees.

Dwarf mistletoe (*Arceuthobium* spp.) is also present throughout the Sugarberry analysis area. Tree growth and vigor is reduced on infected trees with moderate to high mistletoe ratings.

Landscape Age Class Distribution. Much forestland of the Sugarberry Project area has been altered from its historic reference condition. Timber harvest, disease, mining activities, and fire suppression have changed the age class distribution across the landscape and stand structure of the mixed conifer forest. Entire areas surrounding old mining town sites (such as La Porte, Gibsonville, Howland Flat, Port Wine, etc.) were logged in the late 1800s to support mining, railroad and town infrastructures. In addition, large fires around the same time caused huge areas to be regenerated at once, leaving a legacy today of middle-aged forests of medium-sized trees across the project area (Slate Creek Landscape Assessment 1999). Hydraulic mining and associated mine tailing piles that occurred at the turn of the century left large areas barren, of which only some are showing signs of recovery today. Finally, clear-cutting in the latter portion of the 1900s has left blocks of younger forests that are now beginning or will soon enter middle-aged, medium-sized successional stages. Table 3-10 shows age class distribution as delineated by CWHR size classes (roughly equivalent to seral stages, or age classes) across the analysis area. Table 3-10 represents age class distribution of entire forest types across the landscape (looking down at the landscape to different stand types and age groups), compared to Table 3-9 which averaged characteristics within individual stands (looking into a stand at a vertical profile). See Appendix F for complete list of past activities.

Table 3-10. Landscape distribution of CWHR size classes as a percent of total acres for the Sugarberry Vegetation, Fire and Fuels analysis boundary.[a,b]

	CWHR Size 1 and 2	CWHR Size 3	CWHR Size 4	CWHR Size 5	CWHR Non-Stocked
Stand Type	**Seedlings and Saplings**	**Poles**	**Small Trees**	**Medium-Large Trees**	**Brush, Rock, Water, etc.**
Dominant diameter range of stand	0–6 inches dbh	6–11 inches dbh	11–24 inches dbh	>24 inches	N/A
Seral stage	Early seral	Early seral	Mid-seral	Mid to late seral	N/A
Percent distribution across the landscape	3%	13%	56%	21%	6%

Notes:

a. Data are assumed to generally represent age class distribution (e.g., stands with seedlings, saplings and smaller trees are assumed to be usually younger than stands dominated by larger trees). Data are summarized from the CWHR analysis in the silvicultural appendices on file at the Feather River Ranger District.

b. There are no stands classified as Late-Successional Old-Growth in the Sugarberry Project area.

Flame Length. Vegetative conditions are intimately linked to fire behavior and fuel loading. Stands that have skipped fire cycles generally have heavy surface fuel loads, and stands with lots of small trees have fuel ladders contributing to low canopy base heights. Heavy surface fuel loads and low canopy base heights increase potential flame lengths and possible torching (Graham et al. 2004). Approximately 30 percent of the Sugarberry analysis area would burn with flame lengths greater than 6 feet. The slopes in the Sugarberry Project area vary considerably, ranging between 0 and 100 percent. Flame lengths appear highest in the steep Slate and Canyon Creek drainages (see Appendix G, Maps 3 and 4). Fires burning on steep slopes are problematic for multiple reasons: preheating of fuels increases fire spread; increases spotting from convection columns; ignites rolling material that may start fire below suppression resources; makes anchor points difficult to establish; and increases probability of injury to fire fighters.

Fire Type. Fire types within the analysis area would vary with topography, elevation and fuel loading and arrangement. Surface fires are generally lower in intensity and easier to suppress—though may still have high mortality rates if fuel accumulations are great. Passive crown fires, which include surface fires that occasional torch individual or clumps of trees, are indicative of higher fire intensity and severity. Fire intensity is highest in active and independent crown fires, or when fire runs continuously through both surface and canopy fuels. These fires generally are difficult to fight and require more resources to suppress.

The Forest Service did not begin taking organized and consistent fire suppression action until the 1920s. Before that time, fires on National Forest System lands burned unconstrained regardless of cause, unless they were a threat to private property. Fires burned with varying intensity (usually low) and often burned large swaths of land before they were extinguished by weather or lack of fuel. Random fire occurrences maintained dead fuels and stand structures in conditions that were more resistant to stand-replacing fires. These stand conditions have been documented by pioneer accounts, early photo point records, and fire history records from tree ring analysis.

The analysis area and immediate surroundings indicate that fire continues to influence the landscape. Records of large fires between 1909 and 2003 show a total of 6 fires that affected or could have affected the Sugarberry analysis area. Large fires ranged from 376 acres to over 2,500 acres in size. The Devils Gap fire in 1999 was the convergence of two lightning fires, the fire burned with high intensity resulting in approximately 90 percent mortality of vegetation. Fire exclusion, past harvesting practices, and various other land practices have decreased the incidence of historic low intensity fires, allowing for a build-up of surface and canopy fuels (Peterson et al. 2005). Increased trees per acre, ladder fuels and suppression activities have led to increased fuels buildup. Fires burning in over-crowded stands, such as happened in the Devils Gap Fire, have greater potential for crown fire. Other contributing factors to the large size of the Devils Gap Fire were limited resources during a forest wide lightning bust and length of response time by fire fighting resources. In addition to an abundance of surface and ladder fuels creating potential for larger more intense fires, impassable roads, distance of travel for second alarm resources, and steep inaccessible canyons make rapid access to fires on the Feather River Ranger District a problem for fire managers. See Table 3-11 for a list of large fires in the analysis area. See Table 3-12 for a Forest Service detailed history of fires listed by watershed and fire cause.

Table 3-11. Fires greater than 100 acres that occurred between 1909 and 2003.

Year	Cause	Total Fire Size (acres)
1909	Unknown/Unidentified	2,532
1920	Unknown/Unidentified	588
1921	Unknown/Unidentified	999
1921	Unknown/Unidentified	376
1929	Unknown/Unidentified	746
1999	Lightning	1,480

Table 3-12. Number of fires by watershed and fire cause (1965–2003).[a, b]

Cause	Little Grass Valley Reservoir	Lewis Flat	New Bullard's Bar	Canyon Creek	Slate Creek	Total
Campfire	4	1	0	1	7	13
Lightning	4	7	3	7	20	41
Equipment use	1	2	0	1	7	11
Smoking	10	1	0	2	11	24
Children	0	0	0	1	0	1
Debris burning	2	1	2	1	5	11
Railroad	0	0	0	0	0	0
Incendiary	2	2	0	1	3	8
Miscellaneous	6	3	2	2	15	28
Total	29	17	7	16	68	137

Notes:

a. Note that in the last century fires are more likely to be ignited by human causes than by natural causes. This additional ignition source is outside the natural fire regime and increases the risk of starting wildfires.

b. Fires listed are class A (0.1–0.25 acres), B (0.26–9.9 acres), and C (10–99.9 acres) fires.

In the Sierra Nevada, fire regimes varied historically across the landscape with elevation, precipitation, aspect, topographic position, soil conditions or site productivity, and vegetation (Skinner and Chang 1996; Fites-Kaufman 1997). Fire patterns can vary by individual watershed or landscape, even if they have similar vegetation. For example, the role of fire can vary with how the landscape is oriented relative to prevailing wind patterns. Drainages that are aligned with prevailing wind patterns will have more frequent, geographically larger, or more intense fires than those that are sheltered from prevailing winds. However, rarely are there fire history data for each landscape, so generalizations on fire regimes are often made based on similarities in the landscape topography and vegetation. For the northern Sierra Nevada, fire history research has been compiled from all parts of the Sierra Nevada and southern Cascades by vegetation type and landscape conditions to allow the Forest Service to describe general historic fire regime patterns for the northern Sierra Nevada.

According to Fites-Kaufman, in the northern Sierra Nevada, elevation is the most important and visible factor underlying changes in fire regimes and vegetation. The Sugarberry Project ranges from approximately 3,000 feet in elevation to approximately 6,500 feet in elevation. This broad range of elevation is described by three of the six fire regime zones Fites-Kaufman describes: lower montane, mid-montane and upper montane zones. Historic fire return intervals in the project area probably ranged from 5–15 years in the lower elevations up to 40 years in the higher elevations (Fites-Kaufman 2006).

Chang and Skinner (1996) describe a mixed conifer zone, which lies within the middle elevation zone of the Sierran forest and is dominated by ponderosa pine, with large amounts of white fir and sugar pine. Variation in species is usually associated with elevation. Generally, this mixed conifer zone, like Fites-Kaufman's lower montane zone, is described as having frequent fires of low to moderate severity. However, it was found that the fire regime could vary in both interval and severity depending on vegetation, topographic position, site quality, and other local factors. Historic fire intensity and severity in the mid and upper montane zones are generally described as mixed (Agee 1993; Fites-Kaufman 2006). The pattern would be mostly patchy, low intensity fires or high intensity fires when conditions were extremely dry.

Current fire types have been removed from the historic reference condition due to past fire suppression, past timber management practice and a wet climate over the last century. As fire cycles are skipped, fuels accumulate and less fire adapted, shade tolerant tree species grow in forest understories. Dead and down fuel loading is high and fuel ladders are present due to growth of dense understory making for low canopy base heights. More intense fires, including higher incidence of passive and active crown fires, high mortality of in both surface and crown vegetation, and greater impacts on watersheds would be expected to occur under extreme fire conditions.

Fuel Loading. Fuel conditions are variable throughout the Sugarberry Project area and can be described by six NFFL fuel models: FM 10, mixed conifer with heavy timber litter and a dense shade-tolerant understory, comprises approximately 49 percent of the area; FM 9, described as closed canopy stands of long-needle conifers or hardwoods, comprises approximately another 19 percent of the area; brush FMs 4, 5, and 6 make up 18 percent of the project area; and FM 8, closed canopy stands of short-needle conifers, comprises 11 percent of the area. The remaining 2 percent is made up of water or other natural or man-made noncombustible materials. Fuel Models 8 and 9 represent desired fuel conditions. Details of fuel models are summarized in Table 3-8.

There is approximately 20,400 acres of wildland urban interface wildlife urban interface within the project area. The distribution of fuel models within the wildlife urban interface are: FM 10–55 percent, FM 9–15 percent, FM 8–13 percent, brush FMs 4, 5, and 6–15 percent. See Appendix A, Table A-3 and Table A-4, for unit by unit treatments in the wildlife urban interface.

Canopy Base Height. Fire suppression, lack of disturbance, and past timber harvest have created dense multilayered understories known as ladder fuels (see Table 3-9 to view the high quantity of small trees per acre). Current canopy base heights at the stand level in the Sugarberry analysis area average less than three feet. Low canopy base heights allow for an easier transition from surface fires into passive or active crown fires. At 100 percent foliar moisture, a six foot canopy base height will require a four foot flame length to initiate torching into the canopy, while a 19 foot canopy base height will require a nine foot flame length (Agee and Skinner 2005). With the current average canopy base heights in the Sugarberry analysis area one would expect to see torching with flame lengths less than four feet and potential spotting that would lead to larger fire size.

Summary. There has been an overall shift towards and increased proportions of shade-tolerant, less fire-adapted species (true firs and incense-cedar) and decreased proportions of shade-intolerant, fire-adapted species such as large pines. Mountain hardwood species including aspen and black oak are being encroached by these shade-intolerant conifers. The landscape is dominated with middle-aged stands that are generally overstocked with small diameter trees. This overstocking creates forests susceptible to disease and insect attack, especially on low precipitation years. These landscape attributes have contributed to unnatural buildup of ladder fuels and surface fuels. Existing topographic features and a heavy build up of surface, ladder, and canopy fuels make much of the Sugarberry analysis area prone to large, high-intensity fires.

3.3.5 Environmental Consequences

Direct and Indirect Effects of the No-Action Alternative (Alternative A). Under Alternative A, no actions would be implemented to address purpose and need described in Chapter 1 or management opportunities addressed in the Slate Creek Landscape Assessment (located in the project record).

Tree Species Composition. Species composition would remain the same, with existing stand structures promoting low light environments to influence species composition, favoring the regeneration of shade-tolerant species such as white fir, incense-cedar, and, to a lesser degree, Douglas fir. There would be no proposed disturbance or planting of shade-intolerant, fire-adapted species. The trend of having increased numbers of shade-intolerant species would continue. There would be no thinning or release of any remaining "legacy" shade-intolerant species. Without fire or other management disturbance, aspen and black oak stands would continue to be encroached upon by conifers until only a few remnant trees remain below a conifer understory. When overtopped, oaks either die outright or die back successively each year, and with continued overtopping, eventual death is assured (McDonald 1990). Black oak presence in conifer stands would continue to decrease as a result of overtopping unless openings are created by disturbances such as wildfire, blowdown, insect activity, or logging (McDonald and Tappeiner, 2002). Wildfire may kill oaks and other hardwoods, however, due to the ability of black oak and tanoak to sprout; their continued presence would be assured.

Stand Density and Structure. Existing stand conditions would persist and develop unaltered by active management, with the exception of continued fire exclusion. Stands would remain dense, particularly in the smaller diameter classes, in terms of trees per acre and basal area. See Table 3-13 for a 23-year projection of trees per acre, basal area and canopy cover.

Table 3-13. Projected future average basal area per acre, trees per acre, and canopy cover (not overlapping) of Size Class 4 and 5 stands in the Sugarberry analysis area under the no-action alternative.

Projected Year	Basal Area	Trees Per Acre				Canopy Cover
		Trees Per Acre 1–10 inches dbh	Trees Per Acre 10–20 inches	Trees per Acre 20–30 inches	Trees per Acre >30 inches	Canopy Cover >6 inches
		(dbh)				
2010	280	445	67	25	11	57
2020	307	706	67	26	13	58
2030	321	667	61	28	15	58

Canopy cover in the majority of Sugarberry stands would remain relatively high and overlapping in regard to fuels and retardant penetration Retardant penetration refers to the amount of liquid that is able to make contact with surface fuels to slow fire progression. The current canopy cover could reduce effectiveness of retardant penetration to surface fuels, in turn making it more difficult to contain large fires. A high percentage of retardant is intercepted by tree crowns before it reaches the ground and becomes less effective for suppressing and holding fires burning through surface fuels (Alexander 2000; Anderson 1974). This decreased penetration of retardant with higher canopy cover in untreated stands, when compared with an adjacent treated area, was witnessed on the Bell Fire in September 2005 (Craggs 2005; Moghaddas in review). In addition, the use of aerial retardant is generally not effective at suppressing crown fires or fires with high flame lengths.

Forest Health. The high tree densities mentioned above would persist under Alternative A, thereby reducing growth rates and tree vigor and increasing risk of mortality due to inter-tree competition and potential increased incidence of insect activity. Mortality of trees in the lower diameter class will continue and lead to increased fuel loading. While true fir (red and white fir) stands may exist at higher stand densities than mixed conifer stands, increased density combined with stress caused from drought or root rot endemic in older, dense fir stands increases the susceptibility of true fir species to mortality caused by the Scolytus fir-engraver beetle. High densities of small trees in all stand types may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees. Stressed trees become particularly susceptible to insect attack during low precipitation years. It is expected that insects will remain at current endemic levels as long as precipitation levels are near or above normal. However, when precipitation is below normal for several years in a row, some trees stressed by lack of moisture and competition are expected to succumb to insect attack.

Plantation sugar pine trees dead and dying from blister rust in two units would not be removed and would add to fuels accumulations. Older trees with blister rust, mistletoe or other disease would not be thinned. The risk of annosus root rot stump infection would be reduced due to the lack of stump creation. Consequently, there would be no need to apply Sporax®. Existing infections across the landscape would increase in size naturally.

Flame Length. Under the no-action alternative, the ability of fire managers to safely suppress and contain fires, both in initial and extended operations, would continue to decline over time from current conditions due to continued increasing stand densities, surface fuel buildup, and road disrepair. Under 90th percentile weather conditions, flame lengths would generally be at least 6 feet in major drainages (see Appendix G) where topography makes fire suppression especially risky for firefighters. The upper limit for direct action taken by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper limit for direct action taken by mechanized equipment (dozers). Flame lengths in excess of these limits usually result in indirect action taken to contain the fire resulting in larger fire size. See Table 3-14 for estimated percent of DFPZ burning with flame lengths <4 feet, 4–6 feet and >6 foot in Sugarberry shaded fuelbreaks (DFPZs). These flame lengths, when combined with current stand structure and topography, would result in extensive high-intensity surface fires and torching with crown fire activity (see Table 3-15) generating more tree mortality (see Fire Type section below).

Table 3-14 Flame length for in areas proposed as DFPZ for no-action alternative.*

Effects on Flame Length	DFPZ with Flame Lengths <4 feet	DFPZ with Flame Lengths 4–6 feet	DFPZ with Flame Lengths >6 feet
Alternative A No Action	58 %	26%	16 percent
Alternatives B, C, and G	73 %	16%	11%

Note: *Flame lengths on DFPZ acreage that would occur in the case of ignition during 90th percentile weather conditions are displayed. DFPZ acres total approximately 3,000.

Table 3-15. Percentage of DFPZ acres in surface, passive crown and crown fire types.*

Fire Type	Non-combustible	Surface	Crown Fire (Passive and Active)
Alternative A No Action	0.2 %	41 %	59 %
Alternatives B, C, and G	0.2%	66%	33%

Note: *The percentage of land that would burn as surface, passive crown or crown fires in the case of ignition during 90th percentile weather conditions is displayed for the no action Alternative A. DFPZ acres total approximately 3,000, and approximately 2,100 acres would be treated in Alternatives B and C and G. The difference in acres reflects acreage that has already been treated or has been determined to need no fuels treatments at this time.

Fire Type. The fire activity with the above-mentioned flame lengths and fuel loadings and canopy base heights discussed below could result in crown fire up to 59 percent of the untreated DFPZ. Wildfire burning with these stand conditions under the 90th percentile weather conditions would produce 75 to 90 percent predicted direct mortality for trees up to 24 inches in diameter (see Fire and Fuels project file). The predicted direct mortality does not account for secondary mortality to fire-damaged trees due to insect and disease activity. In addition, embers from torching trees and snags could spot outside the main fire increasing potential fire size. These direct and indirect effects do not reflect the influence of the fire itself on local weather conditions (Colson 1956; Cramer 1954). At the landscape level, these two factors (increased spotting and the fire’s influence on local weather) will tend to increase erratic fire behavior, resulting in increased fire size with higher tree mortality, especially when area weather patterns become warmer with increased winds and lower atmospheric stability (Schroeder and Buck 1970). See Table 3-15 for percent of fire type that would exist in the shaded fuelbreak (DFPZ) under the no-action alternative. Refer to “Analysis Methods” section for reasons why passive and active crown fire is combined.

Fuel Loading. Fuel loading is heavy across the Sugarberry analysis area with approximately 49 percent of the landscape represented by 12 tons per acre of dead and down woody debris less than 3 inches in diameter (FM 10). Van Wagtendonk (2004) reports, there are landscapes today where accumulations of dead woody debris and dense stands of shade-tolerant understory trees and shrubs have made the fuel and vegetation complex nearly homogeneous (same vegetation structure or species), and that the inevitable fire that cannot be suppressed becomes larger and burns more intensely. The rates of line construction would be relatively slow for both hand crews and tractors under the fuel loading of the no-action alternative compared with the action alternatives. See Table 3-16 for fuel loading for a sample of the DFPZ units under the no-action alternative. Most of the DFPZ units sampled below would currently fit into FM 10 which would create high intensity fires that would be difficult to attack. 13T has low fuel accumulations due to a history of underburns in the unit. The current prescription is designed to reduce ladder fuels that have grown in since its last underburn and to maintain its current low surface fuel conditions.

Table 3-16. Fuel loading by the no-action Alternative A, tons per acre.*

Unit	Alternative A: No Action (tons per acre)
13T	7.0
15Ta	12.02
902	12.02
904	12.02
905a	12.02
905b	12.02
907a	12.02
907b	12.02
909	12.02

Note: *All units shown are shaded fuelbreaks that would maintain overstory canopy after treatment.

Canopy Base Height. Due to the ingrowth of brush and a large number of small diameter shade-tolerant trees, canopy base heights are often low in un-managed stands (see Table 3-17 for example DFPZ units). The conditions represented in Table 3-17 would allow for greater transition of surface fire into passive and active crown fire, resulting in more spot fire potential that would lead to larger more problematic wildfires when burning under the 90th percentile weather conditions.

Table 3-17. Canopy base height of the no-action Alternative A.

Unit Number	Alternative A: No Action Current Conditions
13T	15 feet
15Ta	1 foot
902	1 foot
904	1 foot
905a	1 foot
905b	1 foot
907a	1 foot
907b	1 foot
909	1 foot
Average	2.5 feet

Summary of Effects. The no-action alternative would not meet the intent of the 1988 Plumas National Forest LRMP, as amended by the 1999 ROD on the HFQLG Act FEIS and the 2004 ROD on the SNFPA FSEIS, or the National Fire Plan. There would be no shift towards historical species composition, no reduction in dense stand conditions, and no diversification of landscape structure. Stands would remain dense with shade-tolerant small trees, which would contribute to higher fuel loadings and lower canopy base heights. These factors would increase risk of more intense fire behavior including higher flame lengths, increased torching into crowns and increased mortality of vegetation.

Rural communities would continue to be at risk from wildfire, and public and firefighter safety would continue to be jeopardized from the existing conditions during the suppression of a wildfire.

Additionally, an increased intensity of wildfire and longer initial attack response time for fire suppression resources over unmaintained roads would increase the likelihood that fires could escape initial attack and become large. Larger fires would increase the risk of injuries to both firefighters and the public, as well as increase the potential for residences to be lost or damaged. The potential for high-intensity fire exists in the Sugarberry Project in those areas where there is little heterogeneity (diversity) in the fuel and vegetation complexes.

The above factors result in major negative effect on the overall ability of fire managers to safely suppress and contain fires, leading to increased suppression duration and cost. This increased suppression intensity can lead to a greater potential for resource damage during the fire and higher Burned Area Rehabilitation costs, once the fire is out. Overall, the current predicted fire behavior during a wildfire could lead to high mortality in forested areas, including RHCAs, Protected Activity Centers (PACs), and Home Range Core Areas (HRCAs) in the Sugarberry Project Aea.

3.3.6 Direct and Indirect Effects of All Action Alternatives

3.3.6.1 Direct and Indirect Effects of Overstory Mechanical Thinning in Alternatives B, C and G

Tree Species Composition. Species favored for retention in both DFPZ and ITS thinning units follow in this order: ponderosa pine, black oak, Jeffrey pine, sugar pine, Douglas-fir, incense-cedar, red fir and white fir and tanoak. Shade-tolerant species (true firs and incense-cedar) would be preferentially removed in areas where they may be crowding shade-intolerant, fire-adapted species (pines). Pine species are fire resistant because of their thick bark, more open crowns, tendency to root deeply, and the ability of their long needles to protect the terminal buds from heat. Favoring residual pine would move forests into a desired condition by protecting future natural seed sources and recreating a forest containing proportionally more species resilient to fire. In true fir dominated forest types, species preference would be weighted towards maintaining naturally occurring shade-intolerant species such as Jeffery pine; however, species composition would be maintained at levels appropriate for that ecological forest type.

In CWHR Size Class 4 and 5 units, thinning would attempt to reduce competition around healthy, large shade-intolerant pines. In CWHR Size Class 3 units, smaller pines would be released to more freely grow into larger size classes which are better capable of withstanding the effects of both wild and prescribed fire. Sugar pines would be preferentially retained where showing signs of white pine blister rust resistance. Retaining and releasing these rust resistant trees would better ensure future seed sources for potential natural or human-caused disturbance (see group selection section below). New cohorts of shade-intolerant species are not expected to significantly increase in Sugarberry thinning because of low light levels able to reach the understory under 40 to 50 percent canopy cover. The overall effect of thinning on species composition in Sugarberry thinning units would be to temporarily increase the proportion, health and vigor of the existing pine component relative to these areas.

Stand Density and Structure. DFPZ and ITS units in CWHR Size Class 4 and 5 stands would be thinned from below. Throughout all treatments regardless of thinning prescription, trees in the 20 to 30 inch and the greater than 30 inch diameter classes would generally be the favored tree sizes to retain. These larger trees have favorable attributes in terms of fire resistance, desired stand structure, and wildlife habitat. Canopy cover in two DFPZ units would be reduced to 40 percent under Alternatives B, C and G. These two units are in a high use recreation area within the wildland urban interface community of La Porte. Reduction to 40 percent canopy in this area under the action alternatives would likely increase effectiveness of retardant penetration in the case of a wildfire. All other units would be reduced to 50 percent canopy cover.

Trees less than 9 inches dbh would be removed for biomass, except in less-stocked gaps within the units where they make up the overstory. In these areas, trees less than 9 inches dbh would be thinned. Trees up to 29.9 inches may be removed, however most trees removed will be less than 20 inches in diameter. Trees greater than 20 inches in diameter may be removed under Alternatives B, C and G when diseased, suppressed, competing with larger trees or when contributing to undesirable canopy fuels. This is further discussed in the canopy base height section below. See Table 3-18 for pre- and post-treatment estimates of average trees per acre in thinning units.

Table 3-18. Average stand density and structure of units with proposed thinning treatments in Alternatives B, C and G.*

		Year	Trees Per Acre: 1–10 inches dbh	Trees Per Acre: 10–20 inches dbh	Trees Per Acre: 20–30 inches dbh	Trees Per Acre: >30 inches dbh	Total	Basal Area (ft^2/acre)	Canopy Cover >6 inches dbh
Mechanical Thinning to 40% Canopy Cover (CWHR Size 4)	No Action	2010	246	78	34	8	366	310	60
		2020	274	94	34	12	414	338	61
		2030	177	89	31	16	313	336	60
	Alternatives B, C and G	2010 Post	15	18	34	8	75	205	40
		2020	24	12	33	13	82	228	43
		2030	23	8	32	17	80	252	46
Mechanical Thinning to 50% Canopy Cover (CWHR 4& 5)	No Action	2010	557	87	25	11	680	315	63
		2020	878	83	31	12	1004	343	62
		2030	888	72	36	13	1009	359	62
	Alternatives B, C and G	2010 Post	59	36	25	11	130	220	49
		2020	123	32	32	13	200	248	52
		2030	140	25	37	14	216	275	54
Plantation Thinning (CWHR Size 3)	No Action	2010	267	136	3	1	406	191	48
		2020	559	147	12	1	719	244	56
		2030	462	133	28	1	624	289	61
	Alternatives B, C and G	2010 Post	18	78	3	1	100	109	34
		2020	0	84	13	1	98	146	41
		2030	0	63	33	1	97	183	48

Note: *Displayed are comparisons of average trees per acre, basal area and canopy cover of units that would occur in the no-action and action alternatives to 2030. This analysis assumes treatments would occur in 2010. Data are averaged by treatment type. Data used were from units in each treatment type. Objectives include removing ladder fuels (small trees <10 inches dbh with most trees removed <6 inches dbh), thinning overstory canopy from below to increase effectiveness of aerial retardant and thinning from below to reduce impacts of insect attack and disease.

Thinning would reduce canopy cover and percentage of crown overlap in the lower diameter classes that contributes to canopy fuels. Canopy cover in the majority of thinned Sugarberry stands would be reduced with regard to overlapping of tree crowns. The reduced canopy cover could increase effectiveness of retardant penetration to surface fuels; in turn assisting in containing large fires.

The combined effects of proposed activities are predicted to reduce the intensity of fire activity within the DFPZ and ITS thinning units. While generalization of the effects of thinning on fire severity are difficult to apply on a broad scale, due to variability of the weather, physical settings and forest fuels, thinning followed by prescribed fire, piling and burning, or other treatments significantly reduced fire intensity and/or severity (Alexander and Yancik 1977, Hirsh and Pengelly 1999, Graham et. al. 1999). Treatment efficacy may also vary depending on the degree of treatment and follow-up surface fuel manipulation. Studies' examining empirical information of past fires indicates thinning followed by the use of prescribed burning, hand piling or tractor piling, is effective in reducing crown fire ignition and fire severity (Omi and Martinson, 2002, Graham et. al. 2004).

Trees greater than 30 inches dbh may only be removed if needed for operability. Removal of trees greater than 30 inches dbh is expected to be minimal because existing skid trails, landings, and temporary roads would be utilized whenever available to facilitate the harvesting and removal of forest products (biomass and sawlogs). New activities would intentionally avoid large trees when possible. The location and size of skid trails, landings, and temporary roads, and the trees harvested for the construction of such facilities, must be approved and agreed upon by the Forest Service. Removal of trees for operability would be incidental and therefore, would have negligible effects on stand structure. A maximum approximate estimate of 1,400 trees greater than 30 inches dbh may be removed for operability for all proposed Sugarberry treatments (including transportation improvements), which equates to 0.3 percent of total trees greater than 30 inches dbh across the project area. An additional 150 to180 trees greater than 30 inches dbh would potentially be removed as a part of aspen enhancement treatments.

Two to six snags per acre, 15 inches or greater, would be retained within treatment units depending on forest type and treatment. Some snags would be removed in DFPZs, particularly those under 15 inches in diameter. Incidental removal of snags may occur for operability and safety. However, sale administrators would be used to ensure that both operability and safety and minimum snag densities would be retained where existing in suffient numbers. Snags to be retained would receive preference in locations where operability and safety is not anticipated to be an issue. Snags within falling distances of roads, landings, and heavily used public areas would receive preference for removal. Where minimum snags densities do not currently exist, marking guidelines would provide for the retention of large live trees with wildlife habitat characteristics, such as multiple or broken tops, crooks, and/or bole cavities, to serve as future snag recruitment.

Post-treatment basal area retention amounts in treatment units would vary, depending on the average size of residual trees in each unit, because larger trees have wider crowns and occupy a greater basal area square footage. Residual trees per acre and basal area within units may also vary due to marking prescriptions. For example, areas within RHCAs would have no reduction in basal area, whereas areas with extensive evidence of disease may be more heavily thinned. Basal area would not be reduced more than 30 percent in ITS units and 40 percent in DFPZ units. See Table 3-18 for pre and post-treatment estimates of average basal area per acre in thinning units. Mean diameter of CWHR 4 and 5 thinning units would change from an average of 18 inches dbh to 26 inches dbh.

Where California black oak is present, amended land management plan direction is to retain an average basal area of 25 to 35 square feet per acre for oaks over 15 inches dbh and greater. Smaller oaks are to be retained where site specific planning has determined the feasibility of and specific needs for future recruitment. The diameter for oak retention was lowered from 15 to 12 inches for all units in order to meet average basal area retention guidelines.

The number of small diameter oaks is expected to be reduced in the short term as a result of thinning from below. However, management standards for basal area retention levels would be met. Sprouting may occur from some of the larger diameter oaks and result in increased numbers of oak sprouts. Some black oak seedlings and saplings are expected to survive harvest operations. Increased light conditions following harvest will likely favor existing and future continued growth and development of residual black oak.

Plantation units with pole-sized trees, or those units in CWHR Size Class 3, have no canopy cover restrictions. These units would be thinned to approximately 18 to 22 foot spacing, or approximately 100 trees per acre. Spacing may vary depending on tree vigor and species as well as to increase structural diversity in what are currently plantation homogenous stands. See Table 3-18 for average estimates of basal area, trees per acre and canopy cover by size class. Mean diameter (of trees greater than 6 inches dbh) would change from 11 inches to approximately 14 inches.

Forest Health—Density Management, Dwarf Mistletoe and Blister Rust. The action alternatives are each expected to have similar effects in CWHR Size Class 4 and 5 units. Thinning from below would remove excess trees and those that are of poor vigor, diseased, and damaged trees. In addition, thinning some of the suppressed, intermediate, and co-dominant tree classes would help maintain the growth and vigor of co-dominant and dominant conifers. The overstocked stands or aggregations within stands would be thinned in order to reduce stress due to inter-tree competition. Consequently, individual tree mortality would be reduced. Stand growth and vigor would be maintained or improved, making stands and aggregations less susceptible to insect attacks (Koehler, Wood, and Scarlett 1978; DeMars and Roettgering 1982).

There would be a preference to remove trees with heavy to moderate dwarf mistletoe infections where possible, and where they have not already spread to trees in lower canopy layers. Many infected trees are greater than 30 inches in diameter or contribute to required canopy cover and would therefore not be removed. In these cases, tree species susceptible to present mistletoes would be preferentially removed in lower canopy layers.

Sugar pines infected with white pine blister rust would be removed in CWHR Size Class 3 plantations units near Lexington Hill. Many trees in the area have large stem cankers which will ultimately girdle and kill the trees. Thinning in this area will remove the fuels that would otherwise be created when these trees die. Infected trees in CWHR Size Class 4 stands in the same area would be preferentially removed over trees appearing to be rust resistant. Blister rust in many large sugar pines throughout the project area is evident as a minor chronic infection. Trees may live with the disease for years though become stressed, usually due to lost photosynthetic ability. Thinning in units would reduce the quantity of infected sugar pine, increase the vigor of residual uninfected sugar pine and would allow infected sugar pine left for canopy cover requirements or diameter requirements to persist longer by reducing competition with other trees. Fuels and fire potential would also be reduced.

Damage to residual trees may occur during harvesting operations including damage to stems, bark scraping, wrenched stems, broken branches, broken tops, and crushed foliage. These effects are typical in logging operations. Potential for damage to residual trees is monitored through inspection by timber sale administrators during harvesting to insure that damage is within reasonable tolerance.

Forest Health—Annosus Root Disease and Borax Treatment. Annosus root disease may be spread by airborne spore colonization of freshly cut stumps and root to root contact. The direct effect of timber harvesting would be the creation of a large number of freshly cut stumps, which would increase the potential for spread of annosus root disease. A common silvicultural practice to minimize the spread of annosus root disease is to apply a layer of borax to freshly cut stumps soon after harvest in order to prevent new infection centers. This method is effective at mitigating the spread of H. annosum spores (Cluck and Woodruff 2006; Kliejunas 1989; Goheen and Otrosina 1998; Schmitt et al. 2000).

All action alternatives propose to apply borax (trade name, Sporax®) to harvested conifer stumps greater than 14 inches in diameter in certain DFPZ and ITS mechanical thinning units to minimize the risk of annosus infection. Group selections within these thinning units would also have borax application. Borax is proposed for to these units to minimize residual tree susceptibility to *H. annosum* root rot. Units for borax application were chosen due to their proximity to known root rot pockets and their higher value, due to location in visual quality and recreation corridors.

There is the potential for new infection in any harvest area because airborne spores can travel far distances, up to 100 miles (Goheen and Otrosina 1998) and *H. annosum* is known to occur throughout the forests of Northern California and Southern Oregon (Schmitt et al 2000). Occurrence of annosus root disease has been confirmed in true fir stands in the Sugarberry Project area, as reported in the *Forest Health Protection Assessment of the Lexington Hill Area* (Cluck and Woodruff 2006).

Infection by annosus 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 on National Forest System lands, as well as adjacent landowners. In addition, harvesting without treating stumps would leave the potential for adverse effects on future species composition across the landscape. The consequences of not treating stumps with Sporax® application may include increased infection rates, mortality of desired large dominant and co-dominant residual trees, reduced canopy cover to below desired levels as a result of mortality, and an increase in fuel loads beyond desired conditions as a result of mortality (Goheen and Otrosina 1998).

Once annosus root disease infests 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. Once established, the disease creates infection centers where trees of like species 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 create localized pockets of dead and down trees that contribute to higher surface fuel accumulation in the future. The borax treatments are expected to reduce potential stand-level mortality, resulting in decreased contributions to surface fuel loads from trees killed by annosus root disease. Annosus root disease is also known to increase susceptibility of infected trees to adverse effects of drought and insect attack, particularly in true fir (Ferrell 1996).

Other methods for controlling annosus root disease 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 (Ammons 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 *H. 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 concerns for potentially introducing a non-native organism into the ecosystem. The treatment strategies discussed above were developed for forests in the southeastern United States. The effectiveness of these practices is not established for forests in the western United States.

The projected levels of Borax application would be 1 pound per 50 square feet of freshly cut stump surface. This application rate and projected levels of borax application are consistent and well within those analyzed in the *Human Health and Ecological Risk Assessment for Borax (Sporax®) Final Report* (USDA 2006).

The Human Health and Ecological Risk Assessment for Borax (Sporax®) Final Report (USDA 2006) concludes that “the use of Sporax® in Forest Service programs will not substantially contribute to boron exposures in humans" and "will not typically or substantially contribute to concentrations of boron in water or soil." In addition the Syracuse Environmental Research Associates, Inc. (SERA) report concludes "the use of Sporax® in the control of *H. annosum* root disease does not present a significant risk to humans or wildlife species under most conditions of normal use, even under the highest application rate." "For workers and the general public, none of the other exposure scenarios considered yield hazard quotients that exceed the level of concern" (USDA 2006).

In summary, application of Sporax® to freshly cut stumps would be effective in mitigating the spread of *H. annosum* spores. Sporax® application would minimize the risk of infection and creation of new infection centers thereby maintaining and improving individual tree vigor and reducing susceptibility to other mortality agents including drought, insects, and fire. Reduction of annosus root disease related mortality will result in a minor to moderate beneficial effect to surface fuels and resulting flame lengths by reducing the amount of woody material contributed by dead and dying trees.

Flame Length, Fire Type, Fuel Loading and Canopy Base Height. Effects of mechanical thinning on these indicators are the same as effects discussed in the understory thinning Section 3.3.6.2 below.

3.3.6.2 Direct and Indirect Effects of Understory Thinning in Alternatives B, C and G

Understory thinning in this section includes the use of (1) mastication, (2) underburning, and (3) handcut, hand or tractor piling, and pile burning. This section will also include the use of these prescriptions in plantations and less-stocked area or those dominated with shrub cover. All action alternatives would have similar effects on vegetation and fuels.

Tree Species Composition. Understory thinning through mastication, piling and pile burning would favor retention of the most vigorous individuals of desired shade-intolerant species in open, brushy or less stocked areas. Understory thinning through underburning is inherently non-selective and it is not likely that favored species would be preferentially retained. All understory thinning would be limited to trees less than 9 inches dbh and would only affect the species composition of understory trees. Hardwoods within plantations would be favored for retention over pines in order to maintain species diversity. Any effects to black oak within plantations are expected to be minimal. Understory thinning in natural stands will have a residual spacing of conifers and oaks of 18 to 25 feet. Thinning aggregations of oaks and conifers less than 6 inches dbh with the retention of the healthiest conifers and oaks is expected to have minimal effect on oaks; the number of small oaks within these stands could be temporarily reduced by cutting, however some of the re-sprouting is expected. Similarly, oaks and other hardwoods could be killed by prescribed fire, however, due to their ability to sprout, would not be eliminated from the stand.

Stand Density and Structure. Understory thinning would reduce stand density and remove small diameter ladder fuels. Most trees removed would be less than 6 inches in diameter, though trees up to 9 inches dbh could be removed. Total trees per acre would decrease greatly. Basal area would be minimally affected because small trees contribute little to basal area. The average diameter of trees within treated stands would slightly increase. Canopy cover would not be significantly affected as trees greater than 6 inches dbh are used to calculate canopy cover in this analysis.

Forest Health. The removal of competing conifers and brush through mastication, piling and pile burning, and underburning would result in better individual tree growth and vigor of remaining conifers and hardwoods. Timing and intensity of underburning treatments to masticated units would be managed to minimize mortality of residual trees. Thinning may reduce some risk of bark beetle mortality in each treated unit. When periodic droughts and their associated bark beetle epidemics occur, there is a lower probability of extensive pine mortality in thinned stands. Maintaining good stand growth and vigor would reduce the risk of beetle populations increasing and attacking adjacent stands.

Flame Length. Flame lengths would be decreased in the treatment units by all action alternatives when compared to the no-action alternative (see Table 3-19). Within the DFPZ, acres burned with less than 4 foot flame lengths would increase by 15 percent, while acres burned with 4 to 6' flame lengths would decrease by 11 percent, and acres burned at with greater than 6 foot flame lengths would be reduced by 5 percent. Decreased flame lengths would allow for greater occurrence of firefighters making a direct attack during the initial stage of a fire. Direct attack normally leads to smaller fire size resulting in less negative fire effects, such as tree mortality, ground cover disturbance and wildlife habitat loss. Table 3-23 below shows the percent change from the no-action alternative. There is no significant difference in fire behavior between Alternatives B, C and G. Refer to related tables in text throughout document where necessary.

Fire Type. In the event of a wildland fire under the 90th percentile weather condition, approximately 66 percent of the DFPZ would burn under surface fire conditions (see Table 3-20). In this situation, mortality of mixed conifer trees between 10 and 29 inches dbh would be approximately 9 percent. Table 3-23 below shows the percent change from the no-action alternative.

Fuel Loading. Fuel loading would be reduced by more than 52 percent across all units. See Table 3-21 for fuel loading post-treatment for Alternative B, C and G. These results indicate that acres inside the treatment units would meet the standards and guidelines of the 1999 ROD associated with the HFQLG FEIS. Units 904, 907a and 907b would not initially meet the post-treatment 5 tons/acre standard required by the 1999 ROD. These are mastication units and were modeled using a light slash fuel model 11CC from the FMA master fuel model list. Although fuel loading in these units does not meet the desired condition, flame length, canopy base height and fire type all do. Table 3-23 below shows the percent change from the no-action alternative.

Table 3-19. Flame length for DFPZ by alternative.*

Effects on Flame Length	DFPZ with Flame lengths <4 feet	DFPZ with Flame Lengths 4–6 feet	DFPZ with Flame Lengths >6 feet
Alternative A (No Action)	58 %	20 %	16 %
Alternatives B, C and G	73 %	16 %	11%

Note: *Flame lengths on DFPZ acreage that would occur in the case of ignition during 90th percentile weather conditions are displayed by alternative. DFPZ acres total approximately 3,000, and approximately 2,100 acres would be treated in Alternatives B, C and G. The difference in acres reflects acreage that has already been treated or has been determined to need no fuels treatments at this time.

Table 3-20. Percentage of DFPZ acres in surface and crown fire (passive and active).*

Fire Type	Non-combustible	Surface	Crown Fire (Passive and Active)
Alternative A (No-Action)	0.2 %	41 %	59 %

Alternatives B, C and G	0.2 %	66 %	33 %

Note: *The percentage of land that would burn as surface or crown fire in the case of ignition during 90th percentile weather conditions is displayed by alternative. DFPZ acres total approximately 3,000, and approximately 2,100 acres would be treated under Alternatives B, C and G. The difference in acres reflects acreage that has already been treated or has been determined to need no fuels treatments at this time.

Table 3-21. Fuel loading by alternative, tons per acre.*

Unit	Prescription	Alternative A: No Action (tons per acre)	Alternatives B, C and G (tons per acre)
13T	Prescribed Fire: Underburn	7.0	3.48
15Ta	Hand Cut, Tractor Pile & Prescribed Pile Burning	12.02	3.48
902	Hand Cut, Tractor Pile & Prescribed Pile Burning	12.02	5.0
904	Mastication	12.02	6.5
905a	Mechanical Thin and Biomass Removal	12.02	5.0
905b	Mechanical Thin and Biomass Removal	12.02	5.0
907a	Plantation Thin and Biomass Removal	12.02	6.5
907b	Plantation Thin and Biomass Removal	12.02	6.5
909	Mechanical Thin and Biomass Removal	12.02	5.0

Note: All units shown are shaded fuelbreaks that would maintain overstory canopy after treatment.

Slash treatments may be accomplished during tree harvest (whereupon whole-trees are removed with limbs and tops attached), hand-cut hand-pile, hand-cut machine pile, lopp and scatter and/or underburned to minimize fuel bed depth, continuity, and arrangement. The net effect could result in incidental activity-generated fuel accumulations. Subsequent secondary underburning, pile burning, or other appropriate surface fuel treatment methods may be required to reduce activity-generated and existing fuels to meet desired levels.

Canopy Base Height. The proposed treatments of hand and mechanical thinning, biomass removal, underburning and mastication would increase canopy base height in most of the units from 1 foot to over 19 feet. The combined reduction in fuel loading and increase in canopy base height decreases the likelihood that surface fires would develop into crown fires. See Table 3-22 for canopy base heights for Alternatives B, C and G for a sample of units in the DFPZ.

Table 3-22. Canopy base height for action alternatives.*

Unit Number*	Alternative A: No Action Current Conditions (feet)	Alternatives B, C and G (feet)
13T	15	30
15Ta	1	26
902	1	18
904	1	10
905a	1	18
905b	1	22
907a	1	14
907b	1	16

909	1	25
Average	2.5	19.8

Note: *All units shown are shaded fuelbreaks that would maintain overstory canopy after treatment.

Effects of Indicator Changes on Fire Severity and Suppression Capability. The following is a discussion about the potential increase in fire behavior due to changes in microclimate and increases in fine fuels (Demming et al. 1977; Weatherspoon 1996; Agee et al. 2000) in the treatment units. Because of the increased tree spacing and decreased shade from tree canopies, the action alternatives would create slightly hotter and drier conditions and slightly increased wind speeds in the DFPZs and group selection units. The open canopy would also encourage more fine fuels and herbaceous plants. However, when all the effects (reductions in surface fuels, flame lengths, and ladder fuels, and an increase in fire suppression production rates) of the treatments are considered together, the fuel treatment activities would mitigate the effects caused by the decreased relative humidity and increased temperature (Martin and Brackebusch 1974; Rothermel 1983; Agee 1996; van Wagtendonk 1996; Agee et al. 2000). Residual canopy cover within DFPZ units would effectively keep fuel in a sheltered or partially sheltered forest. In the group selection units, the existing canopy of trees surrounding the group selections would mitigate any increase in wind speed. The proposed groups would be 1.5 to 2 acres in size. In an opening that small, an increase in wind speed would hardly be noticeable to a person standing in the unit.

Table 3-23 shows the percent change from the no-action alternative to the action alternatives. There is no significant difference in fire behavior between Alternatives B, C and G. Refer to these tables and further discussion of predicted flame length and fire behavior.

Table 3-23. Percent DFPZ acre change from the No-action alternatives to the action alternatives

Fire Type	**Surface Fire**	**Crown Fire (Active and Passive)**	
	15 percent (increase)	15 percent (decrease)	
Flame Length	**<4 Feet**	**4–6 Feet**	**>6 Feet**
	25 percent (increase)	25 percent (decrease)	<1 percent (decrease)
Fuel Loading	52 percent (decrease)	—	—
Canopy Base Ht.	95 percent (increase)	—	—

Both the strategic DFPZ network of fuel treatments, along with non-network fuel treatments, follow past forest-level (Olson et al. 1995) and more recent scientific recommendations for fuel treatments (Hessburg et al. 2005; Agee et al. 2000). Specifically, Hessburg et al. (2005) note:

> Currently, dry forest landscapes of the Inland Northwest exhibit high landscape connectivity of conditions that support large and severe fires. To buy time for more thoughtful and carefully planned forest restoration, it makes sense to begin restoration by designing and developing networks of shaded fuel breaks throughout the dry forests (Agee et al. 2000; Arno and Allison-Bunnell 2002). These networks would provide the advantage of breaking large fire-prone landscapes into smaller and more manageable pieces, which would be of significant benefit, both for restoration and fire suppression efforts. It would be useful to position fuelbreaks adjacent to

> existing roads so that the fuelbreaks could be revisited at regular intervals, and re-treated to maintain a widely scattered cover of medium and large-sized ponderosa pine (where available) with only light fuels (p. 132).

The action alternatives would each increase the likelihood that wildland fires occurring in the treatment units would be successfully suppressed by initial attack hand crews and engines, as compared to the No-action alternative. This would occur because of three factors: (1) the repair of forest roads would promote shorter response times for fire suppression resources to initial attack wildland fires; (2) the reduction in fire behavior characteristics as described above; and (3) the increase in fireline production rates that, at the very least, would double for hand line construction.

Wildland fires that may escape initial attack, either inside or outside the treatment units, would have a higher likelihood of being suppressed at a smaller size with any of the action alternatives compared to the no-action alternative. All of the action alternatives are designed to reduce the likelihood that a crown fire entering a DFPZ would continue to spread as a crown fire through the DFPZ. Standing and dead fuels would be treated such that active crown fire would not be supported, causing crown fires that enter the DFPZ to be reduced to surface fires with periodic torching of individual or small groups of trees. This would be accomplished by increasing canopy separation (crown spacing) to approximately 40–50 percent and raising crown base heights by reducing ladder and surface fuels. Table 3-20 DFPZ fire type, shows that approximately 30 percent of the DFPZ may experience crown fire, possible reasons for this are:

- Not all RHCAs in the DFPZ will receive treatment.
- With all environmental factors effecting fire behavior one would not expect to see total uniformity across the DFPZ.
- Treatment units were modeled with the primary treatment and may need a second entry to achieve full desired condition. Prescribed burning in thinning units is considered a secondary treatment

Also, as previously described, the reduction of surface, ladder, and canopy fuel loading would enhance the capabilities and safety of firefighting suppression resources by decreasing resistance to control. By reducing the canopy cover, the effectiveness of firefighting aircraft would improve retardant and water penetration through the canopy to the surface fuels, thereby slowing the fire progression so ground units would be more effective. The action alternatives would allow for better penetration of water and retardant because of lower canopy covers. One example of improved effectiveness was observed during the 2003 Peterson fire on the Feather River Ranger District, when the District Fuels Officer and District Suppression Battalion Officer observed effective penetration of aerial retardant in timber harvested areas where canopy cover had been reduced versus areas without any prior treatment (Case and Henderson, pers. comm. 2005).

Another example of reduced overstory tree canopy aiding suppression resources was observed on the 2007 Moonlight Fire on the Mount Hough Ranger District on the Plumas National Forest. On September 11th, 2007, firefighter crews initiated aggressive direct suppression tactics on the Moonlight Fire, flanking both the eastern and western slopes of Hungry Creek. Wildfire consumed an estimated 60 percent of the forest canopy. Fire fighters observed a well-formed smoke column, along with surface to tree crown torching and widespread spotting caused by airborne flammable embers. With fire danger ever-increasing, suppression crews had to vacate one flank, foregoing direct attack suppression efforts. Subsequently, the front of the smoke column turned to the east and caused additional spot ignition, causing uphill flare-ups on the opposite flank. Consequently, firefighters in this area also had to vacate.

After the fire had made the initial uphill run, spreading laterally, firefighter crews regrouped and began direct attack suppression tactics on both sides of Hungry Creek, where fire retardant or "wet water" had been effectively applied the day before. Field observations indicate where pre-suppression fuels reduction had been accomplished (thinning-from-below to 40% canopy cover retention and mastication), suppression resources were able to safely employ direct attack tactics and link key fire lines that evening (pers. comm. John Tuett and Larry Jansen, California Incident Management Team 2 2007).

The action alternatives would increase firefighter and public safety should a wildland fire occur in the project area, due to fuels treatments on approximately 1,400 acres in the Wildland Urban Interface area. These fuels treatments would reduce the likelihood of structures being destroyed or damaged by wildland fires in the communities of La Porte, American House, Strawberry Valley and Clipper Mills. Implementing fuel treatments in units that are within 300 feet of residential homes (which is the case in some instances) could prevent intense flaming fronts from reaching structures in the event of a wildland fire. According to the Structure Ignition Assessment Model (Cohen 1997), intense flame fronts (for example, crown fires) will not ignite wooden walls at distances greater than approximately 130 feet.

Treatments in units that are not immediately adjacent to structures could have an indirect effect on structure protection by enabling the fire to be controlled at a smaller size, as described above, or by requiring fewer resources to work on fire perimeter control because of the increased fire suppression effectiveness in the treatment areas, which in turn could allow more resources to be committed to structure protection. The action alternatives would also create safer locations from which suppression resources could establish control points and safety zones for initial or extended attacks because of the reduced number of trees per acre in the treatment units (see Table 3-18). The proposed fuel reduction treatments along roads, as well as the road improvements themselves, would promote safer travel for both the public and firefighters.

As part of the Sugarberry Project, approximately 1,500 acres could be burned during project implementation; this would include follow-up underburning to other treatments. Analysis indicates that prescribed underburning would result in 60 to 80 percent mortality in residual conifers (8 inches dbh and less), and most shrubs. This means that there would be a short-term increase in fire hazard in those units only treated by underburning; however, the reduction of surface fuels by underburning would mitigate this short-term hazard over the majority of the area, in both the underburn-only units, as well as those that are planned for harvest or mastication. It is important to note that units with underburn may not reach the desired condition with only one treatment and would require a follow-up underburn within 2–5 years of the first, if the desired condition is not reached.

Underburning is nonselective and may kill some dominant and co-dominant trees which may have been otherwise retained in mechanical treatments. Implementation of prescribed burning treatments would have a negligible to minor effect on species composition in underburn units. According to the HFQLG FSEIS (p. 19), overall, the overstory canopy would not be affected by underburning, although torching of individual or small groups of trees would occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels occur together. Torching may result in gaps in the canopy typically less than 0.5 acre in size. Localized torching from underburning would occur, thereby creating small openings in the overstory where shade-intolerant species may become established and grow. Effects of pile burning treatments would be highly localized and dispersed. The effects of pile burnng may include scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments. These treatments would reduce understory vegetation and would result in incidental mortality in the midstory but would not be expected to change CWHR size class.

3.3.6.3 Direct and Indirect Effects of Group Selection in Alternatives B, C and G

This section address effects of all activities associated with group selection, including ½ to 2 acre group harvests, site preparation, reforestation and release.

Tree Species Composition. One half to two acre group selection openings are designed to be large enough to provide sufficient light for height growth of shade-intolerant species seedlings, yet still remain small enough to retain ecological and social goals behind uneven-aged management. Shade-intolerant, fire-adapted species such as ponderosa and Jeffrey pine would be planted. Rust-resistant sugar pine and Douglas-fir would also be planted when suited to site conditions. Natural regeneration from seeds of surrounding firs, pines, and cedars, as well as shrub species, is also expected to occur in these openings. Proposed release treatments (grubbing, mastication and hand-cutting) in group selection openings would reduce competition.

Research on seedling survival within group selections in the northern Sierra Nevada forests is still minimal. However, a few experiments have been completed on the Plumas National Forest. Although ponderosa seed distribution and seedling germination was extremely high, McDonald and Abbott (1994) found poor growth of ponderosa pine in 30, 60 and 90 foot radius (approximately 0.1–0.6 acre) group selections (e.g., many seedlings only 5 inches tall at 9 years old). Studies indicate tree competition both above ground for light and below ground for nutrients and water, limit growth for species unable to adapt to low light levels. Another study (York et al. (2004) found significant increased seedling/sapling height with increased opening size, but a leveling off of the effect after 0.6 hectares (approximately 1.5 acres). It is anticipated that edge effects would affect height growth of seedlings in most group selection units, regardless of size. The group selection openings in other completed HFQLG projects have averaged 1.5 acres. There is no research on the effect of leaving residual trees within group selection cut patches.

The silvicultural intent of the traditional group selection harvest system is to remove all trees within the patch. However, the regulatory framework (SNFPA FEIS, Table 2) inhibits the traditional group selection system from being fully employed in the pilot project by stating that no trees equal to or greater than 30 inches dbh would be removed except to allow for operations. Although there an effort was made to avoid stands with a large tree (>30 inches dbh) component, public land allocated to group selection do allow entry into such stands. Sugarberry CWHR Size Class 4 and 5 stands (where group selections would predominantly be placed), average 11 trees per acre greater than 30 inches dbh.

In a study examining the growth of western white pine (*Pinus monticola*) in relation to forest openings, Jain et al. (2004) show that it has a significant relationship between visible sky (related to forest opening size) and growth patterns. Their results illustrated that in order for pine to have an 80 percent probability to occupy a site, there must be greater than 45 percent visible sky. They found the pine species to gain a competitive advantage over fir and hemlock at a site with 53 percent visible sky, and a free-to-grow status at 92 percent visible sky. It can be assumed that other shade-intolerant pine species, such as ponderosa, Jeffrey and sugar pine, have light thresholds as well. McDonald (1976) demonstrated a loss of seedling height growth of ponderosa pine seedlings near residual trees (greatest effects were seen 20 feet from the seed-trees, but the inhibitory effects reached out 40 feet) in a seed-tree cut. He found that density of seed trees and distance from seed trees directly influenced height growth of seedlings.

The effect of residual boundary trees and trees greater than 30 inches dbh reducing height growth of pine seedlings could result in mortality of some pines due to competition from naturally regenerating shade-tolerant species, namely true fir and incense cedar. In shaded situations, height growth of naturally regenerated shade-tolerant species may exceed planted shade-intolerant species. This effect will have to be mitigated through release treatments, including grubbing and hand-cutting, which will favor pine species. Pre-planting site preparation (grapple-piling, hand-piling and burning) will also be very important in ensuring pine seedling establishment and survival.

Placement of group selection units have been designed to avoid black oak areas during layout whenever possible. Generally group selection units will retain oaks greater than 12 inches dbh where they exist. Retention of smaller diameter oaks in group selection units is generally not considered feasible due to the number of large trees and the associated volume being harvested. Some damage to residual oaks greater than 12 inches dbh is to be expected to occur during harvest operations, despite mitigation measures employed for protection. In the event of damage, trees would retain their value for wildlife habitat. Silviculture prescriptions include retention of all oaks greater than 12 inches dbh through post-harvest activities. The number of oaks less than 12 inches in diameter, if found to be in group selection units, would increase initially following harvest as re-sprouting is expected.

Stand Density and Structure. Stand structure would change in group selections by creating small patches of young regeneration. Trees 30 inches dbh or bigger in group selection openings, as well as all trees bordering group selection openings, are expected to respond by increasing growth due to reduced competition. This would further increase the diversification of canopy layers through the development of large predominant, overstory trees. York et al. (2004) found a 30 percent increase in trees along group selection borders compared to trees growing within the group selection matrix. Overall stand density and canopy closure would decrease in a patchy pattern.

Group selection cut patches within thinned DFPZ and ITS units would add diversity to stand structure by creating some early seral (or in cases with many residual trees, two-story) environments. Due to overall thinning and residual trees left within groups, group selection patches within ITS stands are expected to blend into the overall stand matrix, appearing only as small, more open areas.

Although overall stand density would decrease, trees per acre would increase due to the planting of approximately 200 trees per acre at 14-foot spacing. Natural regeneration is also expected to increase trees per acre. See Table 3-24 for average pre- and post-treatment unit trees per acre, basal area and canopy cover. Naturally regenerated trees are not included in post-treatment data in Table 3-24. They will be regulated through a series of release treatments (grubbing and hand cutting).

Table 3-24. Stand density and structure of group selection treatments.[a]

		Trees Per Acre						
	Year	1–10 inches dbh	10–20 inches dbh	20–30 inches dbh	>30 inches dbh	Total	Basal Area (ft^2/acre)	Canopy Cover >6 inches dbh
No Action	2010	403	67	25	11	505	281	57
	2020	715	66	26	13	820	305	58
	2030	683	60	28	15	785	320	58
Alternatives B, C and G	2010 Post	0[b]	0	0	11	11	87[c]	18[c]
	2020	200[b]	0	0	11	11	107[c]	25[c]
	2030	200[b]	0	0	11	11	125[c]	29[c]

Notes:

a. Alternatives B, C and G figures would represent group selection harvest areas (in other words, the 1/2 to 2 acre harvest areas) and the no action figures would represent the matrix around these cutting areas. In group selection units that also have ITS or DFPZ thinning around group cutting areas, figures displayed in Table 3-18 would represent the matrix. Displayed are comparisons of average trees per acre, basal area, and canopy cover projected to 2030 within units proposed for group selection treatment.

b. Regeneration is estimated by silviculturist. It is assumed that groups will be managed for approximately 200 trees per acre (not including overstory residual trees >30 inches dbh) at approximately 14–16 foot spacing. Regeneration will be both natural and artificial.

c. Biomass removal is not prescribed for most group selections. It is assumed that healthy trees <9 inches dbh in open areas would be maintained for advanced regeneration, and suppressed small trees would be removed (through pile burning) due to logging damage during harvesting or intentional removal for site preparation purposes. Trees of this size are not included in the modeled BA and canopy cover predictions of the action alternative analysis above. For the purposes of this analysis, they would be lumped in with the regeneration figures. It is expected that their basal area and canopy cover contribution would be low.

Forest Health. Group selection cuts are not strategically placed near disease centers and would therefore have no direct effects on disease and insect impacts. Effects would be derived indirectly, however, through the opening of stands and the initial reduction in cover. Stand densities would be reduced overall, and tree stress particularly reduced near patch edges. Increased resources contributing to individual tree vigor would subsequently improve future stand resistance to disease and insect attacks.

Logging damage on residual trees and trees bordering units is possible from both thinning and group selection harvests. True firs seem especially prone to insects, disease and injuries caused by logging (Williams et al. 1992). Wounds incurred to residual trees can be susceptible to decay fungi, and stumps can serve as infection points for root diseases such as *Heterobasidion annosum*. However, logging damage can be substantially minimized through good logging practices required in standard mitigation measures. These practices include, but are not limited to, avoiding logging when sap is flowing and bark is loose on trees (spring/early summer), laying out skid trails in advance of logging, limiting log length, using directional felling, and treating stumps near infection sites with Sporax® for protection against *H. annosum* (Aho et al. 1983).

There is risk introducing uneven-age management into the landscape in its current state. Stands in the project area are currently relatively homogenous, fir-dominated forests. Fir species are more susceptible to pests and human-caused injury (Williams et al. 1992), and frequent stand entries may amplify the effect of disease and insect spread. The removal of trees in group selection could leave stump surfaces available for *H. annosum* infection. Residual trees greater than 30 inches dbh within group selections and border trees would have potential for infection in non-borax treated areas. This effect would be somewhat mitigated, however, as group selection units would largely be planted and managed for species not susceptible to the strain present in the Sugarberry Project.

Additionally, the benefits of logging to reduce tree competition within mixed-conifer forests could out-weigh short-term risk of disease/insect attack by improving overall long-term stand vigor. Group selection management would change the species composition across the landscape by encouraging pine species, which are not as susceptible to pest and human-caused injuries as are true fir. Historically, before fire suppression and turn-of-the-century selection harvesting of large pine and cedar, the project area had proportionally more non-susceptible species (pine, cedar and hardwoods). Fire would have maintained more open forests of mixed species with less interconnected root systems. Proposed activities in Alternatives B, C, and G would initiate the move to a more historical condition.

It should also be noted that the strain of *H. annosum* affecting fir trees in the Sugarberry Project area will not necessarily kill an infected tree (as would the strain affecting pine in east-side forests), nor will it infect every stump in harvest units. Fir trees often live for years with infection. If an infected tree is surrounded by unsusceptible species, spread from root-to-root contact would not occur. Group selections harvest areas would be more open than thinning units. As stumps dry from exposure to drying winds and heat, the risk of fungal infection by spores is greatly reduced. Hence areas chosen for Sporax® application were limited to high value areas, including Wildland Urban

Interface (WUI) and areas with higher visual and recreational quality, with known nearby infection sites.

Mistletoe and blister rust infections would be indirectly affected through group selection. Residual trees greater than 30 inches dbh infected with mistletoe within group selections, as well as infected border trees, could infect the regeneration of susceptible species. Tree species used for reforestation are not susceptible to the majority of mistletoe observed in the Sugarberry Project Area (e.g., mistletoe affecting true firs). Blister rust infections are expected to occur on naturally regenerated sugar pine because the disease more easily targets small trees. This would be mitigated, however, by planting of rust resistant sugar pine.

Flame Length, Fire Type, Fuel Loading and Canopy Base Height. The group selection units would have lower flame lengths after site preparation and replanting than the untreated forested areas. Residual trees greater than 30 inches in diameter within the groups would have a low chance of mortality during fires due their high average crown base height and relatively low fuel loads in areas that have been prepared for planting. Planted trees would remain vulnerable to scorch-related mortality several years after initial planting due to their small size. Groups imbedded within fuel treatment and Area Thinning Units would be less vulnerable to damage by wildfire than those established outside of Area Thinning and Fuel Treatment Units.

Research on group selection patches in the Challenge Experimental Forest (located in the project area) indicates that, in 10 years, there will be significant cover of grasses, herbs, and shrubs, but that the vegetation will have achieved little height growth (McDonald and Abbott 1994; McDonald and Reynolds 1999). That research shows that small openings, characteristic of group selection, suppressed growth of shrubs due to shading from trees adjacent to the openings (McDonald and Abbott 1994; McDonald and Reynolds 1999). The live fuel moisture of the grasses, herbs, and shrubs will play the biggest role in reducing fire behavior (Agee 1996) in addition to the ratio of live to dead vegetation available to burn. The proportion of dead and live material in the units may affect the way regenerated shrub species may burn. With a relatively low amount of dead surface fuels (5 tons or less per acre) remaining post-treatment, the live fuels in the group selection units may act more as a heat sink rather than a heat source in the event of a wildland fire. It has been observed on the Plumas National Forest, that brush species do not exhibit severe or extreme fire behavior, especially when the brush is young, succulent, and growing. On the Plumas National Forest, one example of a high-intensity wildfire burning into an older plantation with a heavy brush component occurred when the Pigeon fire in August 1999 (Mount Hough Ranger District) burned to the edge of a plantation where the spread was limited by the fuel characteristics in the plantation. Spot fires in the plantation also had limited spread because of the fuel characteristics (Phil Shafer, pers. comm.). Another example was the Mosquito fire in August 1999 (Feather River Ranger District) that started from a lightning strike adjacent to a nine-year-old plantation comprised mainly of ponderosa pine with a high component of *Ceanothus* shrubs. A fireline was quickly constructed through the middle of the plantation, and the fire was controlled at about 30 acres by one engine crew and a dozer. If the *Ceanothus* shrubs were older and contained more dead branches, the fire may not have been contained so easily or extinguished at 30 acres (Estes, pers. comm. 2005).

3.3.6.4 Direct and Indirect Effects of Aspen and Black Oak Enhancement in Alternatives B, C and G

Tree Species Composition. Conifers would be removed from approximately 20 acres of aspen stands. Aspen trees would remain. Due to increased sunlight and consequent soil warming through removal of conifer shading, suckering (sprouting from roots) of new aspen shoots from the clonal root system is expected to occur shortly after treatment (Sheppard et al. 2006; Sheppard 2004). Small conifers would be removed from approximately 100 acres of black oak stands. Reduced conifer competition early in oak development would allow black oak stands to perpetuate themselves into future larger size classes.

Stand Density and Structure. Conifer basal area, trees per acre and canopy cover would be reduced to minimal proportions within aspen stands. All aspen trees including seedlings, saplings and adults would be protected. Trees over 30 inches dbh would be removed in approximately 12 of the 20 aspen unit acres. It is estimated that approximately 150–180 trees greater than 30 inches dbh or 12 to 15 average trees per acre would be removed. Adult aspen where existing are expected to be released from conifer competition and young aspen are expected to sprout due to released light and water resources needed for regeneration. See Table 3-25 for immediate pre- and post-treatment estimates of aspen stand characteristics.

Table 3-25. Displayed are data collected from the Howland Flat aspen units.*

	Basal Area	1–10	10–20	20–30	>30	Total Trees per Acre	Canopy Cover >6	Canopy Cover >30
		(inches dbh)					(inches dbh)	
Pre-treatment	200	183	47	11	13	254	54	20
Aspen	25	16	14	3	0	33	N/A	0
Conifer	175	167	33	8	13	221	N/A	18
Post-treatment	34	19 (not including aspen suckers)	15	4	0	38	28	0
Aspen	25	16	14	3	0	33	N/A	0
Conifer	9	3	1	1	0	5	N/A	0

Note: *Current shading from conifer within and around aspen is inhibiting regeneration of the species in the area. Data are not projected into the future due to the lack of a region-specific (Sierra Nevada) model for this species. Due to the effects of similar treatments in the Sierra Nevada, the Cascades and throughout the west, it is expected that removing the conifer canopy cover in the aspen stands will stimulate suckering which would enlarge the aspen community and allow for future regeneration.

Some recent hand work done in the Howland Flat area released competition from competing small conifers (less than 9 inches dbh) to stimulate suckering immediately adjacent to existing aspen adults. However, suckering densities are low, growth of new suckers is minimal and suckering appears to be largely limited to areas less shaded by conifers. Aspens require full sunlight to thrive and sufficiently warm soils to induce high density suckering. The dense shade from overtopping and adjacent medium to large conifers is currently inhibiting aspen adult and sucker survival in the Howland Flat area. This reduced regeneration capacity limits the ability of the aspen stand to perpetuate itself into the future. Even partial shading reduces suckering potential of aspen. Trees greater than 30 inches dbh are currently averaging 20 percent canopy cover. Removal of all conifers, including trees greater than 30 inches dbh, within the root zone beyond the visible aspen trees (1 to 1.5 tree heights) would be expected to offer the best chance of successful aspen regeneration and stand growth within the Howland Flat area (Shepperd et al. 2006; Shepperd 2004; Shepperd pers. communication 2004).

Conifer trees per acre would decrease within black oak stands. Basal area is not expected to change significantly as small trees contribute little to basal area. Canopy cover is not expected to change within oak stands. Future effects of removing conifers and some smaller oaks now would include increased oak diameter growth due to reduced competition. Studies of growth of black oak in natural stands indicate that it would take 50 years to grow an oak to approximately 9 inches dbh. On a good site in the northern Sierra Nevada, diameter growth rates of black oak trees thinned when 60 years old were twice that of unthinned trees of similar age 8 years after thinning (McDonald 1980). Acorn production in oaks is sporadic between the ages of 30 to 75 years, increasing significantly when trees are 80 to 100 years of age, and yield increases as bole and crown diameter increase to at least the age of 200 years (McDonald, 1990). Because black oak sprouts profusely after trees are cut (McDonald 1979), thinning would in effect create another age class or two age-class stands resulting in greater seral stage diversity. Thinning would enhance forage habitat for terrestrial wildlife,as mast production is predicted to increase.

Forest Health. Aspen stands are rare in the project area and on public lands exist only in the Howland Flat area. Lack of large-scale disturbance, that would normally remove conifer ingrowth into aspen stands, has been absent in the Sugarberry Project area over the last century. Howland Flat aspen patches today are trapped between areas too wet for them to survive (saturated meadows or riparian hardwood communities such as alder bogs), and neighboring conifer forests that are overtopping aspen by growing around and within them. Regeneration is scarce in all but small portions of the 20 acres as conifer shade is inhibiting aspen sprouts. The proposed action would reverse these conditions to create an environment where aspen could survive and perpetuate itself both at the individual and stand levels.

Oaks stands would be released from conifers and experience less competition for water and nutrients. Thinning oaks would also promote better crown development on residual trees allowing for enhanced mast developments and value to wildlife. Removal of conifer ladder fuels from oak stands will reduce the potential for loss of oak in the event of wildfire.

Flame Length, Fire Type, Fuel Loading and Canopy Base Height. Fuels generated from logging the conifers from the aspen and oak stands would be piled and burned and is not expected to affect fire behavior.

3.3.6.5 Cumulative Effects Common to All Alternatives (A, B, C and G)

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 one can not reasonably identify each and every action over the last century that has contributed to current conditions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. The CEQ 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 cumulative effect of past management practices, fire exclusion, and high-mortality fires have largely shaped the forest that exists in the project area today. These past projects and events are reflected in the Vestra (2000) vegetation layer used to characterize the existing conditions (the baselines for analysis) in the project area. Changes in vegetation structure as a result of fires and recent past projects since the baseline data was collected has been incorporated into the Sugarberry Project's existing conditions.

On public and private lands, past harvest activities focused on even-aged management and removal of dominant and co-dominant trees. Small trees less than 10 inches dbh were generally left on site. These harvest systems often used lop and scatter techniques for limb wood and tree tops. The results of these practices were high-density stands of small trees with relatively high fuel loads. Many of these stands continue to be conducive to high-mortality fire today. Since 1996, commercial thinning-from-below, with and without prescribed fire, has been the primary silvicultural treatment implemented on public lands in the Sugarberry Project area. This silvicultural treatment has been used to establish several fuel treatments (Upper and Lower Slate), which currently meet desired conditions in terms of potential fire behavior and tree mortality.

There are hazard trees removal projects, particularly American House, Lexington Hill, and Devils Gap in close proximity to and within the Sugarberry Project area. From the hazard tree sale cruise information, less than four trees per acre were marked for removal along the roadways.Within the Sugarberry Project Area, an average of 3.4 trees per acre greater than 30 inches dbh were designated for removal along the roadways. The potential number of trees greater than 30 inches dbh is estimated to equal .7 percent, resulting in no change in seral stage diversity classes, nor change the the size or density classes of the California Wildlife Habitat Relationship (CWHR) vegetation types.

Herbicides have been used to control competing brush in conifer plantations on private lands within the Sugarberry Project area. A reduction of competing brush generally reduces stand-level flammability in plantations and increases rates of tree growth. These factors can shorten the length of time that planted trees remain vulnerable to scorch-related mortality.

Watershed and wildlife projects are not generally implemented at a scale or location to have an influence on landscape-level vegetation or fire behavior and related tree mortality. In general, wildlife and watershed projects listed in "Appendix F: Past, Present, and Reasonably Foreseeable Future Actions," have a negligible effect on stand- and landscape-level fire behavior and related tree mortality. Small burn projects and projects that increase riparian vegetation and soil moisture in meadows (grazing exclosures) or riparian areas (check dams) may have a minor beneficial effect by decreasing fire behavior where higher soil moisture and corresponding fuel moistures occur. Current road conditions and past road closures to benefit wildlife have had a negligible impact on the ability of fire managers to suppress and contain fires in the Sugarberry Project area.

Other present and proposed future projects in the project area include wildlife, botanical, watershed, and recreation/special use projects. These projects would not be expected to have a measurable effect on forest structure in the project area due to the nature of such projects, with the exception of the Plumas National Forest Integrated Noxious Weed Control Program. This program would have a major beneficial effect by controlling the invasion and spread of noxious weeds and maintaining native understory vegetation in the project area. Removal of noxious weeds by any mechanical or chemical method would have a negligible effect on stand- and landscape-level fire behavior and related tree mortality. The target weed species are found in small, isolated populations and are not generally considered unusually flammable.

Christmas tree cutting and firewood collection would likely have an adverse effect on regeneration and snag levels, particularly within localized areas around main roads. Christmas trees and fuel wood cutting have a negligible effect on stand- and landscape-level fire behavior. Levels of regeneration and snags outside of the main road corridors are unlikely to be affected due to recruitment in untreated areas and lack of access. Due to the seasonal and dispersed nature of these activities, there would be a negligible effect across the project area. The primary (moderate) adverse effect of past recreation activities, with respect to fire, is increased ignition sources from campfires, vehicles, and other intentional or unintentional ignitions from forest users during summer months.

Future management on private land would include a variety of silvicultural treatments. Projections through 2008 estimate approximately 2 percent of the total Sugarberry Project area would be affected. Most management activities would move age class distribution to younger age classes (e.g., clear-cutting or group selection); while others would have variable effects on stand density (e.g., sanitation salvage or selection). See Appendix F for complete list of projected activities.

3.3.7 Cumulative Effects: No-Action (Alternative A)

The No-action alternative would rely on “natural” disturbance, such as density-dependent mortality and fire occurrence (or lack thereof), to shape overall landscape structure. Maintenance of early seral stand structure would rely on areas of disturbance. The current landscape is dominated by middle-aged (as represented by CWHR Size Class 4), dense forests. This would favor shade tolerant species and would likely perpetuate a lower ratio of shade intolerant to shade tolerant species.

No treatments would occur to enhance the development of mid-seral open-canopy forests. This would result in overall landscape homogeneity. Stand densities would be expected to increase with time and incur competition-related mortality. The ability of Sugarberry aspen stands to increase in size and sustain themselves into the future would be limited under Alternative A. Aspen in the Sugarberry Project area are largely trapped between wet meadows and encroaching conifer stands. Without disturbance and removal of shading coniferous trees, aspen health and vigor is expected to decrease, possibly to the point of losing the clone in this area. See “Section 3.4: Botanical Resources and Noxious Weeds” for further discussion (more information also within the Sugarberry Botany Report on file at the Feather River Ranger District).

Maintenance of high stand densities across the landscape would result in the potential for adverse major impacts such as beetle outbreaks beyond endemic levels, widespread susceptibility to drought, and increased risk for high-mortality fire. These high stand densities and closed-canopy forests would favor a gradual shift in species composition toward shade-tolerant species which would have an adverse effect on species diversity across the landscape. Because such high-density stand structure is susceptible to forest health and fire hazard issues, a homogeneous occurrence of these mid-seral closed canopy forests across the landscape is unstable. Alternative A would not provide for spatially variable, diverse stand structures across the landscape as described by Skinner (2005), Skinner and Chang (1996), Weatherspoon (1996), and the HFQLG FEIS (1999), and it would not meet the desired conditions identified in the Slate Creek Landscape Assessment or the desired conditions identified in the “Purpose and Need” sections in Chapter 1 of this document.

By taking no action, fire behavior is expected to result in high-mortality fires, such as the Devils Gap Fire of 1999, which occurred within this analysis area. This fire burned over 1,500 acres with high mortality throughout. Over the long term, mortality occurring in high-density stands would continue to increase surface fuel loading through deadfall of standing dead trees. These increased surface fuels, combined with continuous ladder and canopy fuels, would likely maintain stands susceptible to high-mortality fires such as the Devils Gap Fire. Increased flame lengths during a wildfire could lead to high mortality in forested areas, including wildlife urban interfaces, RHCAs, PACs, HRCAs, and rare species habitat in the project area. In turn, this may result in continued high fire suppression and rehabilitation costs for the indefinite future in the Sugarberry Project. The no-action alternative would also not improve firefighter and public safety, which could lead to potential future injuries during fire events. Table 3-26 below shows potential fire types that could occur in private, public and owl-habitat acres.

Table 3-26. Alternative A acres of potential surface fire and crown fire (passive and active) for all public lands, private lands, PACs, and HRCAs in the Sugarberry Project.

Fire Type	Acres of Public Land	Acres of Private Lands	Total Public and Private Acres*	All PACs and HRCAs on Public Lands in the Project Area*
	Sugarberry Analysis Area*			
Surface Fire	13,565	5,480	19,045	6,315
Crown Fire (active and passive)	30,445	11,385	41,830	14,305
Grand Total	44,010	16,865	60,875	20,620

Note: *Acres exclude unburnable areas such as lakes, rock outcrops, and other barren areas in the project area.

Table 3-27. Alternative A acres of potential flame length for all public lands, private lands, PACs, and HRCAs in the Sugarberry Project.

Flame Length	Acres of Public Land	Acres of Private Lands	Total Public and Private Acres*	All PACs and HRCAs on Public Lands in the Project Area*
	Sugarberry Analysis Area*			
<4 Feet	19,105	7,730	26,835	9,090
4-6 Feet	11,405	4,470	15,875	5,485
>6 Feet	14,440	5,005	19,445	6,255
Grand Total	44,950	17,205	62,155	20,830

Note: *Acres exclude unburnable areas such as lakes, rock outcrops, and other barren areas in the project area.

Taking no action would not provide connectivity with the Bald Onion, Upper and Lower Slate, South Fork, and Slapjack Projects on the Feather River Ranger District. Future Forest Service fuel reduction projects, as well as those currently being designed by the local area Fire Safe Councils, would lack connectivity without the larger landscape-scale design proposed for the Sugarberry Project. Although DFPZ effectiveness is not conclusive, and has not been established at the landscape scale (Agee et al. 2000), the Sugarberry Project is part of the HGQLG Act Pilot Project that is intended to evaluate the effectiveness of DFPZs.

Cumulative Effects Common to All Action Alternatives

Landscape Age Class Distribution. Present and proposed future fuels and vegetation management projects in the Sugarberry Project area include hazardous fuels reduction in the form of mastication, grapple piling and burning, or underburning. These activities would have a major beneficial effect on the stand level by maintaining an open understory in these stands, thereby reducing high stand densities of small trees, ladder fuels and fire risk. However, these activities would have a negligible impact on overall landscape structure (as represented by CWHR size class) or overstory canopy (as represented by CWHR density class).

Total acres of all DFPZ and ITS mechanical thinning units account for approximately 1 percent of the acreage in the vegetation, fire and fuels analysis boundary. Due to the scale presented, direct effects of mechanized thinning are expected to be very minor. Thinning would convert some CWHR Size Class 4 stands to CWHR Size Class 5. Stands classified as ‘dense’ in the CWHR canopy closure classification (>60 percent canopy closure), would convert to ‘moderate’ (40 to 60 percent canopy closure) after thinning activities. This would occur as the smaller trees are removed, canopy cover is reduced and average diameter of residual trees is subsequently increased. Silvicultural treatments would include the overall maintenance and development of large trees throughout the Sugarberry Project area. Upper diameter limits maintain the component of large trees that exist in the project area, and "thinning-from-below" treatments would create conditions favorable for growth and development of large trees.

The openings created by group selection would mimic fine-scale disturbances (e.g., pockets of high-intensity fire, localized insects, windthrow, snow events, etc.). It is estimated that approximately half of the ½ to 2 acre groups harvested would change to pockets of CWHR Size Class 1 (seedlings) stands if there are few large residual trees per acre. The other half are expected to become sparsely stocked CWHR Size Class 5 stands due to the quantity of residual trees greater than 30 inches dbh. In group selection openings with many residual trees greater than 30 inches dbh, harvested areas might also be classified as CWHR Size Class 6. Post-harvest CWHR size class 5 and 6 groups are expected to blend into the non-harvested area around them as stands naturally have less stocked areas due to small-scale disturbances. See Sugarberry Project File for CWHR analysis.

Disturbance caused by harvest of conifer trees within the proximity of the aspen stands would increase aspen vigor and stand size within the Howland Flat area. This would promote long-term maintenance of this species within the Sugarberry Project area. Some aspen and oak trees may be affected by harvest operations. Impacts to the crown or breakage of the bole would cause suckering to take place in aspen. Impacts to the crown or bole of an oak may provide future nesting for birds or mammals. Any aspen or oak that are affected as a result of harvesting will be retained on site through all phases of activities, unless there is a safety concern to operations or personnel. Aspen has a shallow root system and is susceptible to windthrow in some situations. Hence, removal of conifers surrounding aspen may predispose some aspen to windthrow.

DFPZ Maintenance. Future DFPZ maintenance is not proposed in the Sugarberry Project at this time, but is included in the cumulative effects analysis as a foreseeable future event. The 2003 HFQLG FSEIS 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 described in Appendix B, Sugarberry DFPZ Monitoring and Maintenance Guidelines.

These maintenance activities could occur as soon as 10 years after implementation. The direct and indirect 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. Also, across the project area, snag recruitment would continue to occur, particularly in untreated areas where high stand densities would continue to contribute to mortality.

Another cumulative 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, these treatments would maintain forest canopy and enhance residual tree size. This, in turn, would retain stand structure and composition and would have moderate beneficial effect on the long-term effectiveness of fuel treatments in terms of reducing understory establishment and development.

Relation of Sugarberry to Other HFQLG Pilot Projects. The cumulative effects of HFQLG Pilot Project actions, such as the proposed Sugarberry Project and other vegetation management actions in the Sierra Nevada, were assessed in the SNFPA FSEIS (2004) and the HFQLG FEIS (1999). The fuel treatments constructed in the proposed Sugarberry Project area would constitute less than 1 percent of the total acreage of fuel treatments to be constructed under the Pilot Project (up to 300,000 acres). The group selection proposed for the Sugarberry Project alternatives accounts for less than 12 percent of the annual group selection planned for the Pilot Project (8,700 acres per year) as analyzed under the HFQLG FEIS (1999).

Cumulative effects of the DFPZ treatment units could be much larger than direct and indirect effects, particularly with the occurrence of wildfire. DFPZ thinning units are located among other strategically placed treatment acres which together work as defensible places to fight fire and help reduce risk of wildfires and fire spread. Reducing canopy connectivity (sawlog removal) and understory (biomass removal) fuels in these areas creates fuelbreaks which could potentially protect surrounding areas from wildfire.

The action alternatives would provide connectivity with the Bald Onion, Upper and Lower Slate, South Fork, and Slapjack Projects on the Feather River Ranger District. Future Forest Service fuel reduction projects, as well as those currently being designed by the local area Fire Safe Councils, would lack connectivity without the larger landscape-scale design proposed for the Sugarberry Project. Even though DFPZ effectiveness is not conclusive, and has not been established at the landscape scale (Agee et al. 2000), the Sugarberry Project is part of the HGQLG Act Pilot Project that is intended to evaluate the effectiveness of DFPZs.

Potential Future Fire Behavior. Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in ITS and DFPZ thinning units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments and break up the continuity of surface and crown fuels. A reduction in landscape-level, fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the project area. Table 3-28 displays predicted acres of surface fire and crown fire under Alternatives B, C and G. Table 3-29 displays predicted potential flame length that could occur in private, public, and owl habitat acres under Alternatives B, C and G.

Table 3-28. Alternatives B, C and G—acres of surface fire and crown fire (passive and active) for all public lands, private lands, PACs, and HRCAs in the Sugarberry Project.

Alternative	Fire Type	Acres of Public Land (Project Area*)	Acres of Private Lands (Project Area*)	Total Public and Private Acre*	All PACs and HRCAs on Public Lands in the Project Area*
Alts B, C & G	Surface Fire	15,325	5,480	20,805	6,885
Alts B, C & G	Crown Fire (active and passive)	28,695	11,385	40,080	13,740
Alts B, C & G	Grand Total	44,020	16,865	60,885	20,625

Note: *Acres exclude unburnable areas such as lakes, rock outcrops, and other barren areas in the project area.

Table 3-29. Alternatives B C and G—acres of potential flame length for all public lands, private lands, PACs, and HRCAs in the Sugarberry Project.

Flame Length	Acres of Public Land	Acres of Private Lands	Total Public and Private Acres	All PACs and HRCAs on Public Lands in the Project Area
	Sugarberry Analysis Area			
<4 Feet	20,330	7,730	28,060	9,520
4-6 Feet	10,550	4,470	15,020	5,135
>6 Feet	14,055	5,005	19,060	6,180
Grand Total	44,935	17,205	62,140	20,835

3.4 Botanical Resources and Noxious Weeds

3.4.1 Introduction

This section presents a summary of the results of the BE for botanical resources, which is on file at the Feather River Ranger District office in Oroville, California. The BE includes a complete discussion of: (1) U.S. Fish and Wildlife Services (USFWS) Threatened, Endangered, and Proposed and U.S. Forest Service (USDA) Region 5 Sensitive species; (2) Plumas National Forest Special Interest species ("Appendix A: Botany Report" in the BE); (3) noxious weeds ("Appendix C: Noxious Weed Risk Assessment" in the BE); and (4) Management Indicator Species (MIS) Report ("Appendix D: MIS Report" in the BE).

No Federal or State listed Threatened, Endangered, or Proposed species are located in the Sugarberry Project area. However, five Sensitive plant species in Region 5 were found within the analysis area (Region 5 Sensitive Species List 10/30/2006). These include:

- Western Goblin (*Botrychium montanum*),
- Bug on a Stick Moss (*Buxbaumia viridis*),
- Clustered Lady's Slipper (*Cypripedium fasciculatum*),
- Veiny Aquatic Lichen (*Hydrothyria venosa*) and,
- Quincy Lupine (*Lupinus dalesiae*).

Regulatory Framework

Sensitive Species. The 1988 Plumas National Forest LRMP provides forest-wide general direction to:

- Maintain viable populations of Sensitive plant species (pp. 4–34);
- Protect Sensitive and Special Interest plant species as needed to maintain viability (pp. 4–34);
- Inventory and monitor Sensitive plant populations on a project-by-project basis (pp. 4–34);
- Develop species management guidelines to identify population goals and compatible management activities, and prescriptions which will maintain viability (p. 4-34).

Noxious Weed Management. The HFQLG Act FEIS and the 2004 ROD on the SNFPA and FSEIS amended the management direction in the Forest Plan to address management of noxious weeds and invasive, exotic (non-native) weeds. Management direction for noxious weed and invasive, exotic weed management is found on page 2-9 of the HFQLG Act FEIS and page 36 of Appendix A of the SNFPA ROD. Table 2.4 of the HFQLG Act FEIS Section D states:

- Manage National Forest System lands so that management activities do not introduce or spread noxious or invasive exotic weeds using the following guidelines during site-specific planning and implementation:

– *Inventory*: As part of site-specific planning, inventory project areas and adjacent areas (particularly access roads) for noxious and invasive exotic weeds.

– *Control*: If noxious weeds are found in or adjacent to a site-specific project area, evaluate treatment options relative to the risk of weed spread without treatment. Evaluate control methods at the site-specific planning level.

– *Prevention/Cleaning*: Require off-road equipment and vehicles (both Forest Service owned and contracted) used for project implementation to be weed-free. Clean equipment and vehicles of all attached mud, dirt and plant parts. Use standard timber sale contract clause C6.343-Cleaning of Equipment in timber sale contracts.

– *Prevention/Road Construction*: Require all earth-moving equipment, gravel, fill or other materials to be weed-free. Use on-site sand, gravel, rock or organic matter, where possible. Evaluate road locations for weed risk factors.

– *Prevention/Revegetation*: Use weed-free equipment, mulches, and seed sources. Avoid seeding in areas where revegetation will occur naturally, unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in on-site revegetation, unless contaminated with noxious weeds.

– *Prevention/Staging Areas*: Do not stage equipment, materials, or crews in noxious weed infested areas where there is risk of spread to areas of low infestation."

Additionally, Appendix A of the SNFPA 2004 ROD (p. 36) establishes goals for noxious weed management through the use of an integrated weed management approach according to the priority set forth in Forest Service Manual (FSM) 2081.2:

- Priority 1 **–** Prevent the introduction of new invaders
- Priority 2 **–** Conduct early treatment of new infestations
- Priority 3 **–** Contain and control established infestations.

Provisions for implementing these goals are embodied in the Noxious Weed Management Standards and Guidelines of the SNFPA 2004 ROD.

Analysis Methodology Plants

Survey Techniques. The determination for potential habitat for pertinent botanical species was conducted initially by reviewing aerial photographs for topographic characteristics (including mountain ridge-top, meadow and riparian features, etc.), soils maps (key environmental factor influencing species presence), along with researching documented known occurrences. Floristic botanical surveys were conducted in all proposed treatment units in the years 2004, 2005, and 2006 for: USFWS Threatened, Endangered, and Proposed for listing species; US Forest Service Region 5 Sensitive species; Plumas National Forest Special Interest species; noxious weeds; and Management Indicator Species (MIS). Unique habitats were surveyed by Forest Service botanists and TEAMS, a USDA Forest Service Enterprise Team. Non-vascular plant surveys were conducted by Colin Dillingham and David Toren in 2005. All surveys were conducted at appropriate time of year to readily identify species. In the field, areas identified as high potential habitat were surveyed at a high level of intensity (complete survey) including: openings in the forest, meadows, riparian areas, seeps, and springs. Other areas with little to no potential habitat were surveyed at a less intense level.

Plant location data were recorded using Global Positioning Systems (GPS), and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze the proximity of rare species to potentially detrimental treatments and designate “Controlled Areas.” Areas of concern were discussed at planning meetings, and the necessary modifications were made to the project design to protect plants of concern. Also, past project locations were compared with previously documented occurrences to determine if past activities are contributing lingering effects to plant occurrences.

Analysis Area. The cumulative effects analysis area for *B. montanum, B. viridis, C. fasciculatum, H. venosa, L. dalesiae*, and *P. olivacea*, is limited to the Sugarberry Project Area. The area of study for cumulative effects analysis was bounded in this manner, because direct and indirect effects from proposed project activities would be limited in geographic scope.

Analysis Time Frame. In assessing cumulative effects, impacts of past actions since 1984 were considered. Actions preceding that date were not included because spatial data for past projects is not readily accessible. Distribution of these past and future projects was then compared to known plant locations. Research of previous ground-disturbing activities indicates present known locations of botanical resources of concern lie outside impacted areas.

Vascular Plant Baselines. The baseline level of habitat is the estimated amount of habitat an area is capable of providing suitable growing environments, under optimum conditions. The baseline associated with the cumulative effects analysis area is the current occupied habitat for these species. This can be seen in Table 3-30 below, which shows acres of occupied habitat for the six species of concern. These baselines are comprised of the best known population data and have been compiled from botanical surveys spanning 21 years. It is likely that historic disturbances such as historic mining and timber removal negatively impacted *B. montanum, B. viridis, C. fasciculatum*, and *H. venosa*, because these taxa are not present in areas with recent ground disturbance. Specifically, it has been observed on the Plumas National Forest that *C. fasciculatum* has been extirpated following clear-cutting (pers. comm. Linnea Hanson, Feather River Ranger District Botanist 2007; Jim Belsher-Howe; Mt. Hough Ranger District Botanist 2007). *H. venosa* is found in clear, perennial streams. Historic mining activities may have impacted habitat through increased seasonal discharge and siltation. However these assumptions are not based on quantitative data.

Analysis Methodology Fungi

Potential project-related effects to *Phaeocollybia olivacea*, a Region 5 sensitive fungal species, was assessed using a potential habitat model. This model was developed by Vegetation Management Solutions (O’Hanlon VMS 2006), to aid in the identification of potential habitat for selected Region 5 sensitive fungi.The model is currently being ground tested in order to determine the validity of predicted habitat. This model delineates habitat quality as either low, medium, medium-high, or high quality habitat. The two main variables shown to correspond with know population locations are forest canopy cover and tree species composition.

Based on the results of VMS modeling, there are approximately 670 acres of potential suitable habitat for *Phaeocollybia olivacea* located in the Project Area. For the purposes of this analysis, potential habitat that ranked as medium to medium-high quality were assumed to be occupied. Hence, low quality habitat was not analyzed.,No high quality habitat for *Phaeocollybia olivacea* is present Potential for medium to medium-high quality habitat is available over 640 acres. An estimated 48.3 acres exist within proposed treatment areas.

Analysis Area. The cumulative effects analysis area for P. olivacea is the Sugarberry Project area. The area of cumulative effects analysis is bounded in this manner, because direct/ indirect effects from proposed project activities would be limited in geographic scope.

Fungi Baseline. The baseline level of habitat is the estimated amount of habitat that the area would be capable of providing suitable habitat, under optimum conditions. It is assumed that all areas of medium to medium-high potential habitat are occupied. Therefore the baseline for P. olivaceae is 670 acres for this analysis area.

3.4.2 Affected Environment (Existing Conditions)

There are 73 acres of habitat utilized by the 5 known US Forest Service Region 5 Sensitive Species within the Sugarberry Project area. Areas occupied by each of these species, is considered their habitat. Proposed Sugarberry Project activities would occur within 0.2 acre of L. dalesiae habitat. The remaining portions of occupied habitat occur outside of project treatment areas.

There are approximately 670 acres of habitat within the project area for *Phaecollybia olivacea*, a Region 5 Sensitive mushroom. This estimate is based on the 2006 Vegetation Management Solutions habitat model. Approximately 5 percent of the habitat is located within proposed treatment ares.

Sensitive plant species would be protected by avoidance (flagging areas as closed to activity), by imposing limited operating periods (LOPs) to allow sensitive species to finish their life cycle, or by changing a treatment prescription. In some cases, depending on the species and the management prescription, no protection would be given for disturbance tolerant species. Specific recommendations for each occurrence are based on the Plumas National Forest Interim Management Prescriptions 2007.

Tables 3-30 and 3-31 summarize what is known about the Region 5 Sensitive species located in the analysis area. These tables show the total acres of the respective botanical species and the number of acres within specific treatment units. Table 3-30 also shows the percentage of the occurrences that would be protected (excluded) from Sugarberry Project treatment activities.

Table 3-30. Acres of rare plant species in the botanical resources analysis area and proposed treatment units.

Species	Acres in Project Area	Acres in Group Selection	Percentage of Area Protected	Acres in ITS/Group Selection	Protected Through
Botrychium montanum	1.9	1.2	100%	0.6	CA[b]
Buxbaumia viridis	<1	0	100%	0	RHCA[b]
Cypripedium fasciculatum	29.1	9.9	100%	0.5	CA[a]
Hydrothyria venosa	40.8	39.5	100%	0.0	RHCA
Lupinus dalesiae	0.7	0.2	0%	0.0	No protection

Notes:

a. ITS = Individual tree selection.

b. CA = Controlled Area.

c. RHCA = Riparian Habitat Conservation Areas.

Table 3-31. Acres of *Phaecollybia olivacea* potential habitat within the botanical resources analysis area and proposed treatment units.

Total Acres of Habitat	Total Treated Acres	Acres in Groups	Hand Cut and Tractor Pile	ITS, Groups	Mastication	Mastication, UB, Groups	Oak Enhancement
670.0	48.3	11	1.0	7.6	2.3	16.7	9.7

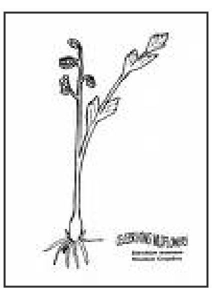
3.4.3 Analysis of Effects for Plants

The general direct, indirect, and cumulative effects of potential project-related activities on botanical resources are described below. These descriptions are intended to provide a background for the types of project related activities that were considered in the species specific analysis that follows.

Direct Effects. Botanical resources can be directly impacted when they are driven over by motor vehicles or other heavy equipment, covered by debris (fallen trees, slash, etc.) or when burned. These disturbances can physically break, crush, or uproot plants. These impacts can reduce plant growth and development population size, and potentially, the viability of the species across the landscape. The plants may also experience reduced or eliminated seed-set and reproduction. If the disturbance is severe, it can kill plants. For annual plant species, the timing of impacts is critical. Management actions that take place after annuals have set seed have much less impact than management actions performed prior to seed-set. Conversely, some sensitive, early seral species respond favorably to such actions. Consequently, a negative impact to one species can be beneficial to another.

Indirect Effects. Indirect effects (both positive and negative) on plants may be caused by changes in vegetation composition, solar exposure, hydrologic patterns, fire regime, or soil characteristics of the habitat. Indirect effects can also occur from noxious weed invasion (see “Appendix C: Noxious Weed Risk Assessment” in the Sugarberry Project BE) or from impacts on pollinators or mycorrhizae associated with the various species.

Cumulative Effects. Cumulative, direct, and indirect effects can be minimized by following Forest Service standards and guidelines and by implementing mitigation measures to monitor or offset impacts on plant species. With these protective measures in place, cumulative effects are less likely to be adverse. Current management direction is designed to eliminate or reduce possible negative cumulative impacts by protecting Sensitive plant species from direct and indirect impacts.



Existing Conditions and Analysis of Effects for Western Goblin (*Botrychium montanum*)

Abundance. Western goblin is a member of the adder’s-tongue family. It is a primitive fern which is found in open marshes and wet meadows. It is widely distributed globally, but is uncommon in California. *Botrychium montanum* is one of the rarest of the *Botrychium* species within California. At this time, there are only nine confirmed occurrences of *Botrychium montanum* in California. Historically, the Lassen National Forest has 11 occurrences, but only 7 of these have been located since 1985. The Modoc and Tahoe National Forests each have only one known occurrence. In addition, there are a few historic occurrences, which have not been confirmed in recent years within Butte County. Known occurrences often consist of only a few plants, so the overall plant numbers in California are low. There are three known occurrences on the Plumas National Forest.

Range/Distribution. *B. montanum* is limited to scattered locations from British Columbia, Montana, Washington, Oregon to California. In California, this species has been found in only Modoc, Shasta, Tehama, Plumas, Butte, and Nevada Counties.

Occupied Habitat Within Project Area. Occupied habitat covers 1.9 acres

Trend. Actual trends in the populations are unknown, since plants do not appear above ground every year, and all known occurrences have very few individuals recorded.

Fragility/Habitat Specificity. *Botrychium montanum* grows in a variety of wet habitats from marshes and meadows to coniferous montane forests and streamside areas. In California, it has primarily been found along shady streams in mixed coniferous forests. These habitats are not highly unusual, so what specific factors limit plant abundance and distribution are not yet known. All *Botrychium* species have strong mycorrhizal requirements. Riparian habitats are subject to grazing and hydrologic alterations, and conifer stands are subject to timber harvesting.

Effects of Alternative A on Western Goblin

Direct Effects. No direct effects.

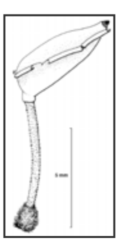
Indirect Effects. Habitat may become more susceptible to high intensity wildfire.

Cumulative Effects. Habitat may be prone to noxious weed invasion as a result of high intensity wildfire.

Effects of Alternatives B, C and G on Western Goblin

Direct/Indirect Effects. No direct/indirect effects, because all of the 1.9 acres would be fully protected.

Cumulative Effects Analysis Summary. There are no cumulative effects to western goblin because there are no direct/ indirect effects as a result of the project and there are no past projects that overlap western goblin populations. Consequently, there are no known lingering negative effects of past projects. Also, there are no future projects planned for areas with western goblin.



Existing Conditions and Analysis of Effects for Bug on a Stick Moss (*Buxbaumia viridis*)

Abundance. Prior to the identification of this occurrence in the project area, the Sierra Nevada Mountains were considered too dry for this species. This is the first recorded occurrence in the Sierra Nevada Mountains.

Range/ Distribution. It grows as scattered individuals and occurs sparsely throughout most of Europe. It also occurs in southwest Asia, China, and North America. In the United Kingdom, since 1950 it has been recorded from two sites in Scotland, but has only been recorded in one site recently.

Occupied Habitat Within Project Area. Thirteen sporophytes were detected on one log.

Fragility/Habitat Specificity. This species occurs as a single sporophyte or in small patches. Consequently, it is extremely sensitive to changes in the environment. *B. viridis* needs the presence of well-rotted logs in perennial moist areas; the loss of this substratum through disturbance (i.e., fire, dehydration of the log, etc.) would limit the distribution of the species within the region.

Effects of Alternative A on Bug on a Stick Moss

Direct Effects. No direct effects.

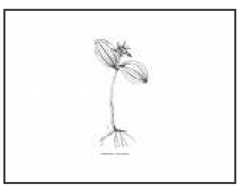
Indirect Effects. Habitat would become more susceptible to high intensity wild fire.

Cumulative Effect. No cumulative effects.

Effects of Alternatives B, C and G on Bug on a Stick Moss

Direct/Indirect Effects. No direct effects, because the occurrence is not located within a treatment unit.

Cumulative Effect. No cumulative effects because there would be no direct/ indirect effects. Also, there are no known lingering negative effects of past projects. The site where the bug on a stick moss was found is in an old growth conifer stand, adjacent to a perennial stream on 90–100 percent slope.



Existing Conditions and Analysis of Effects for Clustered Lady's Slipper Orchid (*Cypripedium fasciculatum*)

Abundance. Clustered Lady's Slipper is in the orchid family. This orchid is found from British Columbia south to California then east to the northern Rockies and Colorado. However wide ranging, population numbers are typically small.

Range/Distribution. It is known from eight western states. In California it occurs from Del Norte County to Sierra County. The Tahoe National Forest is the southern most distribution of *C. fasciculatum*.

Occupied Habitat Within Project Area. An estimated 29.1 acres.

Trend. Declining—the *Federal Register* (9/30/93) lists habitat for this plant as declining. Details of population trends across its range are unknown. It can be assumed, that given the complicated life history of this species, including the required establishment of mycorrhizal relationships, an apparent intolerance to intense disturbance and the presence of this species on lands available for timber harvest that the trend is downward. The population on the Tahoe National Forest is declining due to habitat disturbance. In 1998, the Lassen population included 60 plants, and 50 plants in 2001. On the Plumas National Forest many of the occurrences have been revisited and most relocated year after year. Two occurrences on the Plumas are large, having more than 2,000 stems and the other over 3,000 stems. Small population sizes with risk of local extirpation, coupled with monitoring inconsistency and the fact that some of the populations have not been visited in over a decade, contributes to concerns for this species.

Fragility/Habitat Specificity. *C. fasciculatum* habitat is very broad, occurring on various parent materials from ultramafic, schist, and limestone derived soils. In Oregon and California, *C. fasciculatum* is associated with Douglas-fir dominated and mixed conifer forests in mid to late-seral stands whose structure allows some light to reach the forest floor. Occurrences have also been documented in riparian areas. Exceptions to this general habitat description do exist, which demonstrates the difficulty in identifying leading habitat characteristics. Mycorrhizal fungi play a pivotal role in the biology of orchids. Several stages in the orchid's life-cycle, especially early stages of seedling development, depend on associations with fungi. Given this essential dependence, the habitat needs of the fungi must also be met to have successful propagation of the species.

Effects of Alternative A on Clustered Lady's Slipper Orchid

Direct Effects. No direct effects.

Indirect Effects. Habitat will become more susceptible to high intensity wild fire.

Cumulative Effects. Habitat may be prone to noxious weed invasion as a result of high intensity wildfire and occurrences may be lost when overstory canopy is removed and areas burned at high intensity.

Effects of Alternatives B, C and G on Clustered Lady's Slipper Orchid

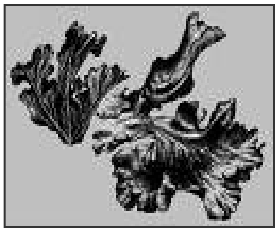
Direct/Indirect Effects. No direct or indirect effects are predicted as a result of this project, as all known occurrences would be protected (see Table 3-30).

Cumulative Effects. There would be no negative cumulative effects as a result of this project, because there will be no negative direct/indirect effects, all occurrences will be protected from project activities with a 150 foot buffer. Also, there are no known lingering effects from past projects. There was one known project adjacent to two large orchid occurrences (*Cypripedium fasciculatum* [CYFA] 81 and 101). The project was the 1990 Mountain Boy Timber Sale. The timber sale avoided the orchid locations and no negative effects are evident. No other past projects within the analysis area are known from areas with clustered lad's slipper.

There is one known future project, The Port Wine Clustered Lady's Slipper Prescribed Fire Study, desgined to apply prescribed fire to approximately 6 acres containing clustered lady's slipper. This project would help determine the effects (positive or negative) of prescribed fire on the orchid. This action may contribute to the loss of some orchids within the study area. However, it is unlikely that a loss of 6 acres of habitat would have any measurable effect to the overall fitness of the orchid populations in this area for the following reasons.

1).There are numerous occurrences both large and small in the general vicinity (CYFA occurrence numbers 21, 65, 66, 81, 82, 85, 86, 101, 102, 103, 124, 125, 129, and 130). These occurrences total approximately 29 acres. Consequently, a wide spatial distribution would be maintained, allowing for re-colonization of the study area.

2).The study would not destroy the major structural components of the orchid's habitat, including: tree canopy, understory vegetation composition, and hydrology.



Existing Conditions and Analysis of Effects for the Veiny Aquatic Lichen (*Hydrothyria venosa*)

Abundance. This aquatic lichen is infrequently reported. Where populations occur, numbers of individuals are generally few in number. No other species similar in appearance is totally aquatic. Project surveys have been conducted for this species beginning in 1998. Twenty-one occurrences are known on the Plumas National Forest, two on the Sequoia National Forest, one on the Shasta-Trinity National Forest, eleven on the Sierra National Forest, and eight on the Stanislaus National Forest. There are also two occurrences known from Calaveras Big Trees State Park, which is encircled by the Stanislaus National Forest and one occurrence on a private land inholding within the Mendocino National Forest boundary.

Range/Distribution. This species is found in cold unpolluted streams in mixed conifer forests along the western slope of the Sierra Nevada on the Plumas, Sequoia, Sierra, and Stanislaus National Forests. It is also found in the northern coast range in the Mendocino National Forest, and northwestern California in the Shasta-Trinity National Forest. The California occurrences are disjunct from other U.S. populations, which occur in the eastern states of Massachusetts, New Hampshire, Vermont, Tennessee and Georgia. Hydrothyria venosa also occurs in Oregon, Washington and British Columbia. Many of the eastern occurrences are historic sightings and some have apparently become extirpated (J. Shevock, e-mail, 10/14/99).

Occupied Habitat Within Project Area. Habitat covers 40.8 acres.

Trend. Known Sierran populations appear to be stable at this time, but the actual extent of local extirpations in California is not possible to determine.

Fragility/Habitat Specificity. Based on the documented occurrences in California, this species occurs in streams that are fed by cold water springs, where the water is very clear, and peak flows are not of the intensity that would lead to scouring. The streamlets have a rich aquatic bryophyte flora. These streams are rarely more than eight inches in depth. Increased sedimentation would significantly impact occurrences. This lichen is a foliose species with a rather delicate thallus. Reproductive structures have been observed, but how the lichen actually colonizes new habitats is unknown.

Effects of Alternative A on the Veiny Aquatic Lichen

Direct Effects. No direct effects.

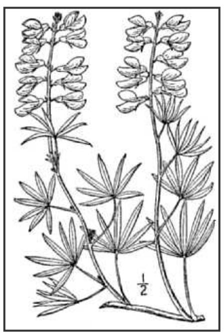
Indirect Effects. Habitat will become more susceptible to high intensity wild fire.

Cumulative Effects. Habitat may be prone to sediment deposition and increased scouring following high intensity wildfires.

Effects of Alternatives B, C and G on the Veiny Aquatic Lichen

Direct/Indirect Effects. No direct effects as a result of this project, because all of the known occurrences would be protected (see Table 3-30).

Cumulative Effects. There will be no known negative cumulative effects as a result of project implementation, because there will be no negative direct/ indirect effects because the streams would be protected with no treatment buffers. Also, there are no known lingering negative effects of past projects within the analysis area. Surveys have been conducted for this species since 1998. SMZs have been in place on the Plumas National Forest since the 1988 LRMP. As a result, habitat for this species has been protected since 1988.



Existing Conditions and Analysis of Effects for the Quincy Lupine (*Lupinus dalesiae*)

Abundance. Quincy lupine is a member of the pea family. It has a limited range but is abundant within its specific habitat. Quincy Lupine occurs in montane chaparral, cismontane woodland, lower montane coniferous forest, and upper montane coniferous forest.

Range/Distribution. It is known to occur on the Plumas and Lassen National Forests with 130 and 19 occurrences, respectively; as well as scattered occurrences on adjacent private lands. There are 2 occurrences on the Tahoe National Forest with approximately 200 and 300 individual plants at each. The range is limited to Plumas, Sierra, and Yuba Counties with nearly all occurrences in Plumas.

Occupied Habitat Within Project Area. There is approximately 0.7 acre of occupied habitat within the project area.

Trend. The California Native Plant Society recently changed the status of the Quincy Lupine from List 1B to List 4 based on the number of mapped occurrences in the California Fish and Game's California Native Diversity Data Base. Also this list change is based on the large number of occurrences considered "good" to "excellent."

Fragility/Habitat Specificity. It occupies sites of open canopy in mixed conifer forests on metasedimentary or metavolcanic soils mainly in the Highway 70/89 corridor in Plumas County. It is tolerant of moderate to high disturbance.

Effects of Alternative A on the Quincy Lupine

Direct Effects. No direct effects.

Indirect Effects. Habitat would become more susceptible to high intensity wildfire, however this would likely benefit Quincy lupine. This plant is known to tolerate moderate to high disturbance and likely needs clearings in the forest to successfully reproduce. This is based on where the Quincy lupine occurs across the landscape.

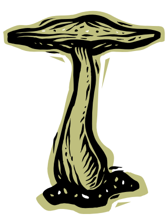
Cumulative Effects. Habitat would likely decline as the forest becomes denser. Overstory trees and shrubs would out-compete the Quincy Lupine for sunlight and water.

Effects of Alternatives B, C and G on the Quincy lupine

Direct/ Indirect Effects. Mature plants may be uprooted, buried, or physically damaged in other ways by harvest activities.

Cumulative effects. This project in unlikely to have any negative effects to the Quincy lupine, because it is tolerant of moderate to high levels of disturbance and requires openings in the forest canopy to reproduce. Approximately 30 percent of the plants in the analysis area are located in a group selection unit, and they will likely benefit from Alternatives B, C and G. Also, there are four occurrences of Quincy lupine within one mile of treatment units. In the unlikely event that plants within the treatment unit are killed, the geographic distribution of plants would be maintained.

Analysis of Effects for Fungi



Effects of Alternative A on *Phaecollybia olivaceae*

Direct Effects. No direct effects.

Indirect Effects. Habitat would become more susceptible to high intensity wildfire.

Cumulative Effects. Habitat may be high intensity wildfire that could remove canopy cover, host trees and kill mycelia through high soil temperatures.

Effects of Alternatives B, C and G on *Phaecollybia olivaceae*

Direct/Indirect Effects. There would be project related activities on approximately 48 acres of potential habitat. However, not all of these actions would be detrimental, because overstory shade would be maintained, host trees would be preserved, and soil disturbance would be avoided. The activities that are likely to have the greatest negative impact are group selection,and tractor-piling because overstory canopy and host species would be removed. There may also be soil compaction associated with these actions. There are a total of 36 acres of group selection treatments located within *P. olivaceae*. When compared to the total amount of habitat in the area, this project would only affect 5 percent of the overall habitat in the analysis area.

Cumulative Effects. It is difficult to determine what effects past projects have had on this species. Areas where hardwoods had been targeted for removal to promote sawtimber production do not contain habitat for this species. There is no observable overlap between past projects and current potential habitat. Also, there is no overlap of high to medium-high potential habitat with vegetation management activities planned in the future that would be detrimental to fungus habitat. Based on the cumulative effects analysis, any reduction in habitat would be minor.

Cumulative Effects Summary for Alternatives B, C and G for All Taxa

The extent of cumulative effects depends on the management of potential direct and indirect effects, as well as the attributes of the Sensitive plant species located within the analysis area, their distribution within the analysis area, and the ability to design future projects with Sensitive plant attributes in mind. Throughout the Sugarberry Project area, management of the direct and indirect effects through project design and mitigation measures would minimize the potential for cumulative effects. Adverse cumulative effects are not expected as a result of implementation of the Sugarberry Project for the following reasons:

- The project area has been adequately surveyed for Threatened, Endangered, Proposed, and Sensitive species and noxious weeds.
- Noxious weed mitigation measures shall be applied to the project to prevent invasions.
- Known occurrences of Sensitive species will be protected through a variety of methods, including changes in management prescriptions, Limited Operating Periods, and avoidance.
- Road layout has been designed to avoid rare plant occurrences.
- Sporax® will have no detrimental effect to rare species, because no applications will be made adjacent to Sensitive plants. Also, the closest application is approximately 0.4 miles from the nearest Sensitive plant population. Furthermore, the primary break-down component of Sporax® is boron, an essential element that plants need.
- Harvest units have been dropped or modified to protect *C. fasciculatum.*
- The modification to *P. olivaceae* habitat is minor.

Determination

The following effects determination is based on professional experience and judgment, existing information, including existing condition of the analysis area. Determinations of the potential direct, indirect, and cumulative effects discussion is organized by alternative.

Alternatives A–G Will Not Effect: *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium pinnatum*, *Eleocharus torticulumis*, *Fissedens aphelotaxifolius*, *Fissedens pauperculus*, *Lewisia cantelovii*, *Meesia longiseta*, *Meesia triquetra*, *Meesia uliginosa*, *Mielichhoferia elongate*, and *Oreostemma elatum*.

The basis for the determination for these Sensitive species includes the following:

1. Adequate surveys have been performed in the Sugarberry Project area.
2. No known occurrences exist within the project area.

3. No potential habitat is known to exist in the project area.

Alternatives B–G may impact individual sensitive species, but is not likely to cause a trend toward federal listing or loss of viability to: *Buxbaumia viridis*, *Bruchia bolanderi*, *Cypripedium montanum*, *Lewisia cantelovii*, *Lewisia kellogii* ssp. *hutchinsonii*, *Lewisia kellogii* ssp. *kelloggii*, and *Penstemon personatus*.

Reasons:

1. Adequate surveys have been performed in the Sugarberry Project area.
2. No known occurrences exist within the project area.

Alternatives A–C MAY impact individual sensitivity species, but is not likely to cause a trend toward federal listing or loss of viability to: *Botrychium montanum*, *Buxbaumia viridis*, *Cypripedium fasciculatum*, *Hydrotheria venosa*, *Lupinus dalesiae*, and *Phaecollybia olivaceae*.

Reasons:

1. Adequate surveys have been performed in the Sugarberry Project area.
2. *Lupinus dalesiae* will likely respond positively to ground disturbing activities.
3. The project has been designed to exclude all known Sensitive plant occurrences from Group selection / Harvest units.
4. Botrychium *montanum, Buxbaumia viridis, Cypripedium fasciculatum, Hydrotheria venosa,* will be protected from project activities through the use of exclusions/ controlled areas.
5. Only 5 percent of *P. olivaceae* habitat will be impacted.

Noxious Weeds

Two weeds that are common in the analysis area are Klamathweed (*Hypericum perforatum*) and bull thistle (*Cirsium vulgare*). Klamathweed can be found along most Forest Service roads and areas on the Plumas National Forest that are not shaded by overstory canopy. Plants are usually scattered within the road prism, rarely forming dense stands or invading the adjacent forest. Plant distribution appears to be most heavily concentrated at the lower elevations (1,000–4,000 feet), with plants becoming less common at the higher elevations. The Klamathweed beetle (*Chrysolina quadrigemina*) is a very effective biocontrol agent, which keeps overall Klamathweed populations low (Borror 1992).

Bull thistle was probably introduced in North America during colonial times. It is naturalized and widespread throughout North America and is found on every other continent except Antarctica (Bossard 2000). It is most common in disturbed areas with little to no canopy and, like Klamathweed, is often found along roads with little shade cover. It is common along most Forest Service roads on the Plumas National Forest, although on the Feather River Ranger District, it normally does not form dense thickets. Although non native, bull thistle plants provide forage for many native insect species. Butterflies and bees are frequently observed on these plants. (Electronic images of insect activity on bull thistle inflorescences are available by contacting Chris Christofferson, Assistant Botanist, Feather River Ranger District, Plumas National Forest). Furthermore, bull thistle does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals (substances released by one plant species that inhibit the germination or growth of competitor plants of the same or different species) like some other A- and B-rated noxious weeds (Bossard 2000). Two biocontrol insects (*Urophora stylata* and *Rhinocyllus conicus*) have been released and help reduce population levels.

All of the weed species listed in Table 3-32, with the exception of Klamathweed and bull thistle are high priority species for eradication in the analysis area. They all have been pulled repeatedly by U.S. Forest Service personnel and populations are small and eradication is a realistic goal. None of the high priority species are located within treatment units. However, skeleton weed (*Chondrilla juncea*) and yellow starthistle (*Centaurea solstitailis*) are adjacent to a group selection unit. These two infestations will be flagged and avoided by all project activities.

Table 3-32. Acres of noxious weeds in the analysis area and proposed treatment units.

Common Name	Species	Total Infestation Area (ft^2)	Infestation Area (ft^2) in Treatment Unit
Broadleaved pepperweed	*Lepidium latifolium*	3,400	0
Bull thistle	*Cirsium vulgare*	Common	Common
Canada thistle	*Cirsium arvense*	150	0
French broom	*Genista monspessulana*	25	0
Klamathweed	*Hypericum perforatum*	Common	Common
Scotch broom	*Cytisus scoparius*	Two plants	0
Skeleton weed	*Chondrilla juncea*	45,000	0
Yellow starthistle	*Centaurea solstitialis*	300	0

Affected Environment (Existing Conditions): Quaking aspen (*Populus tremuloides*)

Five quaking aspen stands are present in the project area and are within proposed treatment units. These five aspen stands encompass approximately 20 acres. Aspen provide important foraging and cover habitat for a variety of species. In montane regions, healthy aspen stands are known to support the greatest level of avian and botanical species diversity (DeByle 1985; Mueggler 1985). Aspen stands are limited in distribution on the Plumas National Forest. Aspen generally has been regarded as a fire-induced successional species able to dominate a site until it is replaced by less fire-enduring but more shade tolerant and environmentally adapted conifers (Mueggler 1985). Due to fire suppression all stands suffer from conifer encroachment and a subsequent decrease in aspen stand vigor (Bartos and Campbell 1998). Complete fire protection will permit coniferous species to take over the majority of sites (Jones and DeByle 1985).

Beginning in the 1920s, an effective fire suppression program began on the Plumas National Forest. Prior to this time, large-scale fires, deliberately set by sheep and cattle herders as well as prospectors, occurred during the latter half of the nineteenth century and into the early twentieth century. Fires were routinely used by sheep and cattle herders to consume undergrowth and to stimulate the sprouting of palatable shrubs and grass. Prospectors used fires to clear vegetation to make ground features more visible. Extensive sheep and cattle grazing followed the gold seekers. Numbers of sheep in California peaked in the 1880s and then began to decline, initially due to poor range conditions and later due to controls placed on the herding of sheep on public lands.

A landscape analysis of Slate Creek was completed in 1999. Fire intervals for large stand-replacing fires within the northern Sierra Nevada are estimated to be between 150 to 500 years prior to Euro-American settlement. Low to moderate intensity fires would have also occurred, appearing at intervals ranging from 15 to 80 years depending upon the ecological group being considered (USDA, 1999). According to Fites-Kaufman, in the northern Sierra Nevada, elevation is the most important and visible factor underlying changes in fire regimes and vegetation. The Sugarberry Project ranges from approximately 3,000 feet in elevation to approximately 6,000 feet in elevation. This broad range of elevation is described by three of the six fire regime zones described by Fites-Kaufman: lower montane, mid-montane and upper montane zones. Historic fire return intervals in the project area probably ranged from 5–15 years in the lower elevations and increased to 40 years in the higher elevations (Fites-Kaufman 2000).

Research and application has shown conifer removal to be effective at releasing existing aspen and causing root suckering. Noticeable results of increased vigor of existing trees and sucker formation from these trees would be visible within the first few growing seasons (Shepperd 2001). Aspen stand recruitment in northern California can be achieved by removing competing conifers from the stand (Jones et al.). Conifers need to be removed at least a tree height in distance from the aspen stand to ensure enough light to the forest floor for aspen release (Shepperd 2004). For the west side of the Plumas National Forest the distance is 150 to 200 feet (Shepperd 2004). Underburning may also be used to promote reproductions in certain circumstances.

This special habitat would benefit from removal of conifers that are competing with the aspen for sunlight and moisture. Conifers would be removed from approximately 20 acres of five aspen stands. Aspen enhancement proposed in the Howland Flat area would remove encroaching conifers to increase water, growing space, and light available for young aspen.

3.5 Economics

3.5.1 Introduction

The HFQLG Act directs the Secretary of Agriculture to implement a pilot project on federal lands in the Plumas National Forest, Lassen National Forest, and the Sierraville Ranger District of the Tahoe National Forest in California. The Pilot Project is designed to maintain ecological integrity, community stability, and forest health. In addition, the Secretary is directed to use the most cost-effective means in conducting the Pilot Project.

3.5.2 Regulatory Framework

The economic environment of the Plumas National Forest is described in the 1988 Plumas National Forest LRMP, which was amended by the August 1999 ROD for the FEIS on the HFQLG Act and the 2004 ROD for the FSEIS on the SNFPA, which amended the SNFPA of January 2001.

3.5.3 Methodology for Assessing Impacts on Economics

3.5.3.1 Scope of the Analysis

This economic analysis focuses on those revenues and treatment costs associated with implementing group selection and fuel reduction treatments in the Sugarberry Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes. This economic analysis is not designed to model all the economic factors used in an intensive and highly complex timber sale appraisal process. This economic analysis takes a less complex, but systematic approach to display the relative differences in financial efficiency (i.e., relevant revenues and costs) between the alternatives being proposed in the environmental analysis. This analysis does not include monetary values which could be assigned to resource outputs such as wildlife, water quality, soils, recreation, visual quality, and fisheries. It is intended as a relative measure of differences between alternatives based on direct costs and values. Other values are discussed in the appropriate sections of Chapter 3 in this document.

Geographic Boundary for the Analysis. The geographic boundary for the social and economic analysis for the HFQLG Pilot Project encompasses the counties located within the core and peripheral areas targeted by the HFQLG FEIS (HFQLG FEIS, Appendix S, p. S-7). The core area of the HFQLG region contains the three counties of Lassen, Plumas, and Sierra. The area peripheral of the HFQLG region include Butte, Nevada, Shasta, Tehama, and Yuba counties. The focus of the socioeconomic analysis is on 41 communities within the HFQLG region (see the HFQLG FEIS, Appendix T, Table T-1). The Sugarberry Project is part of the HFQLG Pilot Project and this economic analysis is be based on the incremental effect of the Sugarberry Project within the HFQLG Pilot Project Area.

Time Frame for the Analysis. As stated above, this economic analysis does not revisit the information presented in the HFQLG FEIS, but focuses on the time-frame associated with implementing thinning and fuels reduction treatments for the Sugarberry Project. Timber harvesting would take approximately 2 to 5 years. DFPZ construction activities would take an additional 3 to 6 years after timber harvest is completed.

3.5.3.2. Analysis Methods

The timber harvest values used in this economic analysis were based on the California State Board of Equalization Timber Harvest Values (Draft January 1, 2007 – June 30, 2007). Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Service work, including mechanical (mastication, grapple pulling), manual (hand cutting, hand piling), and prescribed fire (underburning, pile burning) treatments are based on the latest service contract prices, KV, and brush disposal sale area improvement plans.

3.5.4 Affected Environment (Existing Conditions)

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 revenues to local counties. The Forest also contributes in secondary ways, such as through production of goods and services for local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts would be felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. The percentage of Plumas National Forest land in local counties is shown in Table 3-33.

Table 3-33. Percentage of Plumas National Forest lands by county (based on GIS data).

County	County Acres	Beckworth Ranger District (acres)	Feather River Ranger District (acres)	Mt. Hough Ranger District (acres)	Total Plumas National Forest Lands in Each County (acres)	Plumas National Forest Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

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

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

Payments in Lieu of Taxes. Payments in Lieu of Taxes are administered by the Bureau of Land Management and apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to the nontaxable nature of federal land in the county. Payments are made annually and are based on local population, federal acreage in the county, and amounts of other federal payments during the preceding fiscal year. The minimum payment is 75 cents per entitlement acre. The county may use these funds for any purpose. The Forest has no control over the disbursement of these funds, and the amount disbursed every year is unaffected by land management decisions made by officials on local National Forest System lands.

Timber Yield Taxes. The second source of revenues to local government is the timber yield tax, which is administered by the State Board of Equalization. This tax is not paid by the Forest; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and public lands. The tax is 2.9 percent of the value of the harvested timber. These taxes are collected by the state, and approximately 80 percent is returned to the counties where the timber was harvested. Decisions about the amount of timber to be offered for sale each year by the Plumas National Forest can affect the amount of revenues disbursed by this program.

Receipt Act. Receipt Act payments are distributed pursuant to the National Forest Management Act (Public Law 94-588). Under this law, 25 percent of National Forest revenues are distributed to the states where the Forest is located. The amount allocated to individual counties is based on the National Forest acreage within each county. According to state law, Receipt Act funds must be divided evenly between public schools and public roads of the county or counties in which the National Forest is located and nothing else.

Receipt Act payments amount to 25 percent of the total revenues collected from timber, grazing, land use, recreation, power, minerals, and user fees. However, within the 11 western states, payments from grazing receipts are 50 percent of the total. Historically, at least 90 percent of total revenues were derived from timber sale receipts. As a result, the amount of revenues available each year fluctuates widely, depending on the amount of timber harvested on National Forests.

SRSCSD Act. Congress passed the SRSCSD Act in 2000, offering counties an alternative to the Receipt Act. Under the SRSCSD Act, a state's three highest payment amounts between 1986 and 1999 are averaged to arrive at a "compensation allotment" or "full payment amount." A county may choose to continue to receive payments under the Receipt Act or to receive its share of the state's full payment amount under the SRSCSD Act. National Forests and other federal agencies in California would have to contribute approximately $56.4 million in Receipt Act revenues in order to exceed the $14 million the counties received under the SRSCSD Act.

The SRSCSD Act expired in 2006. However, Congress and the current presidential administration are considering reauthorization of the SRSCSD Act or a one year extension. The Sugarberry Project timber sales would not begin until 2008. If the SRSCSD Act is not reauthorized or extended, counties will have to rely exclusively on the *Receipt Act* for timber-related schools and roads funding, and the amounts received would be affected by management decisions.

Counties can receive variable, revenue-dependent payments under the *Receipt Act* or, if reauthorized the counties could receive stable funding for local schools and roads under the SRSCSD Act. The legislation promotes local involvement, decisions, and choice by creating well-balanced resource advisory committees that recommend forest projects to the Secretary of Agriculture or to advise counties on county project proposals. Counties that elect to receive the full payment amount under the SRSCSD Act, and receive more than $100,000, are required to allocate 15 to 20 percent of their funding to projects under Title II or Title III (see Table 3-34). Like traditional 25 percent funds, Title I funds are expended for public schools and roads. Title II funds are allocated for projects on federal lands or projects that benefit federal lands. Resource Advisory Committees are established to determine Title II fund distribution. Title III funds are allocated for county projects that include search and rescue, community service work camps, easement purchases, forest-related education opportunities, fire prevention and county planning, or cost-share for urban community forestry projects. The SRSCSD Act full payment amounts (fiscal year 2005) for the five counties containing Plumas National Forest lands are shown in Table 3-34.

Table 3-34. SRSCSD Act full payment amounts to counties for fiscal year 2005.

County	Full Payment Amount	Title I Funds	Title I Percent of Full Payment	Title II Funds	Title II Percent of Full Payment	Title III Funds	Title III Percent of Full Payment
Butte	$895,320	$716,256	80%	$0	0%	$179,064	20%
Lassen	$3,876,372	$3,294,916	85%	$581,456	15%	$0	0%
Plumas	$7,258,972	$6,170,126	85%	$816,634	11%	$272,211	4%
Sierra	$1,848,005	$1,570,804	85%	$92,400	5%	$184,801	10%
Yuba	$238,982	$191,186	80%	$0	0%	$47,796	20%
Total	**$14,117,651**	**$11,943,288**		**$1,490,490**		**$683,872**	

Relative to the local economy, there is a potential for Alternatives B, C and G to harvest between 26 and 34 million board feet (mmbf) of timber and biomass (chips and fuelwood) over several years as part of the Sugarberry Project. Plumas and Butte Counties can expect to receive 25 percent of the revenues generated from this timber sale through the *Receipt Act* or, if reauthorized, receive full payment from the SRSCSD Act. However, there is a possibility that the Sugarberry Project may become a *stewardship* project, or a project where goods are exchanged for services—in this case, timber harvested for fuel reduction work. If this occurs, because goods are traded for services rather than revenue generated through commercial timber sale contracts, *Receipt Act* revenues would be reduced or eliminated as revenues directly spent on services. The Sugarberry Project is located in Sierra, Plumas, and Yuba Counties. Employment opportunities would be created from proposed thinning and biomass removal, fuels reduction, site preparation, and planting activities. Furthermore, indirect and induced economic employment and monies would be generated when income received by contractors and the timber industry is re-spent within the local economy.

Economic Consequences

Economic consequences are a comparative measure of the overall social and economic value of the three alternatives considered in this analysis. The impacts discussed in this section include estimated government expenditures and revenues, as well as monetary impacts on local communities.

Direct monetary impacts are discussed in terms of net cash value derived from the implementation of the treatments and direct, indirect, and induced job opportunities.In general, the monetary value of each alternative depends on the amount and method of timber harvest and the acreage planned for fuels reduction treatments. Areas with positive timber harvest values would pay for associated fuels reduction activities on those acres, or surrounding acres. Where fuels reduction treatment costs exceed harvest revenues, the difference would be financed through appropriated funds when available. With the recent authorization of stewardship contracting, vegetation management services (fuels management work) can now be compensated through an exchange for timber stumpage arranged through accounting, rather than the separate funding of service work through appropriated funds.

The HFQLG FEIS and ROD described the economic impacts of implementing the Pilot Project. This economic analysis for the Sugarberry Project does not revisit the information presented in the FEIS and ROD, but focuses only on those revenues derived from timber harvest and vegetation treatment costs associated with each of the alternatives.

Employment. Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are income and wages received by the primary producer. For example, the local manufacturing of lumber from the Sugarberry Project would have a direct effect on local employment opportunities. Indirect effects would be employment in service industries that serve the lumber manufacturer. These industries include businesses involving logging, trucking, and fuel suppliers. Induced effects are driven by wages paid to workers by the primary and service industries, which are then circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of job creation, which typically range from 10 to 15 jobs created per mmbf of timber harvested.

Net Revenue. Net revenue is the difference between the revenues generated by an alternative and the costs required to implement the alternative. In this analysis, revenues come from harvest of timber and in some circumstances, chips or fuelwood. Revenues would either be used to pay for fuel treatment costs or go to the U.S. Treasury, with a possible 25 percent given to the counties under the Receipt Act. The latter may be more important depending on whether the SRSCSD Act is reauthorized (see Section 3.5.4).

Payments to Counties. Local counties receiving payments through the Receipt Act rather than the SRSCSD Act would share part of the revenues generated from the timber harvest. The actual payment amount depends on estimated stumpage value and the price bid by the purchaser awarded the timber sale contract, minus these costs of fuels work performed on the timber sale.

Treatment Costs. Treatment costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments, and mitigation measures, as well as the costs of resource enhancement measures not associated with the sale of timber. Costs vary widely depending on the amount of mechanical, manual, or thermal treatments prescribed; the board feet of sawlogs or tons of biomass removed per acre; and the accessibility of the treatment units.

Non-priced Costs and Benefits. It should be noted that not all costs and values are represented in this economic analysis. Calculations only include costs and values for those items which could be estimated in dollar terms. The economic analysis does not take into account non-priced benefits such as improved long-term wildlife habitat, improved watershed conditions, improved fish passage, control of noxious weeds, and reduced fire hazard. The various habitat improvement opportunities, which are not funded from the project’s timber receipts, would otherwise be funded through other sources such as watershed improvement appropriations, Resource Advisory Committees, appropriations for wildlife habitat improvements, KV, or other appropriated funds. Other examples of costs not estimated in dollar terms are changes in scenic value in the early and later years of fuels treatments, air pollution from wildfires, or reestablishing a forest following a stand-replacing wildfire.

Although not entered into the calculations, these non-priced benefits and costs were considered along with the net economic value of each alternative in order to make a judgment as to which alternative would offer the best overall mix of costs and benefits to society.

Alternative A (No Action)

Direct and Indirect Effects. This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local counties. No additional employment opportunities or wages from timber harvesting and processing or service work would be paid to primary and service industry employees and subsequently circulated through the local economy. Tables 3-35 and 3-36 compare the economic impacts of Alternatives A, B, C and G on the local economy. See Appendix D of the Sugarberry Project FEIS for the complete economic analysis by alternative.

Table 3-35. Comparison of economic impacts of alternatives on local economies.

Employment	Alternatives			
	A	B	C	G
Potential Receipt Act payment	$0	$1,482,863	$1,453,387	1,453,387
Timber yield tax	$0	$172,012	$168,593	168,593
Direct jobs	0	257	252	253
Indirect jobs	0	271	266	266
Total direct and indirect jobs	**0**	**528**	**518**	**518**
Total employee-related income	**0**	**$22,698,921**	**$22,271,251**	**22,288,021**

Table 3-36. Comparison of revenues, costs, and project value for timber harvest, and DFPZs

Revenues / Costs / Project Value	Alternatives			
	A	B	C	G
Direct and Indirect Effects				
Sawlog and biomass harvest revenues	$0	$5,931,453	$5,813,548	$5,813,548
Harvest costs	$0	$5,562,989	5,457,516	5,457,516
Net harvest revenues	$0	$368,464	$356,032	$356,032
Non-harvest costs (DFPZ construction)	$0	-$1,281,250	-$1,281,250	-$1,313,750
Total project value:	**$0**	**-$912,786**	**-$925,218**	**-$957,718**

Cumulative Effects. The no-action alternative would result in a negative effect on local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. These local industries are currently in need of employment opportunities in fuels reduction, site preparation, and timber harvesting—the action alternatives would provide these opportunities. Under Alternative A, the local economy would also not receive benefits from associated employment, such as in food, lodging, and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of economic infrastructure. Further loss of this infrastructure, including local mill closures, could significantly reduce or eliminate future economic and environmental opportunities from National Forest lands. The continuation of current conditions under Alternative A would not only preclude opportunities for long-term employment, but would also threaten rural community stability because the fuel reduction activities related to the creation and maintenance of DFPZs would not occur.

Under the no-action alternative, wildlife habitat, meadow, and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Sugarberry Project area would continue to pose a very high fire hazard to the surrounding areas. If the no-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should a wildfire occur in the Sugarberry Project vicinity. Should wildfire occur, costs could also be incurred from potential fire fighter fatalities or injuries, a loss of facilities, and the cost of post-fire tree regeneration and watershed rehabilitation (Mason et al. 2006). The risk of wildfire related costs is higher under Alternative A than the action alternatives.

3.5.5.1 All Action Alternatives

Direct and Indirect Effects. Thinning, biomass removal, and fuel treatments for Alternative B would directly generate the most full-time employment opportunities, compared to Alternatives C and G. The difference in job creation between alternatives reflects the reduced timber volume associated with 20 acres less group selection harvest under Alternatives C and G. All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) which directly serve the timber industry. There would also be a positive induced effect driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

One sum of direct, indirect, and induced effects is the total economic impact in terms of jobs. In addition to the direct employment that would result from the harvesting and fuel reduction treatments in alternatives B, C and G, and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. Alternative B would generate the most direct, indirect, and induced jobs, resulting in the greatest amount of employee related income. Alternatives C and G would generate slightly fewer jobs and less employee related income (refer to Table 3-35 above).

Net harvest revenues for thinning and biomass removal would generate a surplus for Alternatives B, C and G. The primary difference in the net revenues between Alternatives B and C and G is associated with less timber harvest treatment acres

Implementation of mastication, underburning, and other fuel treatments would occur under Alternatives B, C and G. Non-harvest costs would be similar, since no DFPZ acres were dropped for each of the action alternatives. The surplus revenues from the action Alternatives would offset the cost of treating the DFPZ if a stewardship contract is awarded. Otherwise, payment for non-harvest service work would come from appropriated dollars. The economic analysis does not take into account non-priced benefits such as reduced fire hazard. This is another benefit from Alternatives B, C and G, which could be considered in the decision of the preferred alternative.

Cumulative Effects. The cumulative effects of these alternatives would include an increase in overall economic activity in the HFQLG Pilot Project area. Though it is not a requirement, it is assumed in this analysis that most products from HFQLG projects would be processed locally due to high costs of hauling products and equipment. Likewise, it is also assumed most employment benefits would be realized in Butte, Lassen, Plumas, Sierra and Yuba counties.

The timber sale revenues and service contract employment generated by the Sugarberry Project contribute to the mandated purpose of the other HFQLG-funded projects across the forest. Economic goals for the project as a whole within the Pilot Project Area are discussed in the HFQLG FEIS. Table 3-37 displays the Pilot Project accomplishments of DFPZ and group selection acres and sawlog and biomass volumes offered over the past three years (HFQLG Oracle Database).

The Sugarberry Project contribution to the Pilot Project region by alternative is displayed in Table 3-38. For the DFPZ acres, group selection acres, and the amount of sawlog and biomass volume to be harvested, Alternative B would provide the most contribution to the Pilot Project region, followed by Alternatives C and G.

Table 3-37. Pilot Project region averages of accomplished DFPZ acres and sawlog and biomass volumes offered.

	Fiscal Year			Pilot Project Average
	2003	2004	2005	
DFPZ acres accomplished[a]	24,442	36,635	21,073	27,383
Group selection acres accomplished[a]	-0-	1,738	1,792	1,177
Sawlog volume offered (CCF[b])[c]	41,418	203,012	143,373	129,268
Biomass volume offered (CCF)[c]	44,402	198,204	129,814	124,140

Notes:

a. Accomplished acres include the acres that have been treated and those acres that have been awarded in contracts, but have not been completed.

b. CCF = hundred cubic feet. One million board feet (mmbf) is equal to approximately 2,000 CCF.

c. Sawlog and biomass volumes offered include the sales that have been harvested and those sales that have been offered but have not been sold or harvested (i.e., appeals or litigation).

Table 3-38. Sugarberry Project contribution to the HFQLG Pilot Project area.

	Alternative A	Alternative B	Alternative C	Alternative G
Proposed DFPZ (acres)	0	2,100	2,100	2,100
Percent contribution	0%	8 %	8%	8%
Proposed Group Selection (acres)	0	1,040	1,020	1,020
Percent contribution	0%	88%	87%	87%
Proposed Sawlog Volume (mmbf)[a]	0	31.2	30.6	30.6
Proposed Sawlog Volume (CCF)[b]	0	62,400	61,200	61,200
Percent contribution	0%	48%	47%	47%
Proposed Biomass Volume (tons)	0	7,300	6,842	6,842
Proposed Biomass Volume (CCF)[b]	0	2,920	2,737	2,737
Percent contribution	0%	2%	2%	2%

Notes:

a. mmbf = million board feet (1 mmbf is approximately equal to 2,000 CCF).

b. CCF = hundred cubic feet (one ton equals 0.4 CCF).

There are no ongoing HFQLG projects within the Sugarberry Project area. There is one hazard tree project presently occurring and one planned in the future (see Table F-1 in Appendix F for cumulative effects list of projects table) in the project area that may contribute minimal revenues or breakeven depending upon the condition and the ability to sell the hazard trees. However, neither project is part of the HFQLG Pilot Project. There are also timber sales anticipated on private land (see Table F-2 in Appendix F).

Cumulative effects would also include an economic benefit of reduced potential for uncontrollable wildfire created by the thinning treatments. Although it is difficult to forecast the exact costs of future wildfires, not knowing future fire weather conditions, fire start locations, or other factors, the investment of doing fuels activities has been shown to be positive when considering the potential of future wildfire. An estimated 70 percent positive benefit to cost ratio for fuels reduction activities have been calculated (Mason et al. 2006).

3.6 Heritage

3.6.1 Introduction

Archaeological sites, historic structures, landscapes, and objects are the fabric of our national heritage. Collectively known as heritage or cultural resources, they are our tangible links with the past. The Plumas National Forest is responsible for, and committed to, protecting and managing these important resources in a spirit of stewardship for future generations.

3.6.2 Regulatory Framework

Section 101 of the National Environmental Policy Act (NEPA) requires the Federal Government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies utilize the Section 106 process associated with the National Historic Preservation Act (NHPA). Passed by Congress three years before NEPA, the NHPA sets forth a framework for identifying and evaluating historic properties, and assessing effects to these properties. This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood, and is formally established in 36 CFR 800.3b and 800.8.

NEPA includes reference to "…important historic, cultural, and natural aspects of our national heritage." This terminology includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l) (1)). Therefore, agencies use the NHPA Section 106 process to consider, manage and protect historic properties during the planning and implementation stages of federal projects. Locally, the Plumas National Forest uses a programmatic agreement between Region 5 of the U.S. Forest Service, the California State Historic Preservation Office, and the Advisory Council on Historic Preservation to implement the Section 106 process.

Consultation with the tribes and local Native American communities and/or interested parties was initiated in accordance with the Region 5 Programmatic Agreement, NHPA, and other laws and regulations.

The Forest Service acknowledges that contemporary Native American interests include traditional cultural properties (sites associated with cultural practices or beliefs that are rooted in history and important in maintaining cultural identity), and plant gathering sites for basket materials, medicines, and food resources. To date, the tribes have not identified any traditional cultural properties within the Sugarberry Project boundaries.

3.6.2.1 Geographic Analysis Area

The heritage resources analysis area incorporates the treatment areas of the Sugarberry Project. Archaeological sites within and directly adjacent to the treatment areas are protected during the implementation of project activities.

3.6.2.2 Methodology Assessing Impacts

Heritage resource data for the Sugarberry Project is based on information available in the heritage resources files at the Feather River Ranger District. The heritage resource files include literature pertaining to prehistory and history, site records, and atlases that show recorded site locations, previously surveyed areas, and other heritage resource data. The area of potential affect or treatment area has been surveyed for cultural resources.

3.6.3 Scope of the Analysis

Three levels of analyses were completed to understand the significant themes and extent of heritage resources associated with the Sugarberry Project. First, research into the greater history of the project area was conducted to understand historic themes or events that have transpired in time and space.

Second, a heritage resource survey was conducted for the project area to identify cultural properties associated with these themes. Lastly, cultural properties were assessed to determine potential effects associated with implementation of the project.

3.6.4 Analysis Methods

Surveys or inventories resulted in the identification of 182 cultural resource properties within the proposed Sugarberry Project area. Eleven sites are related to prehistoric use. These sites consist of campsites, food processing stations, and tool production areas. One hundred and sixty one sites are related to historic use, primarily mining, which took place between 1850 to the present. The sites consist of historic encampments, dams, ditches, mine shafts, cabins, and a lookout. Associated artifacts and features represent all aspects of historic mining, from industrial equipment to daily living. There are also ten multi-component sites. These sites consist of both prehistoric and historic features and artifacts.

3.6.5 Affected Environment (Existing Conditions)

Cultural properties identified during literature review, inventories, or surveys were assessed to determine potential effects associated with implementation of the project.

3.6.6 Environmental Consequences

Heritage resources have been considered in all aspects of the Sugarberry Project, including the alternatives analyzed in this document.

Alternative A (No Action). No ground-disturbing activities would occur under the no-action alternative; hence, there would be no effects on heritage resources.

All Action Alternatives. The treatments proposed under the action alternatives would have no direct or indirect effects on heritage resources because all archaeological sites would be protected using Standard Resource Protection Measures.

Irreversible, Irretrievable Effects. Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. No irreversible or irretrievable effects on heritage resources are anticipated.

3.6.7 Past, Present, and Reasonably Foreseeable Future Conditions

Past Conditions. As indicated in the above general history of the Sugarberry Project area, there are numerous archaeological sites and features. Prehistoric sites date from 150–7,500+ years – before present. There are remains of prehistoric housepits, village sites, lithic scatters, and bedrock milling features and artifacts.

Since the landscape is never static, it’s difficult to predict the impact Native Americans had on the land. Current studies on fire ecology hypothesize that Native Americans used fire as a tool to control vegetation. Based on ethnographic data, these studies are suggesting that vegetation control occurred primarily within close proximity to larger villages, and was used to reduce brush, control insects, and enhance certain desirable species of plants. A local example of this is the burning of beargrass to enhance the plants qualities for basket weaving. Based only on ethnographic data it is impossible to know the true extent of vegetative control measures used.

Historic mining land uses had extreme detrimental impacts on the Native Americans as well as the landscape. Also, settlement and industry of post Gold Rush, and the impact of logging and ranching brought further irreversible changes. Evidence of the magnitude of European settlement is found in numerous mining features (e.g., ditches, reservoirs, hydraulic pits, etc.). Early photographs of historic mining towns in the project area provide glimpses of landscapes that are almost completely barren of trees. Trees were removed around towns for building houses, town sites, heat sources, and the shoring of mining adits. Logging mills were built in the project area during the 1850s. By the 1890s the denuding of timbered land on the East Coast brought lumber companies west. These companies bought up millions of acres timbered lands. As the easily accessed trees were cut, logging railroads were built to acquire more timber. Archaeological sites and features associated with lumbering include logging camps, lumber mills, railroad grades, and artifacts.

Prior to the mid 1970s, there were no archaeologists working for the Forest Service. At that time there were few protection measures for archaeological resources. In fact, the digging and collecting on archaeological sites was a common practice. By the early 1980s cultural resources surveys and site protection measures were in place. Today, all archaeological sites are protected from project activities.

Present Conditions. The lure of gold in California is the subject of romanticized myth and legends. In reality, little remains of these early Gold Rush mining towns and sites.

Between 1849 and 1853, in California, it is estimated that 21 million ounces of gold was recovered. From 1854 to 1880 hydraulic mining recovered 11 million ounces of gold, and between 1890 and 1960 dredging recovered an additional 20 millions ounces (EPA). It’s been suggested that 1 gold ring (1 ounce of gold) required 20 tons of processed ore. That same ounce of gold today requires 40 tons of processed ore.

Today, the existing gold extraction areas include miles and miles of historic water conveyance systems (ditches) that run throughout the project area, as well as denuded, eroding ecosystems that are the results of hundreds of abandoned dangerous open mine shafts. Hydraulic mining remnants include enormously deep pits, landscape scars and literally hundreds of acres of barren waste tailing piles. Unseen toxic remnants from the pre and post turn-of-the-century mining activity are the thousands of pounds of mercury that was dumped into rivers and streams from the ore processing. After the turn-of-the-century, miners processed ore with toxic chemicals such as arsenic, cyanide and sulfuric acid.

Since most mining sites are historic archaeological sites, they will be protected from project activities. As indicated previously, activity areas or area of potential effect within the Sugarberry Project have been surveyed for archaeological sites. All archaeological sites located during survey will be protected from project activity.

Future Conditions. Future impacts to archaeological sites may increase due to increased access to the Forest. The likelihood and intensity are unknown. However, the Sugarberry Project itself would not impact archaeologist sites, since the sites are protected from project activities.

The protection of archaeological sites is more than just flagging and avoiding as is done before project activities. Public education of the fragile, finite nature of archaeological sites is paramount to site protection. Educating the public can be accomplished by developing interpretative signs, lectures, and brochures providing information on the history of the sites, as well as archaeological site protection measures.

3.6.8 Summary of Cumulative Effects

Heritage resources have been considered in all aspects of the Sugarberry Project, including the four alternatives.

Although project activities have the potential to affect heritage resources, no effects are anticipated due to the following protection measures that will be implemented, as appropriate, for all heritage resources that could be affected by project implementation. The effect of the project on heritage resource sites has been considered in compliance with the Sugarberry Project proposed action and Section 106 of the NHPA. Application of the following Standard Resource Protection Measures result in the project having “no effect” on heritage resources:

- All proposed activities, facilities, improvements, and disturbances shall avoid heritage resource sites. Avoidance means that no activities associated with the project that may affect heritage resource sites shall occur within a site’s boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid heritage resource sites.

- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.

- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.

- When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes shall be completed prior to initiating any activities.

- Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

- No cumulative effects to heritage resources are expected, due to the cultural resource standards protection measures.

3.7 Transportation Systems

3.7.1 Regulatory Framework

The roads in the Sugarberry Project area that are proposed for decommissioning or closure are causing significant resource impacts. These roads are not needed because other roads are available to provide the necessary access to implement group selection harvests and DFPZ construction as directed in the HFQLG Act (Section 401 (b) (1), (d) (1), and (d) (2)) and the SNFPA. The Forest Service is directed to reduce impacts of the transportation system on resources by implementing road relocation or improvements as part of the Riparian Management Plan (see Appendix R of the HFQLG FEIS) as required by the HFQLG Act (Section 401 (b) (1), (c) (2) (B), and (d) (4)).

3.7.2 Methodology for Assessing Impacts on the Transportation System

3.7.3 Scope of the Analysis

The project area is located south of Little Grass Valley in Plumas, Sierra and Yuba County, California, within the Feather River Ranger District of the Plumas National Forest. It is within all or parts of T20N, R8E; T20N, R9E; T21N, R8E, T21N, R9E; T22N, R9E and T22N, R10E. The project area is within portions of Plumas National Forest's Challenge Management Area #11, Lost Creek Management Area #13, Little Grass Management Area #15, Beartrap Management Area #16, and Poverty Management Area #17.

3.7.4 Analysis Methods

The transportation system for the Sugarberry Project area was evaluated through a roads analysis. The following needs were identified based on that analysis and known access needs for proposed DFPZ and group selection treatments:

- Road reconstruction and maintenance are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to the DFPZ and group selection treatment areas. Reconstruction and road maintenance are also necessary to reduce erosion and sedimentation and to provide for public safety.

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

- Culvert replacement, removal, or upgrade is needed to improve watershed connectivity.

- Temporary road construction is needed to access group selection and DFPZ units where existing road access is absent.

- Road construction is needed to provide access to treatment areas where existing road access is impacting watershed resources.

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

Design Criteria (Prescriptions)

The purpose of the National Forest 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. The road system and improvements should minimize adverse effects on resources such as watershed and wildlife 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. Roads can reduce and fragment wildlife habitat, but they can also provide access for habitat protection from wildfire and treatments designed to improve habitat quality. Roads should be minimized where adverse effects outweigh benefits to wildlife.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through for road construction, reconstruction, or relocation) include the following:

- Accommodation of the 100-year flood at stream crossings, including streamflow, bedload, and debris;
- No diversion of streamflow along roads in the event of crossing failure;
- No diversion of natural hydrologic flow paths at stream crossings, including paths of streamflow, surface runoff, and groundwater; and
- No roads located in wetlands and meadows and minimization of road effects on natural flow patterns in wetlands and meadows.

Affected Environment (Existing Conditions)

Plumas Country Road 511 is the major access for the Sugarberry Project. The Sugarberry Project area is considered to have a fully developed arterial and collector road system.

- There are approximately 301.2 miles of existing classified roads in the project area. In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads, and skid trails in the project area.
- There are 8.3 miles of Level 1 roads assigned to intermittent service.
- There are 205.7 miles of Level 2 roads assigned where management direction requires the road to be open for limited passage of traffic.

3.7.7 Environmental Consequences

3.7.7.1 Alternative A

Direct Effects. Reconstruction of classified roads would not occur, and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity. There would be no increase in hazards to driver safety from logging traffic. Unclassified roads, and abandoned skid trails would not be decommissioned and would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels. Roads would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed. Fire access would be restricted because some roads would remain, or become, impassable.

Indirect Effects. No additional rights-of-way would be needed to accomplish road maintenance.

Cumulative Effects. No reduction in classified or unclassified roads would occur.

3.7.7.2 Action Alternatives B, C, and G

The road improvements proposed in the action alternatives would provide access needed for the DFPZ and group selection units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of catastrophic fire through intensive vegetation manipulation at a lower cost because of the improved access. The action alternatives would generate traffic from log trucks, chip vans, and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements.

Direct Effects. The Sugarberry Project proposes road decommissioning of approximately 4.7 miles of existing non-system roads. Decommissioning could include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, and/or blocking access. Decommissioning of roads would reduce ERA values, thereby lowering cumulative watershed impacts and soil compaction. None of the roads proposed for decommissioning are needed for the long-term transportation system. Portions of roads are in poor locations within RHCAs and are causing direct stream impacts. Roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts. Proposed road decommissioning, closure, or reconstruction would contribute to watershed restoration, including meadow enhancement, fish passage, and stream stabilization. There are many unsurfaced roads in the Sugarberry Project area that are contributing to degradation of water quality and aquatic habitat.

Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an off-highway vehicle (OHV) Route Inventory and Designation (RI&D) process. Roads proposed for decommissioning were not identified as OHV routes.

Direct Effects of the Action Alternatives. New construction of 0.6 mile for Alternatives B, C and G would be needed prior to project implementation. This road would be closed after use with a log earth barrier.

Reconstruction of 25.3 miles under all action alternatives would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed. Hazard trees would be removed after identification—following guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003).

Approximately 21.7 miles of temporary roads under Alternative B and 21.0 miles for Alternatives C and G would be needed to implement planned activities. These roads would be decommissioned upon completion of the project. Existing harvest landings in group selection units and DFPZs would be reconstructed, and new ones would be constructed.

Indirect Effects. The following right-of-ways are needed for this project.

Road #	Classified	Construction	Location Township/ Range Section	Temporary Miles	Notes	Owners
1	21N26		20/8 S2	1.00	Access to Units 62 and 65	Soper Wheeler
2	21N26A	New	20/8 S2	0.10	Access to Unit 65	Soper Wheeler
3	21N26B	New	20/8 S2	0.10	Access to Unit 62	Soper Wheeler
4	21N99E	New	20/8 S1	0.10	Access to Unit 62	Soper Wheeler
5	21N99F	New	20/8 S1	0.10	Access to Unit 58	Soper Wheeler
6	21N11F	Re/New	20/8 S12	0.40	Access to Unit 70	Soper Wheeler
7	21N68Y		20/9 S8	0.30	Access to Unit 87	Soper Wheeler
8	20N28B	New	20/8 S23	0.15	Access to Unit 140	Soper Wheeler
9	20N06A		20/8 S25	0.30	Access to Unit 154	Soper Wheeler
10	22N93Y		22/9 S25	0.25	Access to Unit 500	Soper Wheeler
11			20/9 S4	0.30	Access to Unit 629	Siller Bros
12	FH 120 Spur		21/9 S9	0.50	Access to Unit 7	Soper Wheeler
13	21N19Y		21/9 S20/29	0.10	Access to Unit 31	Soper Wheeler
14	21N18L	New	21/9 S29	0.30	Access to Unit 29	Soper Wheeler
15	22N56Y		21/9 S2 22/9 S25,26,35	3.20	Access to Unit 900	Soper Wheeler

Cumulative Effects. A net reduction of approximately 5 miles of unclassified roads in the action alternatives would occur after proposed road decommissioning is completed. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

Past, Present, and Reasonably Foreseeable Future Actions

Other than on-going routine road maintenance, past, present and future projects in the vicinity of the Sugarberry Project have not impacted nor are they expected to impact the transportation system in the project area.

3.8 Recreation, Visuals, Lands, and Minerals

3.8.1 Introduction

Recreational activities, visual qualities, land-based uses, and mineral extraction operations are historically important values in the vicinity of the geographical areas of La Porte, Howland Flat, Canyon Creek, Gibsonville, St. Louis, American House, Port Wine, Poverty Hill, and Slate Range Bar, which are encompassed within the Sugarberry Project area. Early trail and wagon roads, including those from the gold rush period of the 1850s, are found throughout the area. They were, and remain, important access routes for people in nearby mountain and river communities to hunt, fish, mine, access land, recreate, and camp on the Plumas National Forest.

Most of the recreational use in the project area can be characterized as dispersed, for the purposes of hunting, picnicking, camping, fishing, wood cutting, hiking, backpacking, horseback riding, driving for pleasure, OHV use, snowmobiling, cross country skiing, and observing nature.

The Plumas National Forest's 1988 LRMP projected increases in recreation demand for all Recreational Opportunity Spectrum (ROS) classes in the next 50 years. ROS classes have been assessed for the project area and are defined and mapped in the LRMP.

Within the project area, there are several Notices of Intent (NOIs) or Plans of Operations (POs) on file for mineral operations, and there are several Special Use Authorizations (SUAs) for non-federal land uses such as access roads, communication towers, power lines, telephone lines, etc.

3.8.2 Regulatory Framework

The 1988 LRMP established objectives, goals, and policies for the management of the Forest (p. 4-3 through 4-11 and 4-13 through 4-20). Specific LRMP goals that apply to recreation, visuals, lands, and minerals in the Sugarberry Project area include:

- Provide for a variety of forest related recreation, and coordinate recreation with other resource use through the ROS system.
- Improve and expand developed facilities and trails to meet demand while reducing unit costs and protecting other resources.
- Minimize conflicts between various recreational users.
- Allow use of OHVs wherever user conflicts or unacceptable resource damage are unlikely.
- Allow management activities to dominate the visual landscape of land committed to intensive timber or other commodity production.
- Maintain high visual quality on lands committed to other uses or readily apparent from recreation developments, major travel routes, and other high use areas.
- Encourage mineral and materials development throughout the Forest except in specified areas withdrawn to protect sensitive resources or substantial investments that cannot otherwise be protected.
- Approve mining POs contingent upon reasonable protection of surface resources and reclamation of disturbed land.

- Authorize non-Federal use of Plumas National Forest lands only if: (1) compatible with Management Area direction, (2) use of other land is not feasible, (3) conditions of issuance will mitigate all significant environmental impacts, and (4) the public interest is protected.

3.8.3 Methodology for Assessing Impacts on Recreation, Visuals, Lands, and Minerals

In this section, the effects of the alternatives are analyzed in relation to five indicators:

- ROS land classes
- Visual quality as measured by the Visual Quality Objective (VQO) system
- Impacts on other recreation features such as roads, trails, and snowmobile routes
- NOIs and POs for mineral operations
- SUAs for non-federal land uses.

3.8.3.1 Geographic Boundary for the Analysis

The analysis area for recreation, visuals, lands, and minerals is the approximately 48,000 acre Sugarberry Project area. The proposed vegetation and transportation management activities could affect opportunities and use for recreation, visuals, lands, and minerals values within the project area. The proposed action would have little effect on recreation, visuals, lands, or minerals activities or values outside the project area since they are site specific.

3.8.3.2 Time Frame for the Analysis

The time frame for this analysis was based on known past actions as described earlier in this chapter and projecting approximately five years into the future.

3.8.3.3 Analysis Methods

ROS classes and Visual Management System, including VQOs, within the Sugarberry Project area were evaluated for potential changes resulting from implementation of Alternatives A, B, C and G.

The ROS classification system is a land management tool used to classify lands based on the different recreation settings they provide. A key component of the ROS is to provide high quality scenery, especially scenery with natural appearing landscapes, to enhance peoples' lives and benefit society. The 1986 ROS Book describes recreation setting and opportunities, and is used to evaluate the recreation potential of an area. The Plumas National Forest ROS inventory is described in Appendix R of the LRMP.

The Visual Management System organizes criteria for managing scenery and is a systematic approach for determining the relative value and importance of scenery and associated recreation in a National Forest. High quality scenery, especially scenery with natural-appearing landscapes, enhances peoples' lives and benefits society as a whole. The system is used in the context of ecosystem management to inventory and analyze scenery in a National Forest, to assist in the establishment of overall resource objectives and goals, to monitor the scenic resource, and to ensure high quality scenery for future generations. The process involves inventory, analysis, and the determination of visual management objectives and provides for their input into an integrated resources planning and decision-making process. The synthesis of this information is used to determine VQOs for managing forest lands. VQOs describe different degrees of acceptable alteration of the natural landscape.

The Plumas National Forest is currently undergoing an OHV RI&D process. The Sugarberry Project was evaluated within the context of this process to analyze roads and trails use and to determine potential conflicts.

Special uses and minerals files and databases were reviewed to determine the extent of any current or foreseeable future land or mineral use in the project area and were evaluated for changes or potential changes resulting from alternative implementation.

3.8.4 Existing Condition and Environmental Effects

3.8.4.1 Introduction

The LRMP characterized the ecological and social conditions in the Sugarberry Project area and provided a context for future forest management decisions in the area.

Maintaining and improving current dispersed camping, hunting, fishing, and other recreational opportunities is a moderate priority for the Forest. The USDA Forest Service ROS Users Guide (1982) provides for six classes: Primitive, Semi-Primitive Non-Motorized, Semi-primitive Motorized, Roaded Natural, Rural, and Urban. The LRMP divided the Roaded Natural class into subclasses of Roaded Modified and Roaded Natural. The Forest was inventoried and divided into five ROS classes: Primitive, Semi-primitive, Roaded Modified, Roaded Natural, and Rural during the forest planning process in the late 1980s. The Sugarberry Project area was inventoried and classified as both Roaded Modified and Roaded Natural.

Roaded Modified is defined as those Roaded Natural areas that are also coded as Middleground, Background or Unseen, and Sensitivity Level II or III. This is the general resource management area of the forest, typified by pickup trucks and many miles of dirt and gravel roads. Other than trails and trailheads, virtually no improvements are present. Users experience low interaction with each other. Approximately 90 percent of the project area is in a ROS class for a Roaded Modified setting where the sight and sound of people are moderate. Roads, landings, and debris are evident.

Roaded Natural is defined as those original Roaded Natural areas that are also coded as Foreground and Sensitivity Level I. These lands lie along the major travel ways and viewsheds. Nearly all developed sites are in this class. Paved roads and hardened sites are common. User interaction is moderate to high at developed sites. The remaining approximately 10 percent of the project area is classified as a Roaded Natural setting where evidence of the sights and sounds of people are moderate. The area is mostly natural appearing as viewed from visually sensitive roads and trails. Access is by conventional motorized vehicles. The Roaded Natural classification occurs from Diamond Springs, along Gibsonville Ridge to just north of Gibsonville within the Oroville-La Porte road corridor; along Canyon Creek in portions of Sections 24, 35, and 36 of Township (T) 21 North (N), Range (R) 9 East (E), and portions of Sections 3 and 10 of T 20 N, R 9 E; and in the area of Race Track Point and Wambo Bar in portions of Sections 9, 10, and 15 of T 19 N, R 8 E, Mount Diablo Meridian.

VQOs were mapped as part of the forest planning process using Agriculture Handbook 462 Visual Management System – Volume 2, Chapter 1, 1974. VQOs describe different degrees of acceptable alteration of the natural and characteristic landscape. They are considered the measurable standards for the management of the “seen” aspects of the land. The following definitions for VQOs apply to landscape within the project area:

Retention. Activities are not to be evident to the casual forest visitor.

Partial Retention. People’s activities may be evident but must remain subordinate to the characteristic landscape.

Modification. Activities may dominate the characteristic landscape, but must, at the same time, utilize naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the foreground or middleground.

Motorized recreation is an important use in the project area. OHV use, including over snow vehicles, has increased dramatically over the last decade both locally and nationally, and increased need is expected in the future. Trails and roads generally meet current recreation needs, although an OHV RI&D process is in progress to identify OHV routes and areas to be established by a final Forest Order under a travel management strategy. Two 4-wheel drive OHV camps exist in the area, one on Slate Creek below American House and the other at Poker Flat.

Winter snow sports such as cross country skiing, snow play, and snowmobiling are increasing in popularity and occur within the project area. Approximately 12 miles of snowmobile routes in the project area in the vicinity of La Porte, La Porte Quincy Road (County Road 511), and Lexington Hill are groomed for snowmobile use.

Other recreational activities include, but are not limited to, photography, mushroom picking, Christmas tree cutting, and collection of basket weaving material.

Mineral operations (NOIs and POs) and non-federal land uses (SUAs) are known within the project area. These types of uses were individually evaluated to determine what impact the Sugarberry Project would have on these activities.

3.8.5 Recreational Opportunity Spectrum and Visual Quality Objectives

3.8.6 Existing Condition

The majority of the project area (approximately 90 percent) is classified under the ROS as Roaded Modified. Approximately ten percent of the project area is in the Roaded Natural class. A VQO of Modification is assigned to approximately 95 percent of the project area, while the remaining area is almost equally divided between Retention and Partial Retention. The current VQOs are met across the existing project area.

3.8.6.1 Effects of Alternative A

Except for wildland fire suppression efforts, the no-action alternative (Alternative A) would not initiate human-caused changes to the existing scenic conditions of the Sugarberry Project area. The current VQOs of Retention, Partial Retention, and Modification would not be affected by implementation of the no-action alternative. No timber harvest, road construction, road decommissioning, or prescribed burning would be scheduled. The natural evolution of the vegetative component of the landscape would continue to change the scenic qualities of the area. The potential for large and intense wildfire, along with the inherent changes in visual character, would continue to increase. No cumulative effects are expected with the implementation of the no-action alternative.

3.8.6.2 Effects of the Action Alternatives

Proposed DFPZ treatments and group selection harvest are consistent with the Retention, Partial Retention, and Modification VQOs assigned to the treatment areas. Following implementation of the action Alternatives, there would be no change in VQOs from existing conditions.

A listing of past, present, and foreseeable future action considered in the cumulative effects analysis is provided in Appendix F of this FEIS. Although individual actions were considered, it is important to note that this analysis relies on current environmental conditions as a proxy for the impacts of past actions on recreation, visuals, lands, and minerals in the project area. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected visual quality and recreational opportunities and might contribute to cumulative effects.

In general, areas affected by past vegetation management activities are in varying stages of visual recovery. Effects of activities that occurred near sensitive travel routes, while often still evident, have recovered to a point where they dominate the landscape to a lesser degree than in the past.

Cumulative effects of the action alternatives on the ROS and VQO in the project area are expected to be negligible because:

- Past vegetation and transportation activities have had minor to no impacts on recreation, visuals, lands, and minerals opportunities and use of the Sugarberry Project area.
- Proposed actions for Alternatives B, C and G are consistent with and would not affect the VQO assigned to treatment units.
- There are no present or foreseeable future land and mineral use projects in the project area that would adversely affect the VQO assigned to the area.

3.8.7 Other Recreational Uses (Roads, Trails, and Snowmobile Routes)

3.8.7.1 Existing Condition

Historically, roads and trails in the project area were developed to access mining claims and private lands, to support fire suppression efforts, and for Forest Service administrative uses. Most roads and trails were built to accommodate pack and saddle stock and were primary access routes into the project area.

The Table Rock trail and trailhead are within the northeast portion of the project area. It is approximately 1 mile in length and is considered moderately difficult. The trail takes you to the top of Table Rock for an outstanding view.

A 19 mile mountain bike route loops from La Porte to Gibsonville to Howland Flat to Queen City and back to La Porte. It is considered fairly difficult with an average riding time of five hours.

Approximately 12 miles of over snow vehicle routes are located in the vicinity of the project area. The over snow vehicle routes are part of a winter snowgrooming program in the vicinity of La Porte, La Porte-Quincy Road, and Lexington Hill, provided in partnership with the State of California OHV Recreation Division.

Motorized use by OHVs has increased in the last several years and continues to do so. Effective December 1, 2006, an interim Forest Order, derived through the OHV RI&D, process was issued to prohibit motorized vehicles on National Forest System roads, except for routes, open areas, and National Forest system trails designated on a travel management plan map. A final Forest Order supporting the Forest's travel management strategy is anticipated to be completed in 2008. Roads proposed for decommissioning or closure in this project will not be closed, unless the following criteria apply:

- Dead end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage.
- User created routes in areas that are already closed by existing Forest Orders.
- Routes that are creating egregious resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts to the resource.

3.8.7.2 Effects of Alternative A

The no-action alternative would not initiate human-caused changes to the existing conditions of the Sugarberry Project area except for wildland fire suppression efforts. No timber harvest, road construction, road decommissioning, or prescribed burning would be scheduled. The natural evolution of the vegetative component of the landscape would continue to change the qualities of the area. The potential for large and intense wildfire, along with the inherent changes in other recreational uses, would continue to increase.

3.8.7.3 Effects of the Action Alternatives

Alternatives B, C and G would not change the number of miles of trails available to the public. However, the ability to use the trail systems may be temporarily restricted during active harvesting activities. Removal of canopy or creation of openings resulting from DFPZ construction or group selection harvest would temporarily change the character of the trails and trailheads within the treatment areas. The harvest activity could open up vistas for public viewing.

Several group selection units in Alternatives B, C and G are proposed in this area. Some of these units could potentially become user-developed snowmobile play areas until vegetation is re-established and access is no longer available. Winter logging is not proposed for the Sugarberry Project, so access to the trails during the snowmobiling season would not be affected. If harvest activities are conducted during the winter, snow grooming on the 12 miles of over snow vehicle route in the project area would either: (1) need to be suspended, temporarily restricting access to groomed trails, or (2) a restriction on harvesting activities could be used during the snow grooming season to allow for continued access by over snow vehicle users.

Proposed road closures and decommissioning could reduce the level of OHV access slightly. However, specific road closures/decommissioning would be identified in tandem with the OHV RI&D process, so site-specific effects on OHV access are difficult to predict at this point. See section on "Transportation System" in the FEIS for more information about temporary road construction and roads proposed for closure and decommissioning.

The Back Country Discovery Trail is in the preliminary stages of planning and proposes to provide a motorized route running from the Mexican boarder to Oregon and from the Pacific Ocean to Nevada. If implemented, this trail would pass from the Tahoe National Forest to the Feather River Ranger District of the Plumas National Forest at Poker Flat and would run along existing roads, including the section at Pearson Ravine where road reconstruction and stream crossing improvements are proposed in the action alternatives.

A listing of past, present, and foreseeable future action considered in the cumulative effects analysis is provided in Appendix F of this DEIS. Although individual actions were considered, it is important to note that this analysis relies on current environmental conditions as a proxy for the impacts of past actions on recreation, visuals, lands, and minerals in the project area. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected recreational opportunities and might contribute to cumulative effects.

Cumulative effects of the action alternatives on road or trail systems in the project area are expected to be negligible because:

- Past vegetation and transportation activities have had minor to no impacts on hiking, OHV, and snowmobile roads or trails in the Sugarberry Project area.
- Proposed actions for Alternatives B, C and G may temporarily restrict access to hiking and OHV roads or trails, or temporarily affect the visual character of the roads, trails, and trailheads.

- There are no present or foreseeable future land and mineral use projects beyond what currently exists in the project area that are expected to adversely affect access or use of existing road or trail systems.

3.8.8 Mineral Operations (NOIs and POs)

Existing Condition. Mineral operations occur predominately in the Howland Flat, St. Louis, Canyon Creek, and Slate Creek areas. These range from simple dredging operations (NOIs) to more complex adit extraction operations (POs).

Effects of Alternative A. The no-action alternative would not initiate human-caused changes to the existing conditions of the Sugarberry Project area or the mineral operation except for wildland fire suppression efforts. No timber harvest, road construction, road decommissioning, or prescribed burning would be scheduled. The potential for large and intense wildfire, along with the threat to private property and interruption of mineral operations, would continue to increase. However, no cumulative effects are expected to occur with the implementation of the no-action alternative.

Effects of the Action Alternatives. Alternatives B, C and G would have little impact to mineral operations in the area. The treatment types proposed by the Sugarberry Project do not conflict with the known mineral activities within the project area.

3.8.9 Non-Federal Land Uses (SUAs)

Existing Condition. Several non-federal land uses are authorized by SUAs and include an access road into the La Porte Pines Country Club subdivision, a radio repeater for the La Porte Fire Protection District, power lines for Pacific Gas and Electric, and telephone lines for Pacific Bell.

Effects of Alternative A. The no-action alternative would not initiate human-caused changes to the existing conditions of the Sugarberry Project area except for wildland fire suppression efforts. No timber harvest, road construction, road decommissioning, or prescribed burning would be scheduled. The potential for large and intense wildfire, along with the threat to private property and interruption of uses provided authorized by SUAs, would continue to increase. However, no cumulative effects are expected to occur with the implementation of the no-action alternative.

Effects of the Action Alternatives. Alternatives B, C and G would have little impact to these types of uses. Contractual provisions would be in place to mitigate impacts by protecting these uses during treatment operations.

Irreversible, Irretrievable Effects. Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. There are no known irreversible or irretrievable effects for recreation, visuals, lands, or minerals caused by the action alternatives.

3.8.10 Summary of Cumulative Effects

Past vegetation management activities throughout the project area are in varying stages of recovery. Activities that occurred near sensitive travel routes, while often still evident, have recovered to a point where they dominate the landscape to a lesser degree than in the past.

There are few cumulative effects associated with Alternative A beyond the modest increase in use anticipated by the LRMP, especially recreation for the Sugarberry area. There are few expected cumulative effects on visual resources, recreational, minerals or lands opportunities under Alternatives B, C and G. Past, present, and foreseeable future actions either have not contributed or are not expected to contribute to the adverse impacts on these resources in the project area that could add to effects of the Sugarberry alternatives.

All ROS and VQOs currently assigned to the project area would be met following vegetation and transportation management treatments. Alternatives B, C and G would not exclude any of the existing recreational uses, but could temporarily restrict recreational access during treatment activities. Road closure or decommissioning proposed for Alternatives B, C and G would reduce the level of OHV access slightly. However, roads proposed for decommissioning or closure in this project will not be closed until the ongoing OHV RI&D process has been completed unless the following criteria apply: (1) Dead end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage; (2) User created routes in areas that are already closed by existing Forest Orders; or (3) Routes that are creating egregious resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts to the resource. Proposed transportation management activities are discussed in more detail in “Section 3.7: Transportation System.” Contractual provisions would be in place to mitigate impacts by protecting land use improvements, as indicated on the sale area map, during treatment operations. Known minerals operations are not anticipated to be affected by the treatment types proposed within the project area.

3.9 Hydrology

3.9.1 Regulatory Framework

The following laws, environmental and planning documents, Federal and State agencies, and regulatory programs govern the planning and implementation of the proposed Sugarberry Project. The aspects of the laws, regulations and policies that apply to potential effects on water resources related to the Sugarberry Project are summarized briefly below. They are described in greater detail in the Sugarberry "Hydrology Report" (available in the Sugarberry project file).

Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement and Record of Decision (USDA Forest Service 2004). Standards and guidelines applicable to the HFQLG Pilot Project area are described in Table 2 of the SNFPA FSEIS. (Table 2 does not specifically address hydrology or water resources.). The SNFPA ROD directs that vegetation management projects in the Pilot Project area follow the direction of the HFQLG Act in the application of Scientific Analysis Team (SAT) guidelines (Thomas et al. 1993) (see below).

Herger-Feinstein Quincy Library Group Forest Recovery Act and Record of Decision (USDA Forest Service 1999). The HFQLG Act directs that the SAT guidelines for riparian system protection be applied to all resource management activities specified by the Act and all timber harvesting activities that occur in the Pilot Project area during the term of the Pilot Project. These guidelines include the establishment of RHCAs. On the Feather River Ranger District, RHCA boundaries that apply are:

- 300 feet for perennial fish-bearing streams and lakes
- 150 feet for all other water bodies and wetlands defined in the SAT guidelines.

Scheduled timber harvest is prohibited within RHCAs, unless designed to meet Riparian Management Objectives (RMOs). The HFQLG FEIS requires that any activity within RHCAs be designed to improve or maintain the watershed and aquatic habitat conditions described in the RMOs. A complete list of RMOs and interpretations specific to proposed Sugarberry activities is included in the Sugarberry "Hydrology Report." Other provisions include requirements for passing 100-year flood flows at new and degraded stream crossings, for road management plans that meet RMOs, and for management of fuel treatments to meet RMOs and minimize risks to RHCAs.

Plumas National Forest LRMP (USDA Forest Service 1988). The 1988 Plumas National Forest LRMP (commonly referred to as the "Forest Plan") is the guiding planning document that directs land allocations and management on the Plumas National Forest. It has been amended by more recent programmatic documents, including the SNFPA ROD and the HFQLG ROD. The Forest Plan still provides management direction where not amended, as described below for hydrology resources of the Sugarberry Project.

Streamside Management Zone (SMZ) widths are defined in the Forest Plan. These are generally less extensive and with fewer restrictions on vegetation management activities compared to the RHCAs defined in the SAT guidelines. The Forest Plan requires the implementation of an SMZ plan for any activity within an SMZ. An SMZ plan is included in the Sugarberry Hydrology Report, which describes in more detail the application of Management Mitigation Measures (MMMs), Best Management Practices (BMPs), and standards and guidelines applicable to activities within riparian areas of the Sugarberry Project.

SAT guidelines and RHCA widths supersede SMZ requirements, except for channels not defined in the SAT guidelines (ephemeral channels without evidence of annual scour and deposition). SMZ widths may range from 0 to 50 feet, with widths defined by stream bank and channel gradients and stability. Within these protection zones, proposed DFPZ treatments may still occur but ground-based equipment is excluded.

California State Water Resources Control Board, Federal Clean Water Act, and Porter-Cologne Water Quality Control Act. The California Porter-Cologne Water Quality Control Act and the Federal Clean Water Act govern the management of water quality and sources of water pollution in California and the nation. The State Water Resources Control Board (SWRCB) and the California Regional Water Quality Control Boards (CRWQCB) mandate and administer water quality regulations in the State of California. Land management regulations to control nonpoint source pollution, known as BMPs, have been developed by the Forest Service with approval from the SWRCB. BMPs are applied site-specifically to various land-use practices to minimize erosion and sedimentation and resulting impacts on beneficial uses of water. BMPs relating to water quality are described in the handbook "Water Quality Management for National Forest System Lands in California – Best Management Practices" (USDA Forest Service 2000). The BMPs that apply to the Sugarberry Project are included in Appendix E of this FEIS, and in the Sugarberry "Hydrology Report."

Section 303(d) of the Clean Water Act. Section 303(d) of the Clean Water Act requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The list of affected water bodies, and associated pollutants or stressors, is provided by the SWRCB and approved by the EPA. The most current list available is the 2006 303(d) list (SWRCB 2006). No impaired water bodies are located within the project area or cumulative watershed effects (CWE) analysis area. Regulation of mercury discharge from abandoned mines in watersheds that encompass the project area is anticipated within the approximately the next decade.

Regional Water Quality Control Board – Central Valley Region – Beneficial Uses and State Water Quality Objectives. Beneficial uses are defined under California State law in order to protect against degradation of water resources and to meet state water quality objectives. Beneficial uses of surface water bodies are listed in Chapter 2 of the Central Valley Region's Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin River basins (CRWQCB 1998), including the major water bodies downstream of the Sugarberry Project area. These include water supply, hydropower, recreation and aquatic wildlife habitat. The Forest Service is required to protect and enhance existing and potential beneficial uses during water quality planning (CRWQCB 1998). The Sugarberry CWE analysis analyzes potential off-site and downstream effects on beneficial uses of water (USDA Forest Service 1990), and appropriate mitigation measures and monitoring plans have been developed, which are described in this FEIS and the Sugarberry "Hydrology Report."

Timber Harvest Activities Waiver Program. The Central Valley Regional Water Quality Control Board administers a program whereby timber harvest programs may be issued a waiver from waste discharge requirements. Essentially, if National Forests or private timber operators apply BMPs and provide documentation of their implementation, they will not have to apply for waste discharge permits. They may be required to perform additional wet season monitoring if TOCs for CWEs are exceeded (see Section 3.9.2.1 for definition and description). Additional description of monitoring requirements and a monitoring plan are included in the Sugarberry "Hydrology Report."

3.9.2 Methodology for Assessing Impacts on Hydrology

3.9.2.1 Indicators

Indicator 1: Watershed Condition—Watershed condition represents the overall state of disturbance of the watershed, integrating upland factors influencing hydrologic response including vegetative cover and the extent of impervious surfaces such as roads and urban infrastructure, with the condition of the channel network expressing previous flow regimes and cycles of erosion and deposition. Upland watershed condition is evaluated primarily through the equivalent roaded area ERA model for cumulative off-site watershed effects, which sums the amount of disturbance in upland and near-stream watershed sensitive areas and compares it to a TOC; channel condition is observed in the field and interpreted in relation to watershed history, including past management disturbances and natural watershed processes.

Measure 1 — Cumulative Off-Site Watershed Effects Analysis. The following definitions apply when assessing the direct, indirect, and cumulative effects:

Direct Effects on watershed conditions result when activities occur in and deposit sediment or pollutants directly into aquatic areas. Increased erosion and sedimentation directly into streams and other water bodies may result from road construction or maintenance, fire line construction and reconstruction for prescribed burning, wildland fires, and timber management activities, such as construction of skid trails, temporary roads, and log landings.

Indirect effects can occur when watershed areas are disturbed by roads and timber harvest or associated activities. Disturbances may include soil compaction, removal of vegetation canopy, and removal of effective soil cover. These disturbances can cause hillslope destabilization and/or detachment and mobilization of sediment that will eventually reach streams. Such activities may therefore become nonpoint sources of pollution. Increased erosion and sedimentation may result in increased peak channel flows, alteration of annual flow distribution, stream channel geometry alteration, and degradation or aggradation of channel beds. Project activities could indirectly affect the channel network within or adjacent to proposed treatment units. If not properly mitigated, indirect effects can cause adverse effects on water quality and quality of stream and riparian habitat.

Cumulative off-site watershed effects include any changes that involve watershed processes and are influenced by multiple land use activities (Reid 1993). They do not represent a new type of impact. Changes that accumulate in time or space are considered CWEs. The definition of a cumulative impact on the CEQ Regulations (40 CFR 1508.7) states:

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

Land use activities may alter environmental parameters—they may modify topography; change the character of soil and vegetation; import or remove water, chemicals, and fauna; and they may introduce pathogens and heat. Changes in these parameters can cause changes in watershed processes.

As the watershed changes in response to the altered environmental parameters, changes in production and transport of water, sediment, organic matter, chemicals, and heat can occur (Reid 1993). Land use can cause on-site CWEs that result directly from on-site changes in environmental parameters or off-site CWEs that are the result of changes in watershed transport processes.

The CWE analysis addresses all potential effects on beneficial uses of water that occur away from the locations of actual land use and may be transmitted through the fluvial system. Effects may be either beneficial or adverse and result from additive effects of multiple management activities within a watershed. The CWE analysis is based on guidance from Forest Service Handbook (FSH) 2509.22-Soil and Water Conservation (USDA Forest Service 1990). The method of analysis employed is the ERA model, with ERAs measured in acres. The ERA model serves as an index of the potential impact of past, present, and future land management activities on downstream water quality. The model describes these off-site impacts as equivalence to the roaded area within a watershed. It assumes that the more densely a watershed is roaded, the greater the impacts will be to water quality downstream.

Impact potential is defined in terms of “disturbance coefficients” indexed by relating the degree of impact expected from each type of activity to that expected from roads. The sum of indices for a watershed represents the percentage of road surface in the basin that would produce the same effects as the existing or planned distribution of management activities (Berg et al. 1996). The following land-disturbing activities are evaluated in the ERA model for the Sugarberry Project: roads, landings, OHV trails, timber harvesting activities on public and private lands, urbanization, wildland fire, and legacy mining disturbance. For the present analysis, these land-disturbing effects are assessed for the past 25 years, the present, and the foreseeable future. The analysis is based on geographic and land use information compiled from Forest Service, California Division of Forestry and Fire Protection, and county databases and from aerial photography and field observations.

Landscapes’ responses to and recovery from land disturbances are influenced by climatic, physiographic, geologic, and ecologic conditions (USDA Forest Service 1990). Therefore, recovery coefficients are assigned based on local conditions. The western slope of the Sierra Nevada in the Plumas National Forest area has a high rate of vegetative establishment and growth due to high annual precipitation and the presence of highly productive forest soils. On the Feather River Ranger District, the average recovery period for disturbed sites is estimated to be 25 years. Disturbance from vegetation management is assumed to no longer affect hydrologic processes after 25 years have passed since the last major site disturbance. Recovery from other activities, such as mining or urbanization, occurs more slowly or not at all, and no recovery coefficient is assigned for such disturbances. For a list of disturbance coefficients used in the CWE analysis refer to the Sugarberry “Hydrology Report.”

Watersheds and stream channels have a natural capacity to absorb various levels of land disturbance without major adjustment to their function and condition, but when this capacity is exceeded, the effects of land disturbances may substantially impact downstream channel stability and water quality. This upper estimate of watershed “tolerance” to land use is named “threshold of concern” (TOC). When the sum of disturbances approaches or exceeds TOC, water quality may be impaired for established beneficial uses, such as municipal water supplies, irrigation, or fish habitat. Stream channels can also deteriorate so that adjacent riparian areas become severely damaged.

Within the CWE analysis area, the ERA total of each subwatershed is compared to the TOC and reported as percents of disturbed area and of TOC. The TOCs used and rationale for their assignment are included in the Methodology section of the Sugarberry “Hydrology Report.” ERA totals in the range of 80 to 99 percent are considered to be approaching TOC, while ERA totals of 100 percent or greater equal or exceed the TOC. The TOC does not represent an exact level of disturbance where cumulative off-site watershed effects will begin to occur. Rather, it serves as a cautionary indicator that an increased risk of significant adverse CWEs occurs within a watershed.

The scope of the CWE analysis includes 44 subwatersheds, ranging from 510 acres to 2,350 acres, with a total analysis area of 58,088 acres (see Table 3-39). The locations of watersheds with respect to treatment units are displayed in Figure 3-3. Subwatersheds 1, 2, and 35 are located in the CWE analysis area and may contribute to off-site CWE; however, there are no treatments proposed within these subwatersheds. The major streams in the analysis area include Slate Creek, Canyon Creek, and the North Yuba River. A small portion of the analysis area (4,016 acres or 7 percent) drains to the South Fork Feather River and subsequently to Lake Oroville, the Feather River, the various conveyances of the State Water Project, and via the Sacramento River to the Sacramento-San Joaquin River Delta, emptying to San Francisco Bay and the Pacific Ocean. The remainder of the analysis area is tributary to the North Yuba River and New Bullard's Bar Reservoir, either directly or via Slate and Canyon Creeks. The outflow of New Bullard's Bar Reservoir joins sequentially the main stem Yuba River, the Feather River and the Sacramento River, also ultimately reaching the Pacific Ocean through San Francisco Bay.

Subwatersheds 13, 14, and 20 drain to the South Fork Feather River and eventually to Lake Oroville. Subwatersheds 1–8, 10–12, 15–19, 21, 22, 24–28, 29, 30, 32, 33, 35, 36 39 and 41–43 drain to Slate Creek. Subwatersheds 9, 23, 29, 31, 34, 37, 38 and 42 drain to Canyon Creek. Subwatersheds 40 and 44 drain directly to the North Yuba River upstream of New Bullard's Bar Reservoir (Figure 3-3).

Table 3-39. Subwatersheds located in the CWE analysis area.

HFQLG[a] Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Label	Subwatershed Total Area (acres)
110043	New Bullard's Bar Reservoir	180201250202	Whiskey Creek	1	1,025
110043	New Bullard's Bar Reservoir	180201250202	Headwaters East Branch Slate Creek	2	831
110043	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 1 - Upper Slate Creek	3	2,224
110043	New Bullard's Bar Reservoir	180201250202	Gibson Creek	4	1,186
110043	New Bullard's Bar Reservoir	180201250202	East Branch Slate Creek	5	2,082
110042	New Bullard's Bar Reservoir	180201250202	Wallace Creek	6	1,306
110043	New Bullard's Bar Reservoir	180201250202	Potosi Creek	7	2,270
110042	New Bullard's Bar Reservoir	180201250202	Sacketts Gulch	8	767
110022	New Bullard's Bar Reservoir	180201250201	Upper Canyon Creek 1	9	1,802
110042	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 2 - St. Louis	10	2,076
110041	New Bullard's Bar Reservoir	180201250202	East Branch Rabbit Creek	11	760
110042	New Bullard's Bar Reservoir	180201250202	Cedar Grove Ravine	12	1,602
110040	Ponderosa Reservoir	180201230601	Unnamed tributary S Little Grass Valley Reservoir	13	585
110024	Lewis Flat	180201230602	Upper Lost Creek	14	1,717
110041	New Bullard's Bar Reservoir	180201250202	Rabbit Creek	15	1,408

HFQLG[a] Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Label	Subwatershed Total Area (acres)
110041	New Bullard's Bar Reservoir	180201250202	Unnamed tributary Rabbit Creek	16	577
110042	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 3 - French Camp	17	1,295
110042	New Bullard's Bar Reservoir	180201250202	Wisconsin Ravine	18	596
110042	New Bullard's Bar Reservoir	180201250202	Deacon Long Ravine	19	752
110024	Ponderosa Reservoir	180201230602	Valley Creek	20	1,714
110023	New Bullard's Bar Reservoir	180201250202	Clarks Ravine	21	1,355
110023	New Bullard's Bar Reservoir	180201250202	Pats Gulch	22	1,051
110022	New Bullard's Bar Reservoir	180201250201	Upper Canyon Creek 2	23	2,343
110023	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 4 - Lucky Hill	24	1,300
110023	New Bullard's Bar Reservoir	180201250202	American House Ravine	25	685
110023	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 5	26	1,698
110023	New Bullard's Bar Reservoir	180201250202	Onion Creek	27	1,294
110023	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 6	28	1,138
110021	New Bullard's Bar Reservoir	180201250201	Upper Rock Creek	29	2,178
110023	New Bullard's Bar Reservoir	180201250202	Gold Run Creek	30	1,618
110022	New Bullard's Bar Reservoir	180201250201	Canyon Creek - Sawmill Ravine	31	844
110023	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 7 - Diversion Dam	32	1,052
110020	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 8 - Stowman Ravine	33	1,164
110021	New Bullard's Bar Reservoir	180201250201	Lower Rock Creek	34	2,350

Table 3-39. Subwatersheds located in the CWE analysis area (continued).

HFQLG* Number	HUC6 Name	HUC6 ID Number	Subwatershed Name	Subwatershed Label	Subwatershed Total Area (acres)
110020	New Bullard's Bar Reservoir	180201250202	Buckeye Creek	35	568
110020	New Bullard's Bar Reservoir	180201250202	Brushy Creek	36	1,868
none	New Bullard's Bar Reservoir	180201250201	Middle Canyon Creek	37	830
110021	New Bullard's Bar Reservoir	180201250201	Unnamed tributary Rock Creek	38	655
110020	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 9 - North Star	39	1,416
110019	Dobbins Creek	180201250203	Upper Deadwood Creek	40	2,045
110020	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 10 - Oak Flat	41	510
none	New Bullard's Bar Reservoir	180201250201	Lower Canyon Creek	42	730
110020	New Bullard's Bar Reservoir	180201250202	Slate Creek Canyon 11 - Lower Slate Creek	43	1,904
110019	Dobbins Creek	180201250203	Lower Deadwood Creek	44	919

Note: *HFQLG = Herger-Feinstein Quincy Library Group watershed.

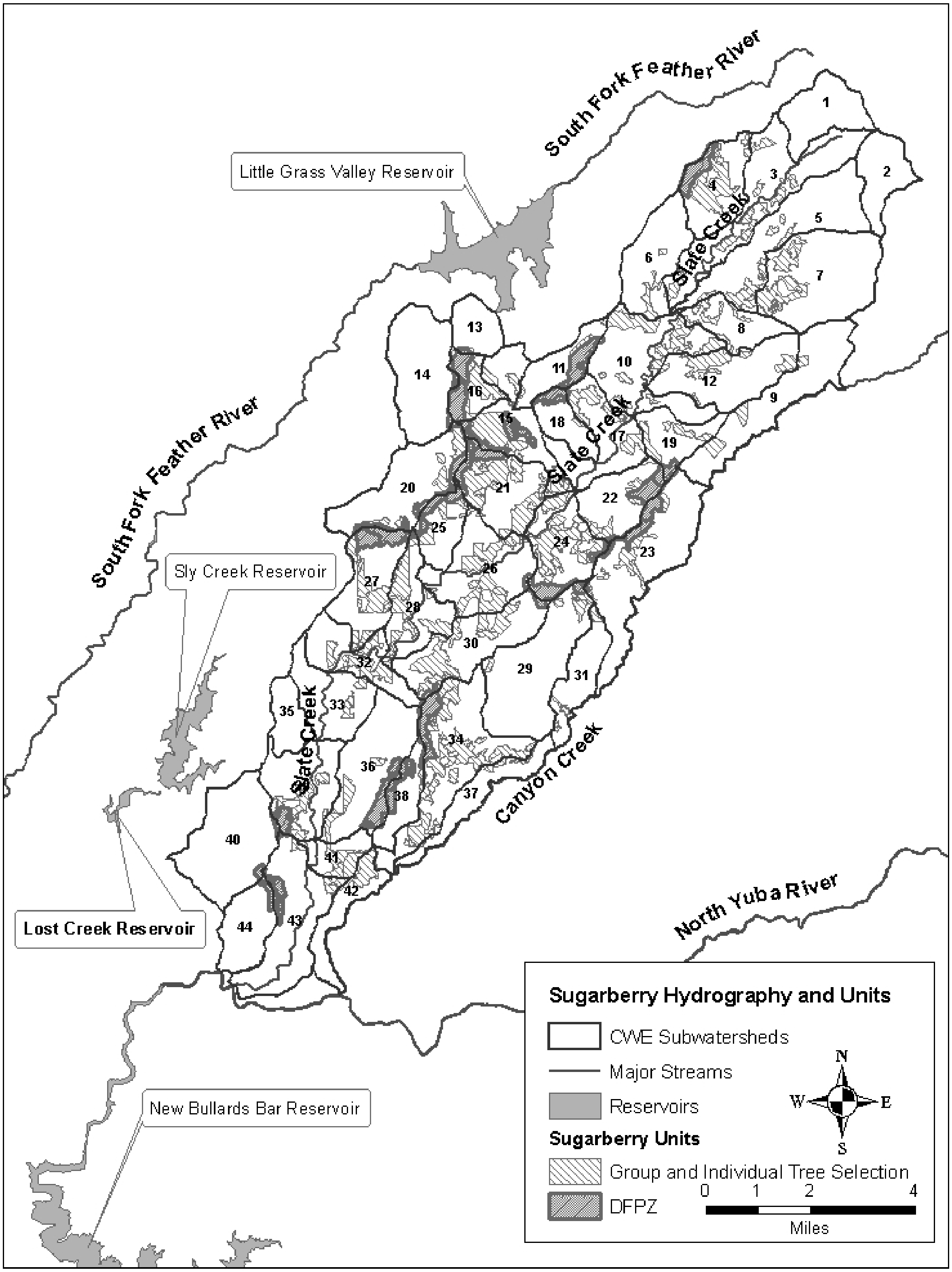


Figure 3-3. Locations of subwatersheds with respect to treatment units.

General watershed and riparian conditions within the Sugarberry CWE analysis area were evaluated during site visits by the hydrologist/soil scientist, botanist, fisheries biologist, and wildlife specialist and by aerial photo interpretation, interpretation of data from fisheries and stream crossing surveys, and professional judgment based on the best available scientific literature. Streams located within proposed DFPZ treatment units were previously field checked for the Lower and Upper Slate DFPZ Environmental Assessments. Information gathered for the Slate Creek Landscape Analysis - USDA Forest Service, Plumas National Forest 1999) was compiled and examined for accuracy and relevance. Observed field conditions were compared with ERA model results, and related to known past management activities and disturbances (see “Section 3.9.4: Environmental Consequences” below).

Stream channels located within DFPZ treatment units were previously identified and flagged in the field as RHCAs for the Upper and Lower Slate DFPZ projects. These demarcations will be used as stream protection zones for the Sugarberry Project. The RHCAs marked for these projects extend the full 150 to 300 foot distance from all observed channels. It is not necessary to provide additional SMZ protection for ephemeral channels without annual scour (ephemeral swales) in DFPZ units, because these features were delineated as RHCAs for the Slate projects, providing more extensive buffers than SMZs would.

During on-the-ground layout of treatment units, the RHCA posting will be refreshed, and RHCA demarcation will be added for any new features identified during Sugarberry field surveys. Specifically, springs and seeps identified by botany survey crews will be flagged as RHCAs with 150-foot radii. In units where mechanical treatment in RHCAs is proposed, site visits were made to assess the proposed treatments for consistency with RMOs, and to ensure compliance with HFQLG FEIS direction for RHCA treatments. Activities within RHCAs must contribute to improving or maintaining watershed and aquatic habitat conditions as described in the RMOs. RHCAs were not identified on the ground in areas where group selection or ITS harvest is proposed. Group selection and ITS areas will be laid out so no mechanical activities occur within RHCAs or SMZs. SMZ demarcations will be posted in group selection and ITS harvest units where ephemeral channels without annual scour occur within harvest unit boundaries. Travel by mechanical equipment will be excluded from these SMZs; “reaching in” with equipment booms to extract forest products is permitted.

Measure 2 — Fungicides and Water Quality. The area analyzed for potential hydrologic effects of fungicides (Sporax®) is the same as the CWE analysis area, and consists of the subwatersheds listed above (Table 3-39). The discussion in “Section 3.9.3: Affected Environment” and “Section 3.9.4: Environmental Consequences” below is based on information from the available literature.

3.9.3 Affected Environment (Existing Conditions): Hydrology

3.9.3.1 Overview

The subwatersheds evaluated as part of the Sugarberry Project CWE analysis are listed above in Table 3-39 and displayed in Figure 3-3. The existing condition information for these subwatersheds is based on site visit surveys and reconnaissance, historical references, interpretation of aerial photography, Forest Service corporate GIS data, corporate GIS data provided by Butte, Yuba, Plumas, and Sierra Counties, and private land timber harvest plans (THPs) filed with the California Division of Forestry and Fire Protection. The subwatersheds lie within a mostly forested rural landscape on the western slope of the northern Sierra Nevada. Overall, 75 percent of the CWE analysis area is National Forest System lands and 25 percent is privately owned. Over three-quarters of the subwatersheds in the analysis area have a majority of National Forest lands. Land ownership in subwatersheds, 6, 11, 13, 19, 29, 33, 35, and 38–40 is greater than 50 percent private.

The productive nature of forest soils in the area and the seasonally moist climatic conditions have ensured that forest vegetative cover remains dense and vigorous. The western slope of the northernmost Sierra Nevada, which includes the Feather River Ranger District, receives the greatest amounts of mean annual precipitation in the range. The climatic regime is Mediterranean, with precipitation events concentrated between November and April and drought conditions generally prevailing the remainder of the year.

The main factors that account for the precipitation conditions include the southwesterly aspect of the drainage network, which favorably intercepts Pacific storm energy; and the topographic influence of the rise of the western slope of the Sierra Nevada. The Sugarberry Project area is centrally located in the main precipitation belt of the northern Sierra, with mean annual precipitation of 75 inches to 80 inches. Approximately 34 percent of the annual precipitation at La Porte falls as snow (California Department of Water Resources [CDWR] 1978). The mean annual runoff exceeds 50 inches per year (CDWR 1978), and 70 percent of annual precipitation appears as stream runoff (Benoit 1980). Streamflow is typically storm flow-dominated in the fall and early winter, with snow pack accumulation and decreased runoff in mid-winter, and the spring melt beginning in April to May. The average monthly runoff peaks generally occur in April and May, declining to a monthly low in September. However, there is high variability in the seasonality, magnitude and intensity of precipitation/runoff events on an annual and inter-annual basis. Rain-on-snow or rain-on-frozen-ground events occur infrequently over the analysis area but have a high potential for destructive flooding. The landscape setting and conditions that currently exist in the analysis area, including the physiographic and geologic framework, are described in the Sugarberry "Soils Report."

In the CWE analysis area, there are 100 miles of fish bearing streams; 57 miles of perennial non-fish bearing streams, 132 miles of intermittent non-fish bearing streams, and 338 miles of ephemeral streams. Overall stream network density is 6.9 miles per square mile.

Stream conditions in the CWE analysis area were field-inspected during site visits to proposed restoration projects, road construction sites and selected stream crossings and reaches. Channel and riparian conditions are observably and substantially influenced by past management activities, particularly the legacy of hydraulic mining in the area.

Timber harvest and associated road construction have also impacted tributary channels, particularly on heavily managed private timberlands. Persistent upland effects of mid-19th- to early 20th-century hydraulic mining include denuded areas with complete loss of the soil profile, steep eroding scarps of pit faces and walls, and large accumulations of frequently unstable tailings and waste rock. Persistent effects to the channel network include alteration of drainage from mined areas, including artificial channel realignment; aggradation of channel reaches downstream of mines, including impoundment of large quantities of sediment behind historic and sometimes failing debris dams; impoverished riparian vegetation related to historic channel scour; interception of hillslope and headwater channel flow by an extensive network of historic flume ditches, and persistence of mercury and other toxic materials used in mining in drainage structures and stream beds. This legacy of effects unquestionably represents large-scale CWE with resultant changes in channel morphology, channel stability, water quality, and aquatic and riparian habitat quality.

At a number of specific sites, disturbances related to mining or to other activities are continuing to adversely affect streams, in some cases associated with poorly engineered or maintained roads and stream crossings. Some of these locations include the failing crossing of Potosi Creek on Sierra County Road 800, unstable crossings near La Porte upgraded in 2006, erosion of the hydraulic pit face and drainage diversion at the Upper Dutch Diggings hydraulic mine site, erosion of the pit face at the Nugget Bowl hydraulic mine site, backwearing and mass wasting of the face of the Pioneer Pit, the failing debris dam on Gold Run Creek and associated channel diversion and erosion, and the landslide on the Scales Road 20N35, near the Slate Creek bridge. Some of these problems are currently being addressed under categorical exclusions for road maintenance or are proposed for restoration as part of the Sugarberry Project. Stream crossings in a degraded condition or that are barriers to migration of aquatic organisms are present at the outlet of Fish Meadow on Road 20N20, Potosi Creek at SC800, Pearson Ravine at SC800, Rock Creek at 20N95, and Gold Run Creek at 21N90. These crossings are planned to be replaced or upgraded with the Sugarberry Project.

Despite the noted lack of riparian cover in a number of channels, the Slate Creek Landscape Analysis found that summer stream temperatures were generally within the range of the desired condition for maximum temperatures (54° to 66°F.). Temperatures in excess of this range were recorded in lower Slate Creek and Cedar Grove Ravine.

The Slate Creek Landscape Analysis indicates that approximately half of streambeds sampled for pool-tail fines exceeded the desired condition of zero to 5 percent. Silt from mining was described as frequently observed, although survey data suggest its presence may be localized and ephemeral.

Road and stream crossing densities in the Sugarberry CWE analysis area are high under the existing condition. Road development has occurred for the following reasons: timber harvesting activities on public and private lands, urban development, mining and OHV recreation. Roads modify drainage networks and accelerate erosion processes, resulting in the alteration of physical processes in streams. These changes can be dramatic and long lasting and can degrade water quality and aquatic habitat (Hagans et al. 1986). Roads can directly affect water quality and aquatic habitat by altering flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian conditions in watersheds (Gucinski et al. 2001; Trombulak and Frissell 2000). Common hydrologic problems originating at roads include: rutting and road surface erosion; poorly placed or inadequate stream crossings and surface drains that may fail, divert drainage from its natural course or block passage for fish and other aquatic organisms; and over-steepened cut-and-fill slopes prone to erosion and mass wasting.

Road densities by subwatershed as calculated for the Sugarberry FEIS range from 0.8 to 8.0 miles per square mile, with an average of 4.5 miles per square mile. Studies have indicated that as road and stream crossing densities increases, so do negative effects on aquatic habitat parameters and fish populations (Eaglin and Hubert 1993). The road density in a majority of subwatersheds in the Sugarberry CWE analysis area exceeds the desired density for minimizing road impacts on aquatic and riparian environments and associated terrestrial wildlife. The Slate Creek Landscape Analysis recommends a road density of no more than 2 miles per square mile, and recognizes that the existing condition of road density exceeds this recommendation in several watersheds.

The existing condition of meadows in the CWE analysis area ranges from good to adversely affected, depending on meadow location, degree of disturbance, and previously accomplished restoration activities. Adverse effects to meadows in the analysis area include stream destabilization and surface degradation related to OHV use and past timber harvests, invasion by conifers due in part to suppressed fire frequency and settlement-related disturbance, and soil deposition from road-related erosion. The Slate Creek Landscape Analysis recognizes that meadow area has declined compared to the reference condition, and recommends enhancing meadow area where possible (see Section 2.2.2 for description of proposed meadow restoration).

3.9.3.2 Subwatershed History of Disturbance

Timber harvesting, road construction, and mining have been the major recent land-disturbing activities in the CWE analysis area. Historic gold mining, unmanaged timber harvest, grazing of both cattle and sheep, and an increase in fire frequency and magnitude all produced changes on the landscape prior to U.S. Forest Service management of the area. The decrease in canopy cover of mature timber and replacement with brush fields or denuded areas, the alteration of channel networks and the dismantling of hillslopes and redistribution of large quantities of soil and Tertiary gravels as a combined consequence of these activities, particularly hydraulic mining, severely altered hydrologic response and accelerated erosion and sedimentation during this era. Construction of debris dams in several higher-order channels, including Slate Creek, following passage of the *Caminetti Act* in a 1893 (see "Section 3.6: Heritage"), further increased channel storage of sediment, elevated base levels, and prolonged and increased the aggraded condition of channels downstream of hydraulic mine pits. The legacy of the hydraulic mining era also includes mercury that was used to extract gold from the hydraulically mobilized materials, and which is still found in mined areas, drainage structures and streambed gravels within the area, and poses potential threats to water quality and beneficial uses including aquatic ecosystems and human health.

Following National Forest proclamation in the early 1900s, a period of hydrologic recovery ensued, concurrent with resource management and fire suppression. Extensive logging and road building began in the 1950s and 1960s, on both National Forest System lands and private lands in the analysis area. Routine road location and logging practices of that time resulted in extensive watershed damage that required 20 to 30 or more years to recover. Changes in timber practices alleviated disturbance to a degree by the 1970s, although large volumes of timber continued to be harvested on the National Forest into the 1980s and early 1990s, and substantial private timber harvest continues today. Until recently, most logging activities have occurred on the gently to moderately sloping ground that occupies broad ridgetop areas in the watershed. Most of the very steeply sloping areas were not historically harvested, but recent harvest activities using cable and helicopter logging systems have begun removing timber on steeper ground.

There have been a number of timber sales and vegetation management projects on National Forest System lands within the analysis area during the past 25 years. However, their total contribution to disturbance as measured in ERA values totals about one-third that of private timber harvest, which is concentrated on one-quarter of the total land base of the analysis area (Table 3-40).

Table 3-40. Land ownership and disturbance by vegetation management in the CWE analysis area.

Ownership	Acres	Square Miles	Percent of Analysis Area	Acres of Vegetation Management	ERA	ERA/ Square Mile
Federal	43,650	68.2	75%	4,785	332	4.87
Private	14,430	22.6	25%	9,805	999	44.2

Recent Forest Service projects have incorporated stream protection and erosion prevention measures specified in the Forest Plan or the HFQLG ROD, effectively reducing impacts to riparian and aquatic systems. Private timber harvest also employs watercourse protection and erosion control measures specified by the state Forest Practice Rules; however, in some instances these stipulations are less stringent and provide narrower stream buffers than the Forest Service regulations.

Fire suppression and reduced vegetation management have resulted in extensive fuel accumulations, which the Sugarberry Project is designed to alleviate. While stand-replacing fire has been relatively uncommon on the western slope of the Plumas National Forest, several historic stand-replacing fires have occurred in the watersheds. Fire history for the area is described in "Section 3.3: Vegetation, Fire and Fuels."

Other influences that have affected the subwatersheds include grazing, urban development, modern small-scale placer and suction dredge mining, and water diversion associated with the South Feather Water and Power water supply and hydroelectric project.

Watershed restoration projects have occurred within the Sugarberry area on Plumas National Forest lands. These restoration projects were designed to reduce and restore stream destabilization from past management activities and benefit ecosystem structure and function. A list of these projects is located in the Sugarberry "Hydrology Report."

3.9.3.3 Existing Condition of Indicator 1: Watershed Condition

Measure 1 CWE Analysis. The Sugarberry "Hydrology Report" lists the total ERA score and the final results for each subwatershed, represented as percent disturbed and percent of TOC for both near-stream sensitive areas and for the subwatershed as a whole.

Table 3-41 lists three subwatersheds where the subwatershed ERA approaches the TOC and one subwatershed where the subwatershed ERA exceeds the TOC under the existing condition, as well as the type of disturbances responsible for the elevated ERA values. In each one, private land timber harvest is the chief source of landscape disturbance. Hydraulic mines are the next-largest contributor in another of the four (19 – Deacon Long Ravine). Roads and landings occupy 12 to 29 percent of these highly disturbed landscape areas.

Table 3-41. Summary of the existing condition of subwatersheds that approach or exceed the TOC.

Subwatershed Number	Subwatershed Name	Subwatershed TOC (ERA percent of watershed area)	Percent of TOC	Reason that the Subwatershed Is Approaching or Exceeding the TOC
11	East Branch Rabbit Creek	13	94	61 percent of the total ERA is from private land timber harvesting activities, followed by 23 percent roads and landings, 7 percent mines, 5 percent urban development, and 3 percent U.S. Forest Service vegetation management. U.S. Forest Service activities in the last 10 years have contributed 3 percent of the total ERA.
13	Unnamed tributary S Little Grass Valley Reservoir	13	83	88 percent of the subwatershed is privately owned. 73 percent of the total ERA is from private land timber harvesting activities, followed by 26 percent roads and landings, and 1 percent U.S. Forest Service vegetation management. U.S. Forest Service activities in the last 10 years have contributed <1 percent of the total ERA.
19	Deacon Long Ravine	12	165	50 percent of the total ERA is from private land timber harvesting activities, followed by 37 percent mines, and 12 percent roads and landings. All U.S. Forest Service activities, including those in the last 10 years have contributed <1 percent of the total ERA.
35	Buckeye Creek	13	87	99 percent of the subwatershed is privately owned. 71 percent of the total ERA is from private land timber harvesting activities, followed by 29 percent roads and landings. All U.S. Forest Service activities, including those in the last 10 years have contributed <1 percent of the total ERA.

Stream conditions were examined in a number of the RHCAs in the analysis area. As noted previously, there is a substantial legacy of landscape disturbance and lingering stream channel effects in the Sugarberry CWE analysis area, largely related to historic mining activities and associated unregulated timber harvest. In general, observable evidence of persisting cumulative effects, reflected by stream channel condition, is apparent in most higher-order channels downstream of hydraulic mine sites, and is less evident elsewhere, even where substantial recent timber harvest has occurred. Streams such as Potosi Creek, Rabbit Creek, Gold Run Creek, Whiskey Creek, Pine Grove Creek, Deacon Long Ravine, and Slate Creek have been affected by aggradation, riparian denudation and impoverishment of large woody debris, and/or mercury pollution. A substantial amount of sediment is stored behind debris dams and mining reservoirs in Slate Creek, Rock Creek, Gold Run Creek, and elsewhere in the subwatersheds, creating discontinuities in channel profiles and hydraulics, and presenting the risk of large sediment releases to the channel network when they eventually fail. Studies elsewhere in the Yuba River watershed indicate that erosion and transport of stored sediments generated by historic hydraulic mining continue to affect channel morphology and aquatic habitat, and that channel adjustment and sediment release is likely to continue for some time to come (James 1999, 2005).

Road-related increases in runoff and poor road drainage, which result in road surface erosion, compromised stream crossings and increased fine sediment input to streams are evident on both Federal and private timberlands in the area, but are more concentrated on the heavily managed private lands. Road density is significantly higher on private lands (Table 3-42).

Table 3-42. Road mileage and density by land ownership in the CWE analysis area.

Ownership	Acres	Square Miles	Percent of Analysis Area	Road Miles	Miles/ Square Mile
Federal	43,650	68.2	75%	247	3.6
Private	14,430	22.6	25%	150	6.6

The Sugarberry watersheds experienced approximately 200 percent of normal precipitation and runoff during winter of 2005–2006 (CDWR 2006). Many drainages experienced high peak flows during the late December-early January flood event and during the spring snowmelt period, and numerous stream crossings were eroded and mass movements were initiated in landslide-prone areas. Crossings and road segments in the analysis area that failed and have been repaired under the Emergency Relief for Federally Owned Roads program include those on East Branch Rabbit Creek, Clarks Ravine, and the landslide on the Scales road (20N35). These failures in combination with sediment delivery from other engineered and natural sources delivered a pulse of sediment to the Slate Creek channel network in excess of background average sedimentation rates, and a geomorphic signature of this event will probably be detectable in the system for a number of years. The previous high-flow event in the area was the flood of January 1, 1997, which had an estimated recurrence interval between 64 and 82 years at Goodyears Bar on the North Yuba River, just downstream of the analysis area (Hunrichs et al. 1998). Sediment, channel adjustments and floated debris from this event are evident in channels in the analysis area as of summer 2006.

Most of the stream reaches observed in the analysis area that are not experiencing legacy mining impacts are in stable condition and have largely recovered from past cumulative effects, although a lack of large woody debris, both present in the channel and available for recruitment, is noticeable throughout the subwatersheds. Exceptions were noted in the Valley Creek subwatershed, where a relict riparian and lower hillslope old-growth mixed-conifer stand is preserved in the Valley Creek Special Interest Area, providing abundant recruitment of large woody stems that exceed in size and number the general availability throughout the remainder of the subwatersheds; and in Gold Run Creek, where bank erosion associated with the channel diversion at the Gold Run dam has toppled numerous tree trunks into the channel, creating debris jams.

Measure 2 – Fungicides and Water Quality. It is presently unknown if the fungicide (Sporax®) proposed for use in portions of the Sugarberry Project area has recently been applied on private timberlands within the analysis area. No recent use of the product has occurred on National Forest System lands in the area. Based on the low risk and minimal likely aqueous concentrations resulting from application of this product, as described in “Section 3.9.4: Environmental Consequences” below, it is assumed that, even if the product has been used on adjacent private timberlands, there is a negligible likelihood of detectable presence of Sporax® or related degradates within the project area, and no contribution of legacy or proximal use to cumulative effects on water quality or beneficial uses.

3.9.4 Environmental Consequences

3.9.4.1 Alternative A (No Action)

Direct Effects on Measure 1 – CWE Analysis. Under the no-action alternative, DFPZ treatments, ITS, group selection, transportation improvements (road reconstruction, closure, decommissioning, and restoration), wildlife restoration, and watershed restoration would not occur; hence, there would be no direct effects on the channel network from the Sugarberry Project.

Vegetation density and accumulation of fuels would continue to increase under Alternative A. Absent the proposed vegetation management, the potential for stand-replacing fire and associated effects on near-stream sensitive areas would remain similar or increase compared to the existing condition. While burn severity and the effects of wildfire disturbance are often limited in near-stream sensitive areas compared to upland areas, the effects of fire adjacent to channels would adversely affect the integrity of proper stream function and condition. Channel degradation, erosion and sedimentation, and resulting effects on stream and riparian habitats and water quality would likely increase following a stand-replacing fire (Neary et al. 2005).

Under the no-action alternative, beneficial changes in stream and meadow conditions from proposed transportation improvements, aspen stand enhancement and watershed restoration would not occur. Sediment would continue to be deposited directly into affected water bodies and riparian areas, and channel and meadow surface conditions would continue to deteriorate. Fish barriers would remain and would continue to obstruct potential aquatic habitat (see “Section 3.9.3: Existing Condition” above).

Indirect and Cumulative Effects on Measure 1 – CWE Analysis. Under the no-action alternative, DFPZ treatments, group selection, ITS, transportation improvements, wildlife habitat enhancement and watershed restoration would not occur, and there would be no project-related increase in ERA values or in the risk of CWE. However, vegetation density and accumulation of fuels would persist, and the potential for stand-replacing fire and its effects on upland watershed areas and near-stream sensitive areas would increase compared to the existing condition. As described in the Sugarberry “Fire and Fuels Report,” portions of the project analysis area are at high risk of severe wildfire. ERA values following a stand-replacing fire in any subwatershed would greatly exceed the TOC and greatly exceed increases in ERA values associated with implementation of proposed treatment activities under the action alternatives. Following a severe wildfire, proper stream function and condition of streams and the quantity and quality of aquatic habitat might remain compromised for decades to centuries (Neary et al. 2005).

Opportunities to improve upland watershed condition by enhancing large woody debris content would not be realized under the no-action alternative. Proposed treatment units where large woody debris components do not meet Region 5 recommended thresholds are present within the proposed treatment area for the Sugarberry Project. The condition of this soil quality indicator could be improved, thereby enhancing the available organic matter in the units, by the application of mitigations and vegetation management methods proposed under the Sugarberry Project. Continued management of timber stands as part of the Sugarberry Project would accelerate the diameter and height growth of residual trees, provide periodic inputs of woody debris under the contractual provisions, and provide for future opportunities for recruitment of snags and down woody material (for details, see "Section 3.10: Soils" of this DEIS and the Sugarberry "Soils Report").

Group selection and ITS treatments are designed to promote the HFQLG Act desired condition of uneven-aged (all-age), fire-resilient, multistoried stands, while maintaining a healthy forest. These treatments would provide seral stage diversity by adding patches of the youngest seral stages to portions of larger CWHR Size Class 4 and 5 stands. Under the no-action alternative, these stand structure improvements would not occur. In the long term, possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements would not occur. Possible short-term increases in runoff and erosion related to these treatments would also not occur.

Under the no-action alternative, beneficial changes in stream and meadow conditions from proposed transportation improvements and watershed restoration would not occur. Sediment originating from upland erosion sources would continue to deposit into affected water bodies and riparian areas, and channel and meadow surface conditions would continue to deteriorate. Fish barriers would remain and the total available potential aquatic habitat would remain restricted (see "Section 3.9.3: Existing Condition" above).

Direct, Indirect, and Cumulative Effects on Measure 2 – Fungicides and Water Quality. Under Alternative A, the proposed Sugarberry Project would not be implemented. Hence, there would be no fungicide treatments. Thus, no environmental effects associated with the application of herbicides would occur, including any that might affect water quality or be transmitted through the hydrologic system.

3.9.4.2 Alternative B (Proposed Action)

Direct Effects on Measure 1 – CWE Analysis. The proposed action has potential to directly affect hydrologic function during implementation of prescribed vegetation management activities, transportation improvements, aspen stand enhancement, and wildlife habitat and watershed restoration projects. Providing adequate protection buffers to all streams, as well as implementation of effective nonpoint source conservation measures (BMPs), would provide protection from direct effects to streams in the proposed treatment units. Implementation of BMPs would greatly reduce any potential of sedimentation of channels within and downstream of proposed treatment units.

Proposed DFPZ treatments include 370 acres of underburning, 375 acres of hand-cutting,/tractor-piling and burning, 30 acres of hand-cutting/hand-piling and burning, 750 acres of mastication, 170 acres of thinning, 80 acres of thinning with underburning, 120 acres of plantation thinning and mastication, 20 acres of aspen thinning, and 100 acres of wildlife habitat improvements (hand-cut/hand-pile burn). RHCAs were previously posted in DFPZ units for the Lower and Upper Slate projects; these demarcations will be refreshed and observed for the Sugarberry Project.

In general, by following the SAT guidelines as required by the HFQLG Act, mechanical treatment would be excluded from RHCAs within the proposed DFPZ treatment units. In two proposed DFPZ treatment units (904 and 905b), limited mechanical treatment (mastication) of RHCAs would be permitted to improve riparian habitat conditions. Channels in the areas of these units where mastication of RHCAs is proposed are ephemeral headwater streams lacking riparian character, with excessive accumulation of small woody debris that contributes to fuel loading and fire risk without enhancing riparian structure or function. Treatments in these areas would be consistent with RMOs, as required by the HFQLG ROD (see the Sugarberry "Hydrology Report").

As noted in "Section 3.9.2: Methodology for Assessing Impacts on Hydrology," SMZ designation for ephemeral channels without annual scour would only be necessary in group selection and ITS harvest units. SMZ demarcations would be posted prior to timber operations; mechanical travel would be excluded except for approved stream crossings. Equipment could reach a maximum of 18 feet into SMZs with the approval of the sale administrator and consultation with hydrologists. Limiting equipment “reach” to a maximum of 18 feet ensures trees along streambanks would not be removed. Group selection and ITS harvest units would be laid out to avoid RHCAs, therefore no direct effects to channels in RHCAs would occur.

Where underburns are proposed, fires could be ignited in RHCAs, but burn plans and prescriptions would be written to assure that burn intensities would remain low enough to retain riparian values. A study of prescribed burning in riparian areas in the Sierra Nevada suggests that effects of underburning to riparian conditions are limited in intensity and duration (Beche et al. 2005). If there is a need to reduce fuel loads conditions prior to underburn treatments, hand treatment would be used.

There is the potential for short-term direct effects (such as increased sedimentation) on hydrologic function from transportation system improvements (reconstruction, decommissioning, and restoration) and watershed restoration activities, especially from in- or near-stream activities like culvert improvement, streambank stabilization, meadow restoration, and fish barrier removal. However, long-term benefits to watershed condition would occur from transportation system improvements that would reduce effects on streams, especially where roads are adjacent to or cross streams. A net reduction in direct effects would occur after the completion of restoration activities. Short-term direct effects to watercourses are possible from temporary road construction. Temporary stream crossings may cross stream banks and channel substrates without modification, or temporary fill may be placed in seasonal channels. In all cases, temporary roads will be closed and restored following project activities. Temporary stream crossings will be restored, and any fill will be removed from the channel and floodplain area so that it is not available for sediment delivery.

There is potential for direct effects on hydrologic function from proposed aspen stand enhancement. Unlike proposed harvest treatments, tree removal would occur in RHCAs. This activity would be designed to conform to RMOs, and to improve the structure and function of the RHCAs. Ground disturbance would be minimized by helicopter yarding. Selection of trees for removal would be made with direct involvement and approval of hydrologists, botanist, and wildlife/aquatics specialist. Trees that are necessary for streambank and riparian area stability would be retained. Potential direct effects include localized erosion and sedimentation as stumps decay and root strength declines, and local increases in water table elevation due to loss of transpiration from the trees that are removed. Long-term benefits could include the development of a more complex riparian ecosystem associated with an increase in aspen stems and greater water availability, and prevention of surface erosion from a combination of high herbaceous cover and woody-stemmed root systems in aspen-dominated ecosystems (Shepperd et al. 2006). Such changes in ecosystem structure and function in response to aspen enhancement may begin become apparent within 3–5 years following treatment (Jones pers. comm.).

Indirect Effects on Measure 1 – CWE Analysis. Under the existing condition, portions of the CWE analysis area are highly disturbed. In order to reduce the potential for the Sugarberry Project to affect water quality and beneficial uses, BMPs and MMMs have been prescribed, and are included in Appendix E of this FEIS and in the Streamside Management Zone Plan in the “Hydrology Report.” The “Hydrology Report” also discusses the criteria for protecting streams from proposed activities in the Sugarberry Project treatment areas and watersheds. These practices would be used to reduce sediment delivery and possible water contamination related to proposed activities or existing conditions. The BMPs and MMMs are site specific to the project area. The potential for sedimentation and stream degradation of the immediate channels and the channels downstream from the project area would be minimal with the implementation of BMPs.

There would be long-term benefits to aquatic ecosystems from reduction of high fuel loads, related to a reduced probability of stand-replacing fires and associated watershed effects. The DFPZ network is designed to reduce the spread of stand-replacing fire and provide zones from which fire fighters may safely defend areas from advancing fires.

Although intensive mechanical treatment would occur during group selection treatments, the proposed group selection units would mostly be situated in upland positions away from channels, and full RHCA and SMZ protection would apply. Consequently, the risk of indirect watershed effects on streams would be low.

The proposed road work or stream channel restoration work could result in short-term negative effects from increased sedimentation to streams. These improvements would, in the long-term, benefit the hydrologic function and condition of the subwatersheds, and aid in restoration of habitat connectivity of stream systems. Road drainage improvement would cause a net reduction in sediment mobilization and delivery. The Sugarberry “Hydrology Report” discusses the strategy that would be used for road decommissioning.

Short-term indirect effects to watercourses are possible from temporary road construction. Temporary stream crossings may cross stream banks and near-stream hillslopes at natural grade, or temporary cut-and-fill slopes may be constructed. In all cases, temporary roads would be closed and restored following project activities. Temporary cut-and-fill slopes would be restored, and any fill would be removed from the streambank and near-stream hillslope area so that it is not available for sediment delivery. Steep road grades would be obliterated and water-barred to recommended waterbar spacing guidelines to prevent runoff and erosion. Proposed temporary road locations were reviewed in the field by the hydrologist.

Aspen stand enhancement treatments could cause indirect effects to hydrologic function. As described above, direct effects could include elevated water tables due to transpiration loss from conifer removal. This would serve to enhance riparian characteristics of near-stream sensitive areas.

Cumulative Effects on Measure 1 – CWE Analysis. The results of the CWE analysis for the proposed action include the sum of all ERA values for the existing condition, reasonable foreseeable future activities, and the proposed action. A summary of the CWE model outputs for the proposed action is presented in the Sugarberry “Hydrology Report.”

The subwatersheds that will approach or exceed the TOC if the proposed action is implemented. The data is summarized below:

- Four subwatersheds would approach TOC and 2 subwatersheds would exceed the TOC under Alternative B.
- Subwatershed 19 exceeds the TOC under the existing condition (165 percent TOC); ERA total increases under Alternative B to 172 percent TOC.
- Subwatershed 11 approaches the TOC under the existing condition (94 percent TOC); ERA would increase to 118 percent TOC under Alternative B to exceed risk threshold.
- Subwatersheds 13 and 35 approach the TOC under the existing condition (83 and 87 percent TOC respectively); ERA would increase to 86 percent TOC for subwatershed 13 and would remain constant for subwatershed 35, both remaining below TOC under Alternative B.
- Subwatersheds 15 and 21 do not approach the TOC under the existing condition (78 and 55 percent TOC respectively); ERA would approach TOC under Alternative B with ERA values increasing to 98 and 81 percent TOC respectively.

Table 3-43. Alternative B: Summary of subwatersheds that approach or exceed the TOC with the proposed action.

Subwatershed Number	Subwatershed Name	Percent of TOC
11	East Branch Rabbit Creek	118
13	Unnamed Tributary S Little Grass Valley Reservoir	86
15	Rabbit Creek	96
19	Deacon Long Ravine	172
21	Clarks Ravine	81
35	Buckeye Creek	87

Subwatershed 35 is almost entirely on private land. It is located in the CWE analysis area and may contribute to off-site cumulative effects; however, there are no treatments proposed within this subwatershed.

Portions of the CWE analysis area are highly disturbed under the existing condition. The ERA model demonstrates that Alternative B has the potential to increase the risk of cumulative effects in portions of the analysis area. In the subwatersheds that exceed the TOC, private timber harvest or legacy mining activities are the primary contributors to the high ERA scores, followed by roads. Among all subwatersheds, the past 25 years of harvest activities on the Plumas National Forest plus the proposed Sugarberry Project activities contribute anywhere from 0 to 70 percent of the total ERA score, with an average contribution of 25 percent. In the subwatersheds that approach or exceed the TOC, past activities on the Plumas National Forest combined with the proposed Sugarberry Project activities contribute between 0 and 36 percent of the total ERA score. In 3 of the 6 subwatersheds that approach or exceed TOC the past and future activities on the Plumas National Forest would contribute in excess of 20 percent to the total ERA score. The largest contribution in these subwatersheds would be in subwatershed 21, where 36 percent of the total ERA would be a result of past activities and future activities on the Plumas National Forest, followed by subwatershed 11 with 23 percent.

Without the past 25 years of Forest Service activities, Subwatershed 11 would be below TOC, but would exceed TOC if the proposed action were implemented. In this subwatershed, the proposed action and past ten years of Forest Service projects contribute 23 percent of the ERA total. As described in "Section: 3.9.1: Regulatory Framework," the Central Valley Regional Water Quality Control Board may require forensic and effectiveness monitoring in this subwatershed, in order to issue a waiver of waste discharge requirements for the Sugarberry Project under Alternative B. Subwatershed 15 approaches TOC with the proposed action (96 percent of TOC). In this subwatershed, the proposed action and past 10 years of Forest Service projects contribute 19 percent of the ERA total.

As described in "Section 3.3: Vegetation, Fire and Fuels" of this FEIS, the DFPZ treatments would be effective if a wildland fire at or below the 90th percentile fire weather conditions were to occur. An effective DFPZ may not entirely eliminate the possibility of high-severity wildfire affecting some subwatersheds, particularly where there is heavy fuel loading on steep canyon slopes. The DFPZ would, however, provide firefighters an opportunity to contain the fire to one or two subwatersheds and prevent it from spreading across larger portions of the landscape. Proposed future projects would similarly treat other portions of the landscape, and over time, the aggregate risk of stand-replacing fires would be further reduced. The potential risk of CWEs from stand-replacing wildfire in the long term would greatly exceed the short-term increased risk of CWEs related to the proposed DFPZ treatments under the Sugarberry Project. For example, in subwatershed 15 (Rabbit

Creek, where the town of La Porte is situated), the proposed action would result in a 23 percent increase in calculated ERA values compared to the existing condition. However, if the entire area of subwatershed 15 were to experience a high-intensity wildfire, the ERA would increase a predicted 98 percent using a conservative estimate of wildfire effects on ERA values.

Group selection and ITS treatments are designed to promote the HFQLG Act desired condition of uneven-aged, multistoried, fire-resilient stands, while maintaining a healthy forest. These treatments would provide seral stage diversity by adding patches of the youngest seral stages to portions of larger CWHR Size Class 4 and 5 stands. These stand structure improvements would occur under Alternative B, and in the long term, benefits to aquatic and riparian systems associated with the fire resiliency of these stands would also occur.

Improvements to the transportation system, streambank stabilization projects, fish barrier removal, and meadow enhancement projects would have long-term benefits for the subwatersheds, especially in the near-stream sensitive areas. Benefits would include reduced road- and bank-related erosion, drainage diversion and sediment deposition to channels; improved function and condition of channels and improved aquatic and riparian habitat, and increased availability of aquatic habitat to mobile species of fish, amphibians, and invertebrates due to restoration of habitat connectivity. Short-term sediment increases may result from these restoration activities. However, the impacts would be mitigated by BMPs and would be offset by the ecological benefits and enhanced beneficial uses that are the intent of these restoration activities.

As described in the discussion on the indirect effects of the proposed action, long-term benefits to riparian habitat and ecosystems would occur if proposed aspen enhancement occurs,. Elevated water tables and temporary increases in bank and channel erosion associated with conifer removal may occur, and slightly increased levels of disturbance may slightly and temporarily increase the risk of cumulative effects in the affected subwatershed (7 - Potosi Creek). The ERA total in this subwatershed is low compared to TOC under the existing condition and Alternative B, so the increased risk of cumulative effects from this activity is also low.

As described in “Section 3.9.3: Affected Environment” most of the subwatersheds have road densities that do not meet the desired condition for minimizing road impacts on aquatic and riparian environments as well as associated terrestrial wildlife. The proposed road decommissioning and natural rehabilitation that would occur under Alternative B would reduce road mileage and road density slightly. (Road decommissioning decisions beyond those proposed under Alternatives B, C and G have been tabled pending the outcome of the Forest Service Travel Management process and OHV route designation.) (See Appendix G of this FEIS for maps of the proposed road changes and “Section 3.7: Transportation System.”) The post-project road densities of the subwatersheds would range from 0.7 to 8.0 miles per square mile, with an average of 4.4 miles per square mile, representing an approximately 2 percent reduction in total road miles.

Potential Cumulative Effects. As described in “Section 3.9.3: Existing Condition” most channels that are not affected by legacy mining activities are in stable condition and have apparently recovered from past cumulative effects. Some channels that do show lingering effects of past mining activities are in subwatersheds that approach or exceed TOC under the existing condition or with the proposed action. These include East Branch Rabbit Creek, Rabbit Creek, Gold Run Creek and Deacon Long Ravine. These streams are at some risk of compounded cumulative effects from contemporary activities added to past disturbance effects. Streams in subwatersheds with concentrated private timber harvest are also possibly at higher risk of new cumulative effects, due to the high ERA values and road densities described in “Section 3.9.3: Existing Condition.”

If CWEs were to occur, effects would be associated with increased channel erosion and chronic sedimentation resulting from increases in runoff and peak flow during high-intensity rain events. Peak flow changes, in particular, may cause increased sedimentation, changes in bed load transport, altered flow regimes, channel incision, undercuts and unstable banks, and channel morphology changes (Reid 1993). If a CWE were to occur from the Sugarberry Project, it would most likely occur within low-gradient, third-order or greater reaches of the channel network and/or at major confluences where sediment has been previously deposited, but has not been stabilized by incorporation into the root systems of streamside vegetation.

Slope instability and active landsliding are present in the analysis area in the inner gorges of Slate Creek and Canyon Creek. These streams would likely not experience measurable peak flow alteration related to proposed activities of the Sugarberry Project. Chronic mass wasting on these inner canyon slopes is accelerated by high flows. However, high-magnitude, low-frequency events such as the 1997 and 2006 floods that trigger landslide toe erosion and increase activity of these deep-seated features are more influenced by the scale of the event than the condition of the landscape. As the return interval of a storm increases, the influence of vegetation losses on peak flows becomes much lower (Rowe et al. 1949). Therefore it is unlikely that loss of vegetation from Sugarberry activities in the upper watershed would influence the rate or frequency of landslide activity in the Slate and Canyon Creek inner gorges. Project-related ground disturbance has been intentionally excluded from these unstable hillslopes, so direct, indirect or cumulative effects of project activities on landslide-prone inner gorges are unlikely.

There are areas of unstable ground associated with legacy mining activities in a number of subwatersheds. These include the eroding pit faces described in “Section 3.9.3: Existing Condition,” and areas of unstable tailings and waste rock in the vicinity of many hydraulic mine sites, including in the Howland Flat, St. Louis and Pioneer Pit areas where group selection and ITS harvest units are located. There is potential to destabilize unconsolidated mine waste by mechanical activity, and potential for delivery to channels where temporary road or skid trails cross streams in these areas.

Where an increased risk of CWEs related to proposed Sugarberry activities has been identified, the risk would be mitigated during project planning, design, and implementation by:

- adoption of unit-by-unit Forest Plan standards and guidelines to protect water quality (RHCAs and SMZs, RMOs, temporary road design and obliteration, etc. See Appendix E for additional site-specific mitigations);
- use of applicable BMPs;
- inventory, funding, and completion of land restoration activities throughout the watershed and;
- scheduling of future harvests to facilitate vegetative recovery.

Protection of headwaters and tributaries to larger watersheds, along with implementation of effective nonpoint source conservation measures (the BMPs), would provide protection for the entire watershed. The implementation of BMPs would ensure minimal delivery of project-related sediment to stream channels. Impacts on water quality in the analysis area could potentially occur from:

- failure to implement BMPs, riparian and wetland standards and guidelines, and other required mitigation;
- extreme water yields resulting from abnormally high-intensity magnitude and duration storm events; and

- removal of vegetative matter and ground cover resulting from wildfire.

Potential Risk of CWEs on Beneficial Uses. As described previously, a number of subwatersheds in the analysis area approach or exceed the TOC. The proposed Sugarberry Project, combined with future foreseeable private land and Forest Service activities would increase the level of disturbance in most subwatersheds. All defined beneficial uses of the South Fork Feather River and the Yuba River could experience some increased risk from water quality degradation due to the combined effects of the Sugarberry Project and other activities on public and private lands in the CWE analysis area.

CWEs result from nonpoint source pollution caused by land disturbance related to timber harvest and other activities. Potential effects are defined in relation to the following categories of state water quality objectives as defined in the Basin Plan (CRWQCB 1998):

- *Sediment*—The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

- *Turbidity*—Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. (Specific allowable increases in turbidity levels are defined as natural turbidity levels measured in nephelometric turbidity units.)

- *Temperature*—The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F above natural receiving water temperature.

- *Pesticides*—(1) No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses; (2) Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial use; (3) Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies; (4) Pesticide concentrations shall not exceed the lowest levels technically and economically achievable; (5) Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

Environmental analysis and proposed mitigations for fungicide use are described below in the section on fungicides and water quality. It is not projected that fungicide application would affect beneficial uses of water in these subwatersheds or any other portion of the analysis area.

If cumulative effects on the subwatersheds were to occur, they could increase sediment, turbidity, and temperature. The beneficial uses at risk if this were to occur include warm and cold freshwater habitat, spawning habitat, wildlife habitat, commercial and sport fishing, and noncontact water recreation. There would likely be minimal or no risk to domestic and municipal water supplies, agricultural uses, hydropower generation, and water contact recreation, although increased sedimentation in Lake Oroville and New Bullards Bar Reservoir would slightly shorten the expected usable lifespan of these reservoirs. The greatest risk would likely be to those uses associated with habitat. The bulk of this risk from CWEs is associated with the existing condition of a disturbed landscape and the future foreseeable disturbance of that landscape from private timber operations and the release of stored legacy mining sediment and chemicals.

As described above, in most subwatersheds, the additional disturbance from the Sugarberry Project proposed activities would contribute only a minor percentage of the total risk of CWEs, and most subwatersheds have low to moderate risk of CWE with or without the proposed action. However, in several subwatersheds, a substantial proportion of the disturbance that would cause them to approach or exceed TOC is related to the proposed action. The application of BMPs and MMMs, including riparian buffers, is designed to reduce the risk that proposed activities under Alternative B could induce CWEs and affect beneficial uses of water. Measures to protect headwater and low-order tributaries would minimize effects to higher-order channels and protect downstream watershed values and beneficial uses. These measures would control sedimentation, and the potential for project-related sediment delivery to the immediate channel and channels downstream would be small, even where the overall state of disturbance of the watershed is high.

General Effects – Measure 2: Fungicides and Water Quality. The proposed fungicide treatment to deter the spread of Heterobasidion annosum (annosus) root disease would be performed by manual application of Sporax® to freshly-cut stump surfaces. Sporax® is the trade name for borax (Na2 B4 O7 •10H2O or sodium tetraborate decahydrate). It is typically applied at a rate of one pound per 50 square feet of stump surface. This is equivalent to one pound of borax on 60 twelve-inch stumps (Sporax label, Wilbur-Ellis Company). Borax as used in forestry is identical to the material sold throughout North America as a household cleaning agent (Dost et al. 1996). Borate salts are rapidly converted to boric acid under conditions typically found in the environment. (The equivalent quantity of elemental boron [B] is used for risk assessment.) At physiologic pH and in most surface waters, exposure of organisms is primarily to boric acid. Risk assessments performed on this product indicate that it is of low toxicity to aquatic organisms, and that concentrations of borax or boric acid in runoff or spill scenarios are generally substantially lower than levels that would cause toxic effects or mortality in most organisms (USDA Forest Service 2006). Rapid dilution as well as the localized area and small quantities proposed for use would assure that no detectable quantities of borax would be present to affect water supplies, or any other beneficial uses of water.

Direct Effects on Measure 2 – Fungicides and Water Quality. Buffer strips for streamside protection are prescribed in BMP 5-12 (Streamside Wet Area Protection During Pesticide Application), which would be observed by not applying Sporax® in RHCAs. Direct effects of Sporax® to aquatic and riparian systems would be prevented by observing RHCAs as no treatment areas. An accidental spill of Sporax® into a small water body is the only scenario that could result in concentrations that approach levels of observable effects to aquatic organisms, and this would be prevented by observing RHCAs and by the implementation of a spill plan (available in the Sugarberry project file). There is considered to be no risk of direct effects to beneficial uses of water from the proposed Sporax® application.

Indirect Effects on Measure 2 – Fungicides and Water Quality. Indirect effects of Sporax® use for DFPZ maintenance under Alternative B would also be prevented by applying BMPs and HFQLG Act standard riparian buffers. Riparian buffers and BMPs would adequately protect all known beneficial uses of water, and water quality objectives would be achieved.

Sporax® is proposed for use in DFPZ thinning and ITS units in the Lexington Hill area (units 7, 33, 905 and 909). Application would occur at an average rate of approximately one pound per acre in unit 909, and at lower rates between one-quarter pound and two-thirds pound per acre in the other units. These ranges of application rates are based on the estimated number of large stumps per acre requiring treatment to prevent annosus spread.

Units 7 and 905 are within 300–600 feet of domestic water supplies for the communities of La Porte and La Porte Pines, respectively. These are shallow groundwater systems that could conceivably be affected by runoff from proposed Sporax® application areas. However, surface runoff and groundwater modeling indicate that concentrations delivered would be undetectable, and that any exposure through consumption of water from these sources would be far below the level of concern for any adverse health effects. Boron is a naturally occurring trace element that occurs at relatively high concentrations in some common agricultural products such as lemons and red cabbage. The EPA exempts agricultural commodities from tolerances for borate levels. Environmental background rates of boron exposure exceed levels that would be experienced from consumption of contaminated water by 125 to 625 times (USDA Forest Service 2006). Additionally, the La Porte water supply is located upslope of unit 7, so there is no plausible surface or groundwater flow path from the proposed Sporax® application area to the well. Therefore there is considered to be no risk of indirect effects to domestic water supplies from the proposed Sporax® application.

As noted above, levels of borates that could be present in runoff water from Sporax® application areas are well below any that could produce observable effects in aquatic organisms. Therefore there is considered to be no risk of indirect effects to aquatic and riparian habitat from the proposed Sporax® application.

Cumulative Effects on Measure 2 – Fungicides and Water Quality. As described in “Section 3.9.3.3: Affected Environment (Existing Conditions)” it is presently unknown if Sporax® has been applied on private timberlands within the analysis area. However, given the low toxicity and low ambient concentrations of Sporax® that could result from the proposed Sporax® application, it is implausible that there could be observable cumulative effects from the proposed action in combination with any other use of Sporax® in the area. Expected quantities of boron added to soil or water via runoff from Sporax® application areas are considerably lower than average background levels in soil and water (USDA Forest Service 2006), therefore there is considered to be no risk of cumulative effects to beneficial uses of water from the proposed Sporax® application.

3.9.4.3 Alternatives C and G

Alternative C was developed in order to reduce the risk of CWE in subwatersheds that approach or exceed the TOC, either in the existing condition or with the proposed action (Alternative B). The focus of the alternative is to reduce the risk of possible CWEs in subwatersheds where either:

1. The Sugarberry proposed action, future foreseeable actions and the past twenty five years of Forest Service activities would cause the subwatershed ERA total to exceed TOC (subwatershed 11); or

2. Under the existing condition, the subwatershed ERA total exceeds TOC, and proposed activities have the potential to cause direct, indirect, or cumulative effects to local or downstream values and beneficial uses (subwatershed 19).

Alternative G was developed in part to increase the amount of road decommissioning in the Sugarberry project, in order to:

- reduce or eliminate resource impacts associated with unnecessary roads, especially hydrologic connectivity and erosion potential, and
- reduce road density to reduce risk of cumulative watershed effects and improve wildlife habitat and migration routes.

Alternative G is identical to Alternative C, except that an additional 6.8 miles of National Forest System roads are proposed for decommissioning. Of the 6.8 miles proposed for road decommissioning, 2.98 miles are egregious and 3.8 miles are dead end spurs with no evidence of use.

Alternatives C and G compared to Alternative B:

- Mechanical treatments for DFPZ implementation would be reduced in subwatershed 11. In subwatershed 11, 125 acres of tractor piling would be hand piled instead in unit 901A.
- Mechanical treatments for group selection would be eliminated in subwatershed 11 and reduced in subwatershed 19. A total of 20 acres of group selection treatments would be dropped, and 3.5 acres of group selection would be yarded by helicopter rather than ground-based logging systems.
- Mechanical treatments for ITS would be eliminated in subwatershed 11 and reduced in subwatershed 19. In subwatershed 11, 5 acres of ITS would be dropped. In subwatershed 19, 13 acres of ITS would be yarded by helicopter rather than ground-based logging systems.
- Temporary road construction would be reduced by 0.7 mile.
- There would be no differences in wildlife habitat restoration and aspen enhancement.
- Alternative G would further reduce risk of CWE’s by decommissioning an additional 6.8 miles of road

Direct Effects on Measure 1 – CWE Analysis.

Mechanical DFPZ Treatment—No mechanical RHCA treatment is proposed in RHCAs in the affected units under Alternative B, so there would be no difference in direct effects between Alternatives B, C and G.

Group Selection—No group selection harvest would occur in RHCAs and SMZs under Alternative B, so there would be no difference in direct effects between Alternatives B, C and G.

Individual Tree Selection—Limited reaching into SMZs would take place under Alternative B, so there would be a slight reduction in possible direct effects associated with Alternatives C and G.

Transportation Improvements—Reduced 0.7 miles of temporary roads under Alternatives C and G would reduce the short-term risk of erosion and sedimentation related to construction activities compared to Alternative B. Any possible detrimental effects to stream channels are predicted to be fully mitigated by the application of BMPs and by road closure and restoration following use.

Wildlife Habitat Restoration and Aspen Enhancements—Since there are no differences in these proposed activities between Alternatives B, C and G, there would also be no difference in direct effects.

Aquatic Habitat Restoration—The 6.8 miles of additional road decommissioning linked to Alternative G is predicted to reduce road-related erosion and sedimentation levels to a greater extent compared to Alternatives B and C.

Indirect Effects on Measure 1 – CWE Analysis.

Mechanical DFPZ Treatment—Because there is a reduction in mechanical activity in upland areas in the affected units between Alternative B and Alternatives C and G, there would be a slight reduction in possible indirect effects between Alternatives B and Alternatives C and G .

Group Selection—Because there is a reduction in the total area of group selection harvest between Alternative B and Alternatives C and G, and a reduction in the area of ground-based yarding, there would be a slight reduction in possible indirect effects associated with Alternatives C and G.

Individual Tree Selection—Because there is a reduction in the total area of ITS harvest between Alternative B and Alternatives C and G, and a reduction in the area of ground-based yarding, there would be a slight to moderate reduction in possible indirect effects linked to Alternatives C and G.

Transportation Improvements—Reduced 0.7 miles of temporary roads under Alternatives C and G would reduce the short-term risk of erosion and sedimentation related to construction activities compared to Alternative B. Any potential indirect impacts to hillslopes and other upland areas that might affect stream channels or beneficial uses of water would be fully mitigated by the application of BMPs and by road closure and restoration following use.

Aquatic Wildlife Habitat Restoration and Aspen Enhancements—Since there are no differences in these proposed activities between Alternatives B, C and G, there would also be no difference in indirect effects.

Aquatic and Wildlife Habitat Restoration—The 6.8 miles of additional road decommissioning linked to Alternative G is predicted to reduce road-related erosion and sedimentation levels to indirectly improve water quality to a greater extent compared to Alternatives B and C.

Cumulative Effects on Measure 1 – CWE Analysis. Table 3-44 compares percent of TOC for those subwatersheds with differences in treatment between Alternatives B, C and G.

Table 3-44. Percent TOC for Sugarberry subwatersheds with differing treatments between Alternative B, C and G.

Subwatershed	Percent of TOC		
	Alternative B	Alternative C	Alternative G
11	118	<100	<100
19	172	170	170

The reduction in area of group selection harvest, ITS harvest and mechanical DFPZ treatment, between Alternative B and Alternatives C and G would decrease the short-term risk of additional cumulative effects. Alternative G would further reduce the potential risk for CWEs, due to the additional 6.8 miles of road decommissioning.

Direct, Indirect, and Cumulative Effects on Measure 2 – Fungicides and Water Quality. Under Alternatives C and G, there would be a slight reduction in the quantity of fungicides applied to reduce the risk of spread of annosus fungi. Some acres where Sporax® application is proposed under Alternative B would not occur under Alternatives C and G. As stated above, no negative environmental effects are anticipated from Sporax® application with the proposed action, therefore, under Alternatives C and G, there are likewise no anticipated direct, indirect or cumulative effects from Sporax® application.

3.9.5 Past, Present, and Reasonably Foreseeable Future Actions

All known future proposals for land-disturbing activities in the CWE analysis area are included in the summation of ERAs for the final cumulative off-site watershed effects assessment. Table 3-45 presents the Plumas National Forest proposed future activities in the Sugarberry CWE analysis area.

Table 3-45. Plumas National Forest future foreseeable actions in the Sugarberry CWE analysis area.

Project	Activity	Acres	Subwatersheds
La Porte Pines Hazardous Fuels Reduction Project	Mastication; Hand cut pile burn	59	15, 16
American House Sanitation Salvage Timber Sale	Salvage harvest; Tractor yarding	79	20, 27
Port Wine CYFA Prescribed Fire Study	Underburn; Hand cut	6	22, 24
South Fork DFPZ Unit 30	Commercial thinning; Underburn; Hand cut pile burn	111	13, 14, 16

The DFPZ treatments for the Sugarberry Project would be connected to other DFPZ projects currently being implemented, including the adjacent Slapjack and South Fork DFPZs.

The Plumas National Forest is currently analyzing the Forest road system and OHV route network in the Travel Management environmental impact statement (EIS) process. At the conclusion of the analysis, it is likely that a number of roads and OHV trails will be proposed for closure and/or decommissioning, including roads and trails in the Sugarberry analysis area. Specific roads and trails to be proposed for closure are not known at the present time.

There are numerous timber harvest plans filed on private lands. A list of all known past, present, and reasonably foreseeable future projects in the CWE analysis area are included in the Sugarberry

"Hydrology Report." Subwatersheds 7, 20, 21, 25, 26, 27, 28, 32, 33, 35, and 39 have proposed future private land activities.

3.9.6 Summary of Cumulative Effects

Measure 1: CWE Analysis. Currently, portions of the CWE analysis area are in a highly disturbed condition. Under the existing condition, 3 subwatersheds (11, 13, and 35) approach the TOC and 1 (19) exceeds the TOC. Subwatersheds 13 and 35 approach the TOC but are almost entirely privately owned. However, activities within these watersheds contribute to possible downstream cumulative effects. The subwatersheds that approach or exceed the TOC do so because: (1) timber harvesting practices on private land; (2) legacy mining activities; and (3) the high-density road network.

Alternative A. Under the no-action alternative, DFPZ treatments, ITS, group selection, transportation improvements (road reconstruction, closure, and decommissioning), wildlife habitat restoration, aspen stand enhancement, and watershed restoration would not occur; consequently there would be no added risk of cumulative effects to watershed conditions from the Sugarberry Project.

Under the no-action alternative, long-term benefits to watershed condition that the proposed action and other action alternatives would provide through vegetation management, including reductions in fuel loads, increased soil cover and organic material in areas deficient in effective soil cover or large woody material; and enhancement of seral-stage diversity, would not occur. Other benefits of the action alternatives that would result from proposed transportation improvements, aspen stand enhancement and watershed restoration, and would promote beneficial changes in stream and meadow conditions would also not occur. Sedimentation in water bodies and riparian areas, degraded channels and meadow surfaces, limited ecosystem diversity, and impaired aquatic habitat connectivity would persist.

Under the no-action alternative, there would be no fungicide application and no environmental effects associated with the application of fungicides would occur.

3.9.6.1 Alternative B (Proposed Action)

In most subwatersheds, the additional disturbance from the Sugarberry Project proposed activities would contribute only a minor percentage of the total risk of CWEs, and most subwatersheds have low to moderate risk of CWE with or without the proposed action. However, in several subwatersheds, a substantial proportion of the disturbance that would cause them to approach or exceed TOC is related to the proposed action.

The ERA model indicates that the proposed action has the potential to increase the risk of off-site CWE in portions of the analysis area. Under Alternative B (the proposed action), 4 subwatersheds (13, 15, 21, and 35) approach and 2 subwatersheds (11 and 19) exceed the TOC. Subwatershed 11 approaches the TOC under the existing condition, and would exceed the TOC under Alternative B. Subwatersheds 15 and 21 do not approach the TOC under the existing condition, but do approach TOC under Alternative B.

For all subwatersheds, the past 25 years of harvest activities on the Plumas National Forest plus the proposed Sugarberry Project activities contribute anywhere from 0 to 70 percent of the total ERA score, with an average contribution of 25 percent. In the subwatersheds that currently approach or exceed the TOC, past activities on the Plumas National Forest combined with the proposed Sugarberry Project activities contribute between 0 and 36 percent of the total ERA score. In three of the six subwatersheds that approach (Rabbit Creek) or exceed (East Branch Rabbit Creek and Deacon Long Ravine) TOC, the past and future activities on the Plumas National Forest would contribute in excess of 20 percent to the total ERA score. The largest contribution in these subwatersheds would be in subwatershed 21, where 36 percent of the total ERA would be a result of past activities and future activities on the Plumas National Forest, followed by subwatershed 11 with 23 percent.

The proposed DFPZ, group selection, and ITS treatments are designed to promote the HFQLG Act desired condition of uneven-aged, multistoried, fire-resilient stands, while maintaining a healthy forest. An effective DFPZ would not entirely eliminate the possibility of high-severity wildfire affecting some watersheds, however, it would provide firefighters an opportunity to contain the fire and prevent it from spreading across larger portions of the landscape. DFPZ projects across the HFQLG Pilot Project region would treat other portions of the landscape, and over time, the aggregate risk of stand-replacing fires would be reduced. The potential risk of CWEs from stand-replacing wildfire in the long term would greatly exceed the short-term increased risk of CWEs related to the proposed DFPZ treatments under the Sugarberry Project. Over time, implementation of these DFPZ, group selection, and ITS treatments across the landscape would provide seral stage diversity by adding patches of the youngest seral stages to portions of larger CWHR Size Class 4 and 5 stands. Under Alternative B these stand structure improvements would occur and in the long term provide possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements. Possible short-term increases in runoff and erosion related to these treatments could also occur.

Transportation system improvements, streambank stabilization projects, fish barrier removal, and aspen stand and meadow enhancement projects would have long-term benefits for the subwatersheds, especially in the near-stream sensitive areas. Benefits would include reduction in road- and bank-related erosion, drainage diversion and sediment deposition to channels; improved function and condition of channels and improved aquatic and riparian habitat; and increased availability of aquatic habitat to species of fish, amphibians, and invertebrates from restoration of habitat connectivity. Short-term sediment increases that could result from these restoration activities would be outweighed by the ecological benefits and enhanced beneficial uses that are their objectives.

If CWEs were to occur, their most likely expression would be increased channel erosion and chronic sedimentation related to increases in runoff and peak flow during high-intensity rain events. In particular, peak flow changes may cause increased sedimentation, changes in bedload transport, altered flow regimes, channel incision, undercuts and unstable banks, and channel morphology changes (Reid 1993). If a CWE were to occur as a result of the Sugarberry Project, it would most likely occur within low-gradient, third-order or greater reaches of the channel network and/or at major confluences.

It is assumed that measures to protect headwater and low-order tributaries, including riparian buffers and implementation of effective nonpoint source conservation measures (BMPs), would minimize effects to higher-order channels and protect downstream watershed values and beneficial uses. These measures would control sedimentation, and the potential for project-related sediment delivery to the immediate channel and channels downstream would be small, even where the overall state of disturbance of the watershed is high.

3.9.7 Alternatives C and G

The reductions in proposed mechanical treatments between Alternatives B and Alternatives C and G would lower the ERA total of subwatershed 11 to TOC or below, and would reduce the ERA total in subwatershed 19. CWE risks for sensitive and unstable sites and downstream resources would be reduced by the proposed changes.

The reduction in area of group selection harvest, ITS harvest and mechanical DFPZ treatment between Alternative B and Alternatives C and G would decrease the short-term risk of additional cumulative effects, but the potential long-term benefits of these treatments would also be reduced. In the long term, possible benefits to aquatic and riparian systems associated with the reduced fire risk from fuels reduction and increased fire resiliency from stand improvements associated with Alternatives C and G would be reduced slightly compared to Alternative B.

3.10 Soils

3.10.1 Introduction

The purpose of the Sugarberry Soil Effects Analysis is to analyze the direct, indirect, and cumulative effects of the Sugarberry Project to long-term soil productivity, hydrologic function, and buffering capacity. The land management activities proposed under this project have the potential to affect the soil resource in a beneficial, indifferent, or adverse manner. Soil productivity is the inherent capacity of a soil to support growth of plants, plant communities, and soil biota (USDA Forest Service 1995). The land management activities proposed under this project have the potential to benefit or adversely effect long-term soil productivity. Soil productivity is determined by measuring soil cover, soil porosity, and soil organic matter (see "Section 3.10.4: Indicators and Measurements"). Soil hydrologic function is the capacity of a soil to intake, retain, and transmit water. Soil buffering capacity is the inherent capacity of soil to absorb, filter, or degrade added chemicals, heavy metals, or organic materials. For more detailed information on direct, indirect, and cumulative effects refer to "Section 3.10.7: Environmental Effects."

3.10.2 Regulatory Framework

3.10.2.1 National Forest Management Act

The National Forest Management Act of 1976 mandates that land management plans be prepared for each National Forest (see Plumas National Forest Land Resource Management Plan below), and that guidelines be specified that will:

> "Insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land." and
>
> "Insure that timber will be harvested from National Forest System lands only where - "(i) soil, slope, or other watershed conditions will not be irreversibly damaged."

3.10.2.2 Plumas National Forest LRMP

The 1988 Plumas Nation Forest LRMP (referred to as the "Forest Plan") specifies standards and guidelines for the maintenance and improvement of soil resources on page 4-44 (USDA 1988). A summary of these standards and guidelines is provided below, for more information see the Sugarberry "Soils Report" on file in the project record.

1. Prevent significant or permanent impairment of soil productivity.

   A. During project activities, minimize excessive loss of organic matter and limit soil disturbance according to the Erosion Hazard Rating (EHR) as follows: (a) EHR 4-8: Conduct normal activities; (b) EHR 9-10: Minimize or modify use of soil-disturbing activities; and (c) EHR 11-13: Severely limit soil-disturbing activities.

B. Determine adequate ground cover for disturbed sites outside of SMZs during project planning on a case-by-case basis, based on specialist evaluation, using the following as a guide: (a) Low EHR (4-5): 40 percent minimum effective ground cover; (b) Moderate EHR (6-8): 50 percent minimum effective ground cover; (c) High EHR (9-10): 60 percent minimum effective ground cover; and (d) Very high EHR (11-13): 70 percent minimum effective ground cover.

C. To avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Measurement will be along the travel way and shall not include width of cut and fill slopes.

3.10.3 Management Direction

3.10.3.1 National Soil Management Handbook FSH 2509.18-91-1 (USDA Forest Service 1991)

The Soil Management Handbook (USDA Forest Service 1991) is a national soils handbook which defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in forest planning. The handbook also contains the definitions of terms which are used in the Sugarberry “Soils Report” on file in the project record.

3.10.3.2 Region 5 Soil Management Handbook FSH 2509.18-95-1 (USDA Forest Service 1995)

The Forest Service Region 5 Soil Management Handbook establishes regional soil quality analysis guidelines and provides threshold values that indicate when changes in soil properties and soil conditions would likely result in a significant change or impairment of the soil productivity potential, hydrologic function, or buffering capacity of the soil. When these threshold values are exceeded the result is considered detrimental soil disturbance. The handbook states that the extent of detrimental soil disturbance that affects soil productivity, shall not be of a size or pattern that would result in a significant change in production potential for the activity area. The Region 5 soil quality analysis guidelines apply only to those areas dedicated to growing vegetation. They are not applied to other dedicated uses, such as system roads and developed campgrounds.

The following is a summary list that includes soil properties, conditions, and associated threshold values to avoid detrimental soil disturbance and to evaluate management effects on soil productivity, soil hydrologic function, and soil buffering capacity. For more information refer to the Sugarberry “Soils Report” on file in the project record.

2. Soil porosity should be at least 90 percent of total porosity found under natural conditions. A 10 percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction.

3. Organic matter is maintained in amounts sufficient to prevent significant short- or long-term nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. Prescribe surface organic matter in amounts that would not elevate wildfire risk or severity to the point that desired organic matter for nutrient cycling cannot be achieved or maintained because of increased wildfire risk potential. If there is no viable alternative for providing surface organic matter without elevating wildfire risk, prescribe an amount that does not significantly increase wildfire risk and monitor soil nutrient status. Apply mitigation measures if decreased nutrient supply has the potential to affect

ecosystem health, diversity or productivity. The prescribed amount shall not reduce the amount needed for soil cover to prevent accelerated erosion. Use the kinds and amounts of organic matter identified below.

A. Surface organic matter is present in the following forms and amounts:

a) Fine organic matter occurs over at least 50 percent of the area. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter. Use the presence of living vegetation that could contribute significant annual litter fall to compensate for conditions when immediate post-disturbance fine organic matter coverage is too thin or less than 50 percent. The preference is for fine organic matter to be undisturbed, but if disturbed, the quantity and quality should avoid detrimental short- and long-term nutrient cycle deficits.

b) Large woody material is at least 5 well distributed logs per acre representing the range of decomposition classes defined in the Soil Management Handbook. Desired logs are at least 20 inches in diameter and 10 feet long. Protect logs in decomposition classes 3 through 5 from mechanical disturbance. Do not count logs less than 12 inches in diameter or stumps as large woody material. The amount of large woody material that is recommended should consider the potential for the ecological type in the project area to generate large woody material and also the fuel management objectives for the area.

c) Large woody material and fine organic matter amounts (except when needed for essential erosion control) may be reduced to meet fuel management objectives in strategic fuel treatment areas, on fuel breaks, and in other critical areas. Evaluate or monitor soil nutrient status in fuel treatment areas and other areas that lack sufficient large woody material and fine organic matter.

4. Soil Hydrologic Function – Avoid accelerated surface runoff, infiltration and permeability reduction of ratings to 6 or 8 as defined in the Region 5 EHR system.

5. Soil Buffering Capacity – Materials added to the soil must not alter soil reaction class, buffering or exchange capacities, or microorganism populations to the degree that significantly affects soil productivity, bioremediation potential, soil hydrologic function, or the health of humans or animals.

Region 5 also recommends standard operating procedures (B and C clauses) to mitigate for detrimental soil disturbance. Detailed descriptions of all recommended B and C clauses that would be used during the implementation of the Sugarberry Project are included in Appendix E of this report.

3.10.4 Indicators and Measurements

The soil effects analysis is based on the soil quality analysis guidelines as described in the Region 5 Soils Management Handbook (see "Section 3.10.3: Management Direction"). Indicators analyzed include soil productivity, soil hydrologic function, and soil buffering capacity.

3.10.4.1 Indicator 1: Soil Productivity

Soil Productivity is the inherent capacity of a soil to support growth of plants, plant communities, and soil biota (USDA Forest Service 1995). Important measures of soil productivity include: soil cover, soil porosity, and organic matter.

Measure 1: Effective Soil Cover. Effective soil cover consists of low-growing vegetation (grasses, forbs and prostrate shrubs), plant and tree litter (fine organic matter), surface rock fragments, and may also include applied mulches (straw or chips) (USDA Forest Service 1995). Vegetative cover serves several purposes in the mitigation of accelerated soil erosion by dissipating the energy of falling raindrops through interception (California Soil Survey Committee 1989). Without vegetative cover, an intense storm can generate large quantities of sediment from hillslopes (Cawley 1990). The litter layer absorbs water, increases storage capacity, and slows the velocity of overland flow. At higher velocities of overland flow, falling rain causes rain splash which detaches and mobilizes soil particles and overland flow occurs as sheet-wash. Effective soil cover was measured in field surveys, and the EHR system was used to quantify the kind, amount, and allowable disturbance of soil cover necessary to prevent detrimental accelerated soil erosion as defined by the Forest Plan (see the "Analysis Methods" section).

Measure 2: Soil Porosity. Soil porosity is the volume of pores in a soil that can be occupied by air, gas, or water and varies depending on the size and distribution of the particles and their arrangement with respect to each other. A 10 percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction (USDA Forest Service 1995). Detrimental soil compaction was determined in field surveys at a depth of 4 to 8 inches (see the "Analysis Methods" section). The use of heavy forestry equipment and frequent stand entries increases bulk density and decreases the porosity of soils, which increases the potential for detrimental compaction (Powers 1999). The degree and extent of susceptibility to compaction is primarily influenced by soil texture, soil moisture, depth of surface organic matter, ground pressure weight of the equipment, and whether the load is applied in a static or dynamic fashion. The potential or possible effects of compaction on tree growth are well documented (Poff 1996). Effects of soil compaction can cause increased soil strength, slowed plant growth, impeded root development, poor water infiltration, restricted percolation, increased overland flow during high precipitation events, and cause plant nutrients to be relatively immobile.

Measure 3: Soil Organic Matter. Soil organic matter consists of living biomass (plant roots, microorganisms, invertebrates, and vertebrate fauna) and dead biomass (dead bark, large woody debris, litter, duff, and humus materials). Soil organic matter is the primary source of plant-available nitrogen, phosphorous, and sulfur, provides habitat for the diverse soil biota that carry out energy transformation and nutrient cycles, contributes to soil structure and porosity of soils, protects soils from erosion, and enhances infiltration and hydrologic function (Neary et. al. 2005). The Region 5 Soil Management Handbook provides recommended measures and thresholds for maintaining soil organic matter in the amounts sufficient to prevent significant short- or long-term nutrient cycle deficits and to avoid detrimental physical and biological soil conditions (see the "Management

Direction" section). Measures include fine organic matter and large woody material. Fine organic material includes plant litter, duff, and woody material less than 3 inches in diameter. Large woody material consists of down logs that are least 20 inches in diameter and 10 feet long. Fine organic matter and large woody material was collected during the Sugarberry Forest Inventory and Analysis and soil field surveys.

3.10.4.2 Indicator 2: Soil Hydrologic Function

Soil hydrologic functions is defined as the inherent capacity of a soil type to intake, retain, and transmit water and is influenced by infiltration and permeability (USDA Forest Service 1995). Infiltration is the rate of water movement into the soil and is determined by soil texture and soil porosity (USDA Forest Service 1990). Permeability is the rate at which water percolates or moves down through the soil and is primarily based on soil porosity (USDA Forest Service 1990). The Plumas National Forest Soil Resource Inventory (USDA Forest Service 1988) included an estimation of infiltration and permeability for each soil map unit and this information is included in Appendix B of this report. Infiltration rates are grouped according to the intake of water when soils are thoroughly wet and receive precipitation from long duration storms and are described as high (low runoff potential), moderate, slow, and very slow (high runoff potential). Permeability is measured as the number of inches per hour that water moves downward through saturated soil and is described as: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid. The EHR system was used to estimate soil hydrologic function.

3.10.4.3 Indicator 3: Soil Buffering Capacity

Soil buffering capacity is the inherent capacity of soil to absorb, filter, or degrade added chemicals, heavy metals, or organic materials (USDA Forest Service 1995).

3.10.5 Analysis Methods

3.10.5.1 Geographic Scope of the Soil Effects Analysis

The scope of the analysis for direct, indirect, and cumulative effects for all proposed activities is limited to the proposed treatment units. Changes to soil productivity do not occur outside of the proposed treatment units. Refer to the "Sugarberry Project Map" on file in the project record for proposed treatment unit locations.

3.10.5.2 Time Frame of the Soil Effects Analysis

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

3.10.5.3 Field Data Collection

A representative sample of proposed treatment units were surveyed in fall 2005 and summer of 2006. The sampling strategy took into account the level and similarity of known past management activities, soil map unit occurrence and soil type, slope configuration, and the level of soil disturbance expected from the proposed management activity. Non-surveyed proposed treatment units are expected to have similar existing conditions and project effects in surveyed proposed treatment units A correlation between surveyed and non-surveyed proposed treatment units is located in Table 5 of the Sugarberry "Soils Report" on file in the project record, ("Existing Condition" section). There are a few non-surveyed proposed treatment units where existing condition is unknown, because a comparison cannot be made to surveyed proposed treatment units as a result of different known past management activities or soil types (see below). The following criteria were utilized to stratify which proposed treatment units have similar existing conditions.

Level of Ground Disturbance Created by the Sugarberry Project. Surveys were conducted on high priority proposed treatment units. High priority proposed treatment units included thinning, group selection, and ITS treatments areas with ground-based mechanical equipment operations. These types of treatments have the potential to adversely affect long-term soil productivity. For group selection treatment areas, the silviculturalist determined the maximum area available for group selection treatments. Within this larger area multiple 1–2 acres plots could be treated for group selections. The maximum area available for group selection was analyzed for the maximum area that could potentially have disturbance to soil indicators, meaning expected effects assume a maximum area disturbed. The treatment units proposed for skyline or helicopter (including group selection treatments and aspen restoration) were not surveyed. Skyline and helicopter were selected for this method of treatment due to the steep slopes. Skyline and helicopter treatments do not employ mechanical ground-based equipment; because of this, soil cover would not be removed, and there would not be additional detrimental soil compaction. Therefore, they were not included in the calculations for the cumulative effects analysis.

Hand cut and pile burn and underburning was a selected treatment method in area of steep slopes, treatment units that are mostly composed of RHCAs (RHCAs are stream buffers used to protect streams during land management activities), and areas of black oak restoration. Typically these areas do not have known past management activities in the last 25 years and there is thick duff and litter layer (soil cover) and high fuel loading conditions. Under the existing condition proposed underburning treatments exceed the Forest Plan standards and guides for effective soil cover (see "Section 3.10.6: Existing Condition"). Observations of past projects (BMP monitoring of the Brush Creek DFPZ) that used prescribed burning on areas with similar fuel types and fuel loading conditions have not resulted in a loss of soil cover below Forest Plan standards and guidelines. This was due to an existing condition having a thick duff and litter layer that does not burn all the way to the topsoil and needle cast following the burn. Due to the similar fuel types and fuel loading conditions between the Brush Creek and Sugarberry Projects it is expected that the post-project conditions in Sugarberry Project would exceed "Forest Plan" standards and guides for soil cover. Therefore, they were not included in the calculations for the cumulative effects analysis, but discussion of possible cumulative effects to soil productivity is included in this report (see "Section 3.10.7: Environmental Effects").

Areas of road reconstruction or new road construction were not analyzed for effects to soil indicators. Forest Service system roads are designated by the Forest Plan as areas unsuitable for timber growth and are not include as part of a timber stand. Proposed road decommissioning and restoration activities were considered a long-term improvement to soil productivity and are discussed in this report (see "Section 3.10.7: Environmental Effects").

Known Past Land Management Activities. Surveys were conducted in proposed treatment units with known and unknown past land management activities. An emphasis was placed on proposed treatment areas with known past land management activities that had the potential to cause detrimental soil compaction or soil erosion and displacement (areas with the use of ground based mechanical equipment). Known past land management activity information was based on information gathered for the hydrology cumulative off-site watershed effects assessment (for more information see “Section 3.9: Hydrology”). Information for the proposed treatment units was gathered for the past 25 years, but the existing condition of the soils could be a result of activities dating back further in time.

Surveyed proposed treatment units were compared to non-surveyed proposed treatment units with similar past land management activities, occurring during the same year, within similar soil map units (even though soil moisture conditions are unknown at the time of activity). Ten of the non-surveyed proposed treatment units have an unknown existing condition, because this comparison could not be accomplished. Table 3-46 includes the expected cumulative effects of these proposed treatment units.

Table 3-46. Proposed treatment units with an unknown existing condition due to past land management activities differing from past land management activities surveyed.

Proposed Treatment Unit Number	Proposed Treatment Alternative B	Proposed Treatment Alternatives C & G
11P, 12P1, and 903	Hand cut and Pile Burn – No cumulative effects.	Same as Alternative B
608, 649, 900, and 910	Group selection skyline – No cumulative effects.	Same as Alternative B
911	Mastication – increases soil cover and organic matter, and does not cumulatively effects soil compaction (see “Section 3.10.7: Environmental Effects”).	Same as Alterative B
912	Underburn and group selection tractor and cable. Tractor methods will mostly likely decrease soil cover and organic matter and increase soil compaction. However it is expected that soil cover would exceed standards and guides and that increases in soil compaction would not effect biomass production in this unit (see “Section 3.10.7: Environmental Effects”).	Same as Alterative B
913	Underburn – No cumulative effects.	Same as Alterative B

Surveyed proposed treatment units that did not have recorded past land management activities typically containing legacy skid trails, landings, or temporary roads. This suggests there were past land management activities greater than 25 years within the soils effects analysis area. It is likely that past land management practices occurred within all proposed treatment units.

Known Soils Types. Surveys were conducted within the majority of known soil map units and soil types contained within the proposed treatment units. Based on a GIS analysis, there are forty-five soil map units identified within the soil effects analysis area (see “Section 3.10.6: Existing Condition”). An emphasis was placed on soil types that are more susceptible to detrimental compaction and surface erosion due to loss of soil cover from past and future land management activities. This information was based on soil map units identified in the Plumas National Forest Soil Resource Inventory (USDA Forest Service 1989), which is an Order 3 soil survey. These general soil map units do not delineate the exact location of each soil type. The map units usually consist of a group of soils that occupy particular portions of the landscape. A soil map unit is an association or complex of soil components and does not necessarily consist of similar soils. They consist of geographically associated soils that may be, and usually are, different in their characteristics and their suitability for use and management. Soil textures were determined in proposed treatment units surveyed to aid in soil type detection and interpreting expected effects.

Proposed treatment units 510 and 647 were not surveyed and contain soil map units that do not correlate with proposed treatment units surveyed. In these treatment units the existing condition is unknown; however, these proposed treatments are expected to have no cumulative effects as a result of helicopter logging operations.

Geographic and Topographic Location. Proposed treatments that had the same past land management activity, occurring during the same year, with the same or similar soil map unit, and similar topographic location are expected to have similar existing conditions and project effects. Even though soil moisture conditions are unknown at the time of the past treatments, the same treatment prescription was applied in the same year on the proposed treatment units that were determined to have similar past management activity effects on a particular soil map unit.

Proposed treatment units that were surveyed with the similarities mentioned above do have similar existing conditions (see “Section 3.10.6: Existing Condition”). The proposed treatments that were not surveyed were adjacent to surveyed proposed treatment units on similar topography. The non-surveyed units were briefly examined in the field and appeared to have similar characteristics to the surveyed units.

Field Surveys. Data collection included point sampling in proposed treatment units along systematic randomized transects, which were designed to sample the geographic and topographic extent and variation of those proposed treatment units. Transects were randomly located using a topographic map and modified in the field to ensure collection of the necessary information. Transect length, number of sample points, distance between sample points, and number of transects required for adequate sample size were determined using the topographic map scale. The data was collected systematically along each transect. The number of sample points along each transect varied between 20 to 40 sample points, depending on the unit size and variation in soil type and topography. Information on slope, soil texture, detrimental soil compaction, soil cover, soil disturbance, and large woody debris was recorded at each sample point. For detailed information of data collected at each sample point refer to the Sugarberry “Soils Report” on file in the project record.

3.10.5.4 EHR

EHR is a risk assessment of specific soil factors that induce accelerated erosion (USDA Forest Service 1990) and was determined for each proposed treatment unit surveyed. The purpose of the EHR is to: (1) evaluate the likelihood of accelerated sheet and rill erosion from a specific soil disturbing activity, (2) evaluate the risk for adverse consequences, and (3) identify approximate soil cover amounts need to achieve an acceptable risk. EHR was computed using the California Soil Survey Committee EHR Computation Form (California Soil Survey Committee 1989). The form is based on the following components: soil erodibility factors, runoff production factors, runoff energy factor, and soil cover factors. For more information on EHR refer to the Sugarberry “Soils Report” on file in the project record. EHR Risk Ratings are based on Table 3-47.

Table 3-47. EHR risk rating.

Numerical Value	Risk Rating
<4	Low
4–12	Moderate
13–29	High
>30	Very High

3.10.5.5 Sporax Risk Assessment

To prevent the spread of *Heterobasidion annosum* (annosus) root disease, the use of sodium tetraborate decahydrate (a fungicide treatment) is proposed under the Sugarberry Project. Sodium tetraborate decahydrate, also know as borax, is the active ingredient and sole constituent in Sporax®. Sporax® is not applied as a liquid using backpack, broadcast or aerial spray methods and it is not applied directly to vegetation (USDA Forest Service 2006). Sporax® is applied to freshly-cut stump surfaces and is typically applied at a rate of 1 pound per 50 square feet of stump surface. This is equivalent to one pound of borax on 60 twelve-inch stumps (Sporax label, Wilbur-Ellis Company).

It is presently unknown if the fungicide Sporax® has recently been applied on private land within the Sugarberry soil effects analysis area. No recent use of the product has occurred on National Forest System lands in the area. Boron is the agent of toxicological concern from Sporax® and occurs naturally in soil (USDA Forest Service 2006). The use of Sporax® in the control of annosum root disease does not present a significant environmental risk under most conditions of normal use, even under the highest application rate. Given the highly focused application method for Sporax®, application of granular product to cut tree stump surfaces, exposures considered for environmental risk assessments are limited to those which are expected to result in significant exposure due to spill or by runoff. According to the SERA risk assessment (USDA Forest Service 2006) the effects of Sporax® to soil microorganisms essential for formation of soil organic matter have not been characterized, and there is a risk of environmental exposures effecting nontarget microorganism. However, given the atypical application method for Sporax®, widespread exposures are not likely and the risk of effects to soil indicators is minimal.

Based on the low risk from the application of this product, as described above, it is assumed that, even if the product has been used on adjacent private lands, there is a negligible likelihood of effects from Sporax® or related degradates to all soil indicators as a result of the proposed Sugarberry Project. Therefore cumulative effects of Sporax® to soil indicators were not included in "Section 3.10.7: Environmental Effects."

3.10.6 Existing Condition

3.10.6.1 Soil Types and Soil Map Units

The Plumas National Forest Soil Survey was utilized to determine which soil map units occur in the soil effects analysis area. A GIS analysis summary was performed with the soil effects analysis area to calculate acres and percent of each soil map unit. A detailed description of each soil map unit is contained in the Sugarberry "Soils Report" on file in the project record.

The Holland family (soil map units 198, 199, and 200), basic is within 12 percent of the soil effects analysis. This soil type is one of the most productive soils and one of the most unstable soils on the Plumas National Forest. The Holland family soils are prone to mass instability on steep slopes and are highly susceptible to detrimental compaction when the soil moisture content is near field capacity. Other soil map units within the soil effects analysis area that contain Holland family soils include: soil map unit 130, Clallam Holland families complex (less than 1 percent); soil map unit 169, Forebes Holland families complex (4 percent); and soil map units 208, 209, and 210, Holland Clallam families complex (10 percent).

The Hurlbut family (soil map units 211 and 212) is located within twelve percent of the project area. For this soil group, soil cover maintenance is essential due to the erosive nature of these soils.

Twelve percent of the analysis area is composed of the Waca Woodseye families complex (soil map units 293, 294, 295, and 296). This soil map unit is prone to erosion in areas without effective soil cover and commonly has mass instability on slopes greater than 50 percent.

Six percent of the analysis area is composed of the Smokey family (soil map units 265 and 266). In this soil, family mass instability occurs in roaded areas and on slopes greater than 50 percent. Other soil map units within the soil effects analysis area that contain the Smokey family soils include: the Uvi Smokey families complex, soil map unit 286 (8 percent), and soil map unit 287 (5 percent). Soils in the Uvi Smokey families complex are prone to surface erosion in areas without effective soil cover.

Another 6 percent of the analysis area contains the Gibsonville Waca families complex (soil map units 179, 180, and 181). This soil family is highly susceptible to erosion in areas without effective soil cover.

Four percent of the analysis area is composed of the Aiken family (soil map units 101 and 102) and this soil type is highly susceptible to detrimental compaction when the soil moisture content is near field capacity.

Other minor occurrences (<1 percent) within the soil effects analysis area include the Deadwood family, Dubakella family, Josephine family, Kistrin family, Mariposa family, Toiyabe family, and Portola family. All of these soil types are prone to surface soil erosion when there is lack of effective ground cover.

3.10.6.2 Existing Condition of Indicator 1: Soil Productivity

The Sugarberry “Soils Report” contains a table explaining the correlation between surveyed and non-surveyed proposed treatment units based on criteria explained in “Section 3.10.5: Analysis Methods.” This section provides a summary of the existing condition.

Existing Condition – Measure 1: Soil Cover. Percent of effective soil cover was measured through field surveys and the EHR system is used to determine the kind, amount, and disturbance of soil cover necessary to avoid detrimental accelerated soil erosion (USDA Forest Service 1995). Standards and guides for effective soil cover are listed on page 4-44 of the Forest Plan (see “Section 3.10.2: Regulatory Framework”). The Sugarberry “Soils Report” contains a table displaying the existing condition of effective soil cover and the calculated EHR for proposed treatment units. Under the existing condition all of the proposed treatment units have an EHR rating with a numerical value below 8. According to the Forest Plan standards and guides, the Plumas National Forest can conduct normal activities during this project. Under the existing condition all of the proposed treatment units meet or exceed Forest Plan standards and guides for percent effective soil cover.

Under the existing condition all of the proposed treatment units have an EHR rating with a numerical value below 8. According to the Forest Plan standards and guides, the Plumas National Forest can conduct normal project activities.

Existing Condition – Measure 2: Soil Porosity. Detrimental soil compaction was determined at each sample point along transects. Sugarberry “Soils Report” contains a table displaying the existing condition of detrimental soil compaction determined in proposed treatment units. Detrimental compaction was not measured in 49 percent (27 out of 55) of the proposed treatments surveyed. The majority of the Sugarberry Project area incurred past land management activities. Landings, skid trails, and temporary roads are still visible on the landscape today. Most areas with previous disturbance were not found to be detrimentally compacted for the following reasons: low risk soil type (soil types that do not compact due to a low clay content or high rock fragment content occurs throughout the project area); operations probably occurred during dry soil periods; have had sufficient time since the last disturbance to naturally recover; or have been subsoiled to reduce impacts from detrimental compaction. However, based on data collection, there are areas within proposed treatment units that remain detrimentally. Within proposed treatment units, detrimental compaction ranges from 4 to 20 percent. In some cases, recovery has not occurred, due to recreational ground disturbing uses such as camping on landings or OHV traffic (all-terrain and four-wheel drive vehicles, etc.) along skid trails and temporary roads.

Standards and guides on page 4-44 of the Forest Plan state “to avoid land base productivity loss due to soil compaction; dedicate no more than 15 percent of timber stands to landings and permanent skid trails.” The Feather River Ranger District has not dedicated landings and permanent skid trails during past timber harvesting projects. The Forest Plan does not establish a threshold standard for detrimental soil compaction (compaction of soil at a depth of 4 to 8 inches). The Region 5 Soil Management Handbook defines a 10 percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction (USDA Forest Service 1995). This analysis threshold is for site specific measurements and does define a threshold for detrimental compaction of activity areas.

Existing Condition – Measure 3: Soil Organic Matter. Percent of fine organic matter and the amount of large woody debris per acre was calculated based on measurements from field surveys, and a table displaying the existing condition of soil organic matter is included in the Sugarberry “Soils Report.” The Region 5 Soil Management Handbook lists recommended thresholds for fine organic matter and large woody debris (see “Section 3.10.3: Management Direction” above).

Under the existing condition fine organic matter meets or exceeds the recommended threshold in the majority of the proposed treatment units. However, proposed treatment units 12P2, 123, and 904 are below the recommended threshold under the existing condition (Table 3-48).

Table 3-48. Proposed treatment units below the Region 5 recommended threshold for fine organic matter.

Proposed Treatment Unit Number	Non-Surveyed Proposed Treatment Unit(s) with Similar Conditions	Percent Fine Organic Matter	Reason for Treatment Unit Below Standards
12P2	11P	40	This unit does have an effective soil cover of 84 percent and is a plantation. There were several points where vegetation occurred with bare soil underneath the vegetation.
123	113, 120, 154 (these units are also similar to unit 111, which contains 72 percent fine organic matter).	48	This unit does have an effective soil cover of 88 percent. The unit had several points that contained large woody debris. Also this unit had hydraulic mining activities and evidence of past land management activities.
908		48	This unit does have an effective soil cover of 68 percent and is a plantation. This unit is part of a DFPZ with past management activities (thinning, mastication, and pile burning) occurring during 2004.

Large woody debris material meets or exceeds the recommended threshold in the majority of the proposed treatment units surveyed under the existing condition. However, proposed treatment units 15, 15P1, 21, 42, 55, 57, 70, 72, 92, 102, 107, 109, 130, 638, 639, and 907A are below the recommended threshold (Table 3-50).

Proposed treatment units 15P1 and 907A are plantations. Plantations in the Sugarberry Project area range in age from 15 to 30 years old. Most of the plantations were established from previous clearcuts or wildfires. Previous management activities had different large woody debris requirements than the Region 5 Soil Management Handbook recommended thresholds. Trees in these plantations have not yet reached suitable dbh or heights for the development of large woody material (desired logs are at least 20 inches in diameter and 10 feet long, but need to be at least 12 inches in diameter).

Table 3-49. Proposed treatment units below the Region 5 recommended threshold for large woody debris.

Proposed Treatment Unit Number	Proposed Treatment Units (not surveyed with similar conditions)	Total Large Woody Debris (Down Logs) (per acre)
15	—	4
15P1	—	4
21	LP1, LP2, 14B, 526, 905B	1
42	—	0
55	—	3
57	—	3
70	—	3
72	626	1
92	—	3
102	—	4
107	—	0
109	—	3
130	—	0
639	638	2
907A	—	1

Continued management of plantations as part of the Sugarberry Project would accelerate the diameter and height growth of residual trees, provide periodic inputs of woody debris from thinning operations, and provide for future opportunities for recruitment of snags and down woody material. Precommerical thinning, especially by mastication, would generate shredded woody material to be left on the soil surface, which may have long-term beneficial effects to soil moisture, temperature, and nutrient cycling. Subsequent commercial thinning would also generate woody material from tops and limbs, which could be piled and burned or some of the piles could be left unburned to meet wildlife and soil requirements. Once trees in the plantations reach diameters of at least 20 inches (expected after approximately 40 years of growth; Oliver 1997), these 20 inch dbh and greater trees could be used during subsequent harvests to create snag and large down logs in areas where they are deficit.

For proposed treatments that are not plantations, high quantities of large woody material are not expected to exist equally across the landscape. Overall, less productive soil types, such as exposed sites including ridgetops or south-facing slopes, serpentine sites, and areas with shallow or erosive soils, are expected to have less downed large woody material due to more open forest cover and slower growth rates of vegetation. Productive sites are capable of growing vegetation more quickly and producing high tree densities associated with mortality.

Management of forestlands over the last 150 years has affected the quantity of large woody material. In some areas, historical logging, grazing, fires, and mining created very open forests. These areas were naturally regenerated and vegetation is now reaching the diameter size classes and densities high enough to begin to create large woody material. The process can be slowed further, however, due to protected medium to high canopy conditions limiting blowdown of standing dead wood, or snags. Snags may stand for many years before falling and consequently becoming large woody material. Additionally, past thinning projects across the project area would have limited potential density-related mortality by removing trees in dense conditions to create growing space for residual healthy trees.

3.10.6.3 Existing Condition Indicator 2: Soil Hydrologic Function

The majority of soil map units in the soil effects analysis area (57 percent) have water movement in soil ratings (infiltration and permeability) of eight. These soil map units have a slow to very slow infiltration rate under natural conditions which indicates a higher level of risk of accelerated runoff if sufficient levels of effective soil cover are not present, as discussed in "Section 3.10.6.1: Soil Types and Soil Map Units."

Under the existing condition all proposed treatment units meet or exceed Forest Plan standards and guide for effective soil cover. In the majority of the proposed treatment unit surveyed, detrimental compaction has occurred in locations of landings, skid trails, and temporary roads. However, there does not appear to be significant changes in the soil hydrologic function within a timber stand. Increased surface runoff and erosion only occurs in site specific locations, such as skid trails and temporary roads where vegetation has not recovered and functioning waterbars do not exist. Typically this occurs in areas with high recreational uses.

3.10.6.4 Existing Condition Indicator 3: Soil Buffering Capacity

The soil buffering capacity of soils within the project area is not known. Soil buffering capacity is a function of soil pH and cation exchange capacity (CEC), and changes in these properties could affect soil chemistry, reaction, and nutrient availability. No large wildfires or widespread applications of chemicals that might affect soil pH, cation exchange capacity, or nitrogen availability have occurred within most of the Sugarberry project area. Fire can produce pulse nitrogen inputs into the soil, which are short-lived and generally considered beneficial to nutrient supply for vegetation. Boron is the agent of toxicological concern from Sporax® and occurs naturally in soil (USDA Forest Service 2006).

3.10.7 Environmental Effects

3.10.7.1 Alternative A – No Action

Indicator 1: Soil Productivity—Under Alternative A, the proposed Sugarberry Project would not be implemented, and there would be no fungicide treatments. Thus, no environmental effects associated with the application of Sporax® would occur to long-term soil productivity. The benefits from the use of Sporax® would not occur, which is would help prevent the spread of *Heterobasidion annosum* (annosus) root disease.

Measure 1: Effective Soil Cover

Direct, Indirect, and Cumulative Effects—The no-action alternative would allow effective soil cover to remain and develop at its current rate in the Sugarberry Project area. The continued accumulation of soil cover would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event. If soil cover is reduced to bare soil following a wildfire, the soil type in this area would be more susceptible to erosion. In addition, a high-intensity fire could induce the formation of hydrophobic soil layers (soils resistant to water adsorption and infiltration), thus increasing runoff, and erosion in the short term. Immediately following a fire, the affected stand may not meet the Forest Plan standards and guides for effective soil cover.

The benefits from proposed fuel reduction, ITS, and group selection treatments, watershed restoration, and aspen and black-oak stand enhancement would not occur. In the event of a future wildfire, effective soil cover would be reduced in larger quantities than expected with the proposed project.

Measure 2: Soil Porosity

Direct, Indirect, and Cumulative Effects—Under the no-action alternative, no new soil compaction or displacement would occur as no ground-disturbing activities would occur. In areas where there had been a decrease in soil porosity as a result of past land management activities, soil porosity may continue to slowly recover to pre-disturbance levels. The benefits from proposed fuel reduction, ITS, and group selection treatments, watershed restoration, and aspen and black-oak stand enhancements would not occur. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity (Clark 1994).

Measure 3: Soil Organic Matter

Direct, Indirect, and Cumulative Effects—Accumulation of organic matter would continue at current rates. Increased organic matter would contribute to ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event. Fires can instantaneously combust organic matter and cause the rapid acceleration of decomposition rates and nutrient cycling processes that are essential for plant growth and soil organisms. Hence, the effects of fire can cause short-term and long-term adverse effects (Neary et al. 2005). When organic matter burns, essential nutrient loss can occur during a fire in the following ways: nutrients are transferred to the atmosphere through volatilization and ash convection or surface runoff (erosion) of deposited nutrients in the surface ash layer (Neary et. al 2005 and Raison et al. 1984). Nutrients at a greater depth in the soil profile may be immediately lost following a fire due to leaching (Boerner 1982 and Neary et. al. 2005). 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 (Neary et al. 2005). These effects would adversely affect long-term soil productivity.

Indicator 2: Soil Hydrologic Function

Direct, Indirect, and Cumulative Effects—Under Alternative A, the proposed Sugarberry Project would not be implemented, and there would be no fungicide treatments. Thus, no environmental effects associated with the application of Sporax® would occur to long-term soil productivity. The benefits from the use of Sporax® would not occur, which would help prevent the spread of Heterobasidion annosum (annosus) root disease. Also infiltration and permeability rates would not be reduced by management activities. Ground and surface fuel loads would not be treated, which could lead to increased fire severity and intensity during a fire event. If hydrophobic conditions were caused by a high intensity wildfire, the infiltration and permeability rates would change. This could result in slowed plant growth, impeded root development, and increased overland flow during high precipitation events. The benefits from proposed fuel reduction, ITS, and group selection treatments, watershed restoration, and aspen and black-oak stand enhancement would not occur.

Indicator 3: Soil Buffering Capacity

Under Alternative A, the proposed Sugarberry Project would not be implemented, and there would be no fungicide treatments. Thus, no environmental effects associated with the application of Sporax® would occur to soil buffering capacity. The benefits from the use of Sporax® would not occur, which would help prevent the spread of *Heterobasidion annosum* (annosus) root disease.

3.10.7.2 Alternative B – Proposed Action

Indicator 1: Soil Productivity

Measure 1: Effective Soil Cover

Direct and Indirect Effects—Direct and indirect effects on this measure include partial removal of effective soil cover. It is difficult to predict precise treatment effects on forest floor materials; however, general trends are well established. Group selection, thinning, and ITS treatments typically decrease effective soil cover due to felling and skidding operations which tend to displace duff and litter along the equipment tracks (Westmoreland and McComb 2005). Mastication treatments typically increase soil cover and organic matter as materials are broadcast away from the machine. Pile burning and underburning could reduce effective soil cover. Pile burning would remove forest floor on a micro scale. In the majority of the proposed underburning treatment units, treatments are expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Typically the duff layer is thick, and fire and fuels specialists have observed that only small quantities of the duff layer is burned, especially on steep slopes where underburning is the only proposed treatment. However, proposed underburning treatment units 912 and 913 contain naturally hydrophobic and highly erosive soils and have a thin duff and litter layer. BMP monitoring of the Upper Slate DFPZ project has occurred in underburn treatment areas with similar soil types and existing conditions (thin duff and litter layer). Underburn treatments occurred when fuel moisture was too dry and a moderate to high intensity fire resulted. During this fire some treatment areas had little to no consumption of the duff and litter layer. Other areas had complete consumption of the duff and litter layer and exposed bare soil, causing rilling and erosion of the surface soils. To prevent a medium to high intensity fire in proposed treatment units 912 and 913, burning would occur during cool conditions to prevent loss of effective soil cover below standards and guides.

A reduction in forest floor cover would temporarily increase the risk of surface soil erosion in affected areas. The removal of forest material is most likely to occur in areas where most soil cover is removed in areas such as landings, skid roads, temporary roads, and equipment tracks. The quantity and type of soil 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 effective soil cover. Soil erosion will be minimized by the installation of erosion control structures (cross ditches, waterbars) which is a standard timber sale contract practice. In thinned areas, litter fall from the residual trees will add to soil cover in disturbed areas. Soil monitoring across the HFQLG Pilot Project has verified that MMMs are effective at minimizing soil erosion potential and soil cover usually meets standards and guides following project completion (see “Cumulative Effects” discussion below).

The goal of road decommissioning, as described in the proposed action, is to restore the designated land base to natural conditions and allow natural revegetation to restore soil cover on the decommissioned road bed surfaces. Through time an increase in soil cover would occur on the existing roadbed and reduce surface erosion. Fish passage improvements and meadow restoration would not affect soil cover in areas where ground-based mechanical equipment would not be used. If ground-based mechanical equipment is used for these improvement activities, soil cover would be maintained with the use of standards, guidelines, mitigation measures, and BMPs (refer to Appendix A and the Sugarberry “Hydrology Report”). Streambank restoration would increase soil cover on unstable streambanks. Stabilization of streambanks would require the enhancement of an effective soil cover (e.g., planting willow, large boulders, logs, etc.) to prevent further erosion.

Cumulative Effects—The implementation of this alternative has important positive cumulative effects for long-term soil productivity, which is the reduction of future wildfire risk or a modification of future wildfire behavior and intensity. Wildfire, typically occurring under conditions of high heat and low humidity, would result in nearly complete combustion of soil cover, and a significant increase in the risk of erosion. The proposed DFPZ (mastication, thinning, and prescribed burning), group selection, and ITS treatments are designed to reduce the risk of wildfire and behavior of a wildfire by modifying the arrangement of fuels and regenerate disease free and fire-resilient species.

Cumulative effects of proposed mastication treatments are expected to increase the existing soil cover and as a result increase fine organic matter for both soil protection and nutrient cycling. Under the existing condition all of the proposed mastication treatment unit surveyed meet or exceed Forest Plan standards and guides for percent effective soil cover. Appendix A lists several mitigation requirements that would be used to reduce the potential of loss of soil cover from mastication treatments. The mitigation requirements included equipment specifications, equipment use, and soil wetness conditions.

Cumulative effects of thinning, group selection, and ITS treatments proposed in Alternative B are expected to temporarily reduce effective soil cover from the existing condition. Under the existing condition all proposed group selection, thinning, and ITS treatment units exceed Forest Plan standards and guides. A quantifiable reduction in soil cover is difficult to determine. Quantifiable reductions were reported in the 2004, 2005, and 2006 HFQLG Soil Monitoring Reports (Westmoreland and McComb). Since 2001 pre- and post-treatment soil monitoring has been conducted across the HFQLG Pilot Project in group selection and thinning treatment units. While no statistical analysis has been performed on this data, general trends and expected ranges of effects are established. In 2004 post-treatment effective soil cover was determined in nine thinning treatment units. On average effective soil cover decreased from 90 to 81 percent, with a nine percent total reduction (Westmoreland and McComb 2004). In 2005 post-treatment effective soil cover was collected in eleven group selection treatment units and 20 thinning treatment units. On average effective soil cover decreased from 91 to 64 percent, with a 27 percent total reduction (Westmoreland and McComb 2005). In 2006 post-treatment effective soil cover was collected for in eleven thinning treatment units and three group selection treatment units. On average soil cover decreased from 93 to 83 percent, a 10 percent total reduction (Westmoreland and McComb 2006). All reductions of effective soil cover measured in post-treatment units during the monitoring study are within Forest Plan standards and guides.

Reductions in soil cover following implementation of group selection, thinning, and ITS treatments are expected to be within the ranges found during the HFQLG soil monitoring. Conservatively assuming the largest observed reduction, the average 27 percent reduction in soil cover from the 2005 HFQLG Soil Monitoring Report was applied as the methodology to calculate cumulative effects. Reductions in effective soil cover are expected to be short term and effective soil cover is expected to meet or exceed Forest Plan standards and guides in all proposed thinning, group selection, and ITS treatment units. All calculations are displayed in a table included in the Sugarberry "Soils Report."

Proposed treatment unit 908 is at high risk for a reduction in effective soil cover (41 percent) below Forest Plan standards and guides following proposed group selection treatments (Table 3-50). Proposed treatment 908 has had the following past land management activities: plantation created in 1989, DFPZ treatments 2004 (hand cut and pile burn and mastication), and proposed sanitation salvage in 2007. In proposed treatment unit 908, under the existing condition effective soil cover exceeds the Forest Plan standards and guides at 68 percent. This proposed treatment contains soil map units 211 and 212, and soil cover maintenance is essential due to erosive nature of these soils. To mitigate for the reduction of effective soil cover and associated soil erosion Contract Clause C6.601 would be required in the Timber Sale Contract. This contract clause requires the seeding and mulching in areas of disturbed bare ground such as landings and skid trails.

Table 3-50. Proposed treatment unit(s) at high risk for reductions in effective soil cover below Forest Plan Standards and Guides.

Proposed Treatment Unit Number	Proposed Treatment(s)	Existing Condition Effective Soil Cover	Cumulative Effects of Alternative B Effective Soil Cover
908	DFPZ – Group Selection-Tractor and Cable	68 percent	41 percent

Measure 2: Soil Porosity

Direct and Indirect Effects—Direct and indirect effects on this measure occurs when soil porosity decreases and detrimental soil compaction increases. The use of heavy forestry equipment and re-entry of stands would increase the potential for detrimental soil compaction (Powers 1999). The degree of detrimental soil compaction varies with soil texture, soil moisture content at the time the activity takes place, the weight or ground pressure of the equipment used, and whether woody material remains in place to cushion the weight of the equipment while the operation is occurring. Increases in detrimentally compacted areas are expected in proposed group selection and thinning treatment units due to the need for new skid trails, landings, or temporary roads. Increases in detrimental compaction have been documented in group selection and thinning treatment units within the HFQLG Pilot Project (Westmoreland and McComb 2006). Results of HFQLG soil monitoring are used as the basis for the cumulative effects discussion presented below.

It is expected there would be no direct and indirect effects from proposed mastication treatment units since landings and skid trail are not re-used or created. Appendix A lists equipment specifications used to mitigate for potential detrimental soil compaction in mastication treatment units. There is a high risk for detrimental soil compaction to occur in proposed treatment units with high clay content, if operations occur when clay soils have a moisture content that is near field capacity. To reduce the risk of mastication treatments causing detrimental compaction, a Limited Operating Period (LOP) would be applied to the entire Sugarberry Project. The LOP would only allow ground-based harvest equipment to operate only when soils are considered dry. Soil is defined as “dry” when the upper 8 inches is not sufficiently moist to allow a soil sample to be squeezed and hold its shape, or crumbles when the hand is tapped. Dryness would be determined by the sale administrator upon the recommendation of a soil scientist.

Improvements to the transportation system described in the proposed action would help alleviate the overall extent of detrimental compaction within the project boundary. Road decommissioning would reduce the total area of compacted roadbed, and return these areas to the productive forest land base. Fish passage improvements and meadow restoration would not increase soil compaction where ground-based mechanical equipment would not be used. Where ground-based mechanical equipment is used standards would be met by applying standards, guides, mitigation measures, and BMPs listed in “Section 3.10.2: Regulatory Framework.” Removal of streamside roads during streambank restoration would reduce detrimental soil compaction on unstable streambanks. Stabilization of streambanks would include enhancements of riparian vegetation, and these measures would reduce compaction as well.

Cumulative Effects—Cumulative effects due to detrimental soil compaction could occur if project activities, combined with past or future foreseeable actions, were to result in an unacceptable proportion of the landscape experiencing detrimental soil compaction that would adversely affect long-term soil productivity.

Within the Sugarberry soil effects analysis area the following soil map units are susceptible to detrimental compaction when the soil moisture content is near field capacity: Aiken family (101 and 102) which is within 4 percent of the analysis area, Deadwood and Josephine families complex (138) which is within 1 percent of the analysis area Forbes and Holland families complex (169) which is within 4 percent of the analysis area, Holland family (198, 199, and 200) which is within 12 percent of the analysis area, Josephine and Mariposa families complex (219) which is within 1 percent of the analysis area, and Kistern, Aiken, and Deadwood families complex (223) which is within 1 percent of the analysis area. Based upon the 10-year results of The Long Term Soil Productivity Study, these areas would be more susceptible to a reduction in soil productivity if significant increased levels of detrimental soil compaction occurred. The greater clay content of these soils would, however, give them very high soil strength and resistance to compactive forces when they are dry. All other proposed treatment units are mostly composed of loam and sand, which have a low to medium risk of detrimental compaction effecting long-term soil productivity. However, these proposed treatment units are still at risk because a small percentage of clay exists in the loam or sand dominated soil map units. Table 3-51 lists the proposed treatment units where a greater risk of detrimental compaction could result if heavy equipment operations occurred under moist or wet soil conditions.

Table 3-51. Proposed treatments with a high risk of detrimental soil compaction affecting long-term soil productivity.

Proposed Treatment Unit No.	Existing Condition Detrimental Soil Compaction (percent)	Range of Cumulative Effects for Detrimental Soil Compaction (percent)	Soil Map Unit that Indicates Clayey Soils
2	8	13 to 21.5	Contains soil map unit 179 (39%)
11G	0	5 to 13.5	Contains soil map units 198 (2%) and 199 (76%)
11K	16	21 to 29.5	Contains soil map unit 199 (81 acres or 100%)
12G1	16	21 to 29.5	Contains soil map units 169 (1%), 199 (1%), and 219 (13%)
12G2	4	9 to 17.5	Contains soil map unit 219 (37 acres or 90%)
14O	0	5 to 13.5	Contains soil map unit 169 (94%)

Proposed Treatment Unit No.	Existing Condition Detrimental Soil Compaction (percent)	Range of Cumulative Effects for Detrimental Soil Compaction (percent)	Soil Map Unit that Indicates Clayey Soils
15	0 to 9	5 to 22.5	Contains soil map unit 200 (2%)
21	4	9 to 17.5	Contains soil map unit 102 (21%)
32	0 to 4	5 to 17.5	Contains soil map unit 102 (62%)
33	0	5 to 13.5	Contains soil map units 102 (15%) and 199 (3%)
35	8	13 to 21.5	Contains soil map unit 200 (92%)
37	0	5 to 13.5	Contains soil map units 199 (84%) and 200 (3%)
79i	8	13 to 21.5	Contains soil map units 169 (1%) and 199 (10%)
79iii	4	9 to 13.5	Contains soil map unit 199 (86%)
87	0	5 to 13.5	Contains soil map unit 199 (41%)
92	0 to 4	5 to 17.5	Contains soil map unit 199 (96%)
98	0	5 to 13.5	Contains soil map units 199 (2%) and 200 (52%)
100	0	5 to 13.5	Contains soil map unit 199 (33%).
103	0	5 to 13.5	Contains soil map unit 199 (95%)
109	8	13 to 21.5	Contains soil map units 169 (67%) and 199 (33%)
110	0 to 8	5 to 21.5	Contains soil map unit 199 (71%)
111	0	5 to 13.5	Contains soil map units 169 (0.5%) and 199 (92%)
113	0	5 to 13.5	Contains soil map units 169 (20%) and 199 (80%)
117	0 to 4	5 to 17.5	Contains soil map units 102 (19%) and 199 (81%)
118	0	5 to 13.5	Contains soil map unit 102 (100%)
119	4	9 to 17.5	Contains soil map unit 102 (100%)
127	4	9 to 17.5	Contains soil map unit 102 (53%)
120	0	5 to 13.5	Contains soil map unit 102 (36%) and 199 (64%)
128	4	9 to 17.5	Contains soil map unit 199 (7%)
130	4 to 8	9 to 21.5	Contains soil map unit 102 (6%)
134	0	5 to 13.5	Contains soil map unit 199 (14%)
141	8 to 16	13 to 29.5	Contain soil map units 101 (26%), 102 (5%), and 199 (20%)
150A	0 to 16	5 to 29.5	Contains soil map unit 199 (3%)
150B	0	5 to 13.5	Contains soil map unit 169 (75%)
577	4	9 to 17.5	Contains soil map unit 138 (42%)
636	8	13 to 21.5	Contains soil map unit 169 (7%)
905B	0 to 9	5 to 22.5	Contains soil map unit 199 (6%) and 200 (29%)

Since 2001 pre- and post-treatment soil monitoring has been conducted across the HFQLG Pilot Project in group selection and thinning treatment units. A total 52 treatment areas have been examined post-treatment. The findings reported to date are included in the 2004, 2005, and 2006 HFQLG Soil Monitoring Reports (Westmoreland and McComb 2004, Westmoreland and McComb 2005, and Westmoreland and McComb 2006). The monitoring method has been mostly visual examination of soil porosity and structure using a tile spade with some quantifiable soil core sampling to corroborate the visual examination determination (same method used for determining detrimental soil compaction for the Sugarberry Project). The monitoring method calls for the observer to determine whether or not (yes or no) the sample point meets or exceeds the threshold stated in the Region 5 Soil Management Handbook (Westmoreland and McComb 1995). This monitoring protocol method does not determine the actual degree of change in soil bulk density or porosity at the sample point. In general, the findings indicate that legacy detrimental compaction occurs in the majority of the monitored sites.

Post-treatment monitoring between 2004 and 2006 has shown a total of 25 out of 52 (about 50 percent) treatment units have had an increase in detrimental soil compaction (Westmoreland and McComb 2006). Within these 25 treatment units, the detrimental compaction increased between 2 and 40 percent with an average increase of 13.5 percent (Westmoreland and McComb 2006). A decrease in detrimental compaction was observed in the post-treatment monitoring in 2005 (Westmoreland and McComb 2005). Decreases occurred in nine group selection treatment area (1 to 2 acre treatment area) and seven thinning treatment units with subsoiling occurring after project completion. Of the group selection treatment units, one treatment unit had the landing subsoiled, six treatment units were completely subsoiled and replanted, and in two treatment units the skid trail system was subsoiled. In the units completely subsoiled, compaction only increased an average of 5 percent. In the two treatment units with the skid trail system subsoiled, overall the compaction level increased from 14 to 19 percent.

In the thinning treatment units the skid trails were subsoiled and had an average decrease of 7 percent in detrimental soil compaction. The 2006 HFQLG Soil Monitoring Report concludes within group selection treatment areas, not subsoiled, there is a statistically significant increase in detrimental soil compaction. (Westmoreland and McComb 2006). These treatments are one to two acres in size with concentrated ground disturbing activities. The increase in detrimental soil compaction for group selection treatments were not analyzed on the timber stand as a whole. The current findings also concluded that when subsoiling is used as mitigation measure post-treatment, the mean amount of detrimental compaction is less than the pre-treatment mean. However the decrease in compaction was not statistically significant (Westmoreland and McComb 2006).

Ongoing research has been published on the effects of soil compaction to long term soil productivity. Powers et al (2005) recently published the ten year results of The Long Term Soil Productivity (LTSP) study. This is a national and international study initiated in 1989 and is comprised of 62 study sites, including sites in the Sierra Nevada. The goals of the study are to gain understanding of a site's potential soil productivity and effects of land management activities. The study focuses on two key components readily affected by management, soil porosity and soil organic matter. The LTSP study has 1-acre study plots with 3 levels of compaction (none, intermediate, and severe- similar to a landing), in factorial combination with 3 levels of organic matter removal (bole only, whole tree, whole tree and all forest floor). All plots were clearcut and planted with native species. In addition, to investigate the role of understory vegetation in compaction recovery, vegetation was allowed to naturally return on half of each plot, controlled on the other half by manual or chemical methods. The national ten year results indicate that soil compaction effects on total biomass productivity (all vegetation within a site, not just tree growth) differs depending upon the soil particle size or soil texture, along with other factors such as initial bulk density, rock content, and climate. On soils characterized as Sandy, compacted plots had greater biomass productivity than uncompacted plots; on soils characterized as Loamy, compaction resulted in little change in biomass productivity; and on soils characterized as Clayey, compaction resulted in up to a 50% reduction in biomass productivity at particular sites in the Southern Coastal plains, primarily in areas with poor soil drainage or high water table. This ten-year publication incorporated results from 6 of the 12 California sites.

Recently in June 2007, during the National LTSP Conference, additional results were presented by David Young (R5 North Zone Soil Scientist) incorporating 9 of the 12 California sites to reach ten years; these sites include all study sites within the Sierra Nevada (including Challenge Experiential Forest located on the Feather River Ranger District of the Plumas National Forest). The following information from recent findings is based on personal communications with David Young (June through July 2007), again reflecting total vegetation biomass in addition to trees. For the clay loam sites (Challenge and Brandy City), there is no statistical difference in total biomass production between the no, moderate, and severe compaction levels. On sites with soils characterized as Loam

(Lowell Hill and Blodgett), there is no statistical difference in total biomass production between the no, moderate, and severe compaction levels. The are five study sites with soils characterized as Sandy Loam (Rogers, Wallace, Vista, Central Camp, and Owl); on three of the sites there is no statistically significant difference in total biomass production between the no, moderate, and severe compaction levels. At the Rogers site (parent material decomposing granite) there was an increase in biomass production in the moderate and severe compaction levels compared to no compaction. At the Owl site, there was a decrease in biomass production in the moderate and severe compaction levels, attributed to a rise in water table after harvest, so aeration porosity was limited by compaction. The latest results have concluded that soil compaction, even above degrees considered detrimental by Regional analysis standards, has little effect on soil productivity at most sites, at least at ten years of growth. These results will be revisited and published after ten year data is available for all 12 California LTSP sites.

It is important to note that LTSP compaction treatments were experimental- as much plot area as possible was compacted (90+ %) and to greater severity than normally encountered during operational practices. Therefore, treatments represent a “worst case scenario” when compared with current operational practices, and resulting effects would presumably be much greater. Despite this, no significant effects of compaction on soil productivity have been discovered at most sites.

Conclusions: Results from the HFQLG Soil Monitoring study are inconclusive for quantifying the cumulative increases or decreases in detrimental soil compaction in timber stands with thinning and group selection treatments. Within the Sugarberry soil analysis area legacy detrimental compaction was observed in the majority of the proposed treatment units surveyed in the Sugarberry Project area. It is expected that Sugarberry project would cumulatively increase the level of detrimental soil compaction in thinning and group selection treatment units. Most of the analysis area contains soils classified as loam or sandy loam, with some occurrence of clay loams. The current LTSP study suggests that soil compaction does not affect soil productivity, except with poorly drained or perennially wet soils (unusual occurrence for general forest soils). Regardless, project design mitigations have been included to decrease the level of detrimental soil compaction that would occur as a result of proposed treatments.

Mitigations: To reduce the increase of detrimental compaction, a Limited Operation Period (LOP) would be applied to the entire Sugarberry Project. The LOP would allow ground-based harvest equipment to operate only when soils are considered dry. Soil is defined as “dry” when the upper 8 inches is not sufficiently moist to allow a soil sample to be squeezed and hold its shape, or crumbles when the hand is tapped. Dryness would be determined by the sale administrator with available consultation by a soil scientist. In addition to the LOP, subsoiling would occur on all landings used, 200 feet of the main skid trail approach to the landing, and temporary roads (Appendix B). When properly designed and implemented, subsoiling is effective at reducing soil compaction (Kolka and Schmidt 2004). When subsoiling is used to mitigate for detrimental soil compaction, increases in group selection and thinning treatments would be less (Westmoreland and McComb 2005). Subsoiling on skid trails would not exceed a 25 percent slope, to prevent unacceptable risks of soil erosion and to tree health. Subsoiling creates loose soil material that is susceptible to erosion, and erosion is more likely to occur on steeper slopes. Also there is some risk of root damage to plants during subsoiling.

Brent Roath (Region 5, Forest Service Soil Scientist) recommends not subsoiling on skid trails within harvest units on coarse textured soils (USDA texture classes: sands; loamy coarse sands; and coarse sandy loams with less than 5% clay) that have developed from granitic parent material (Regional Office Subsoiling Review letter June 29, 2006). These soils lack structure, aggregation and are cohesionless in their natural state because of the low clay and very high sand content. These characteristics appear to make subsoiling ineffective, given the results observed during this review. Likewise, these soils are highly erosive. The subsoiling results observed during June 12-14, 2006 indicated that narrow channels were formed where the tines were pulled through the soil, and in-between the furrow marks the soil was still compacted or crusted. This situation resulted in the channeling and concentration of runoff water in the furrows which caused unacceptable erosion levels. The erosion potential and its control must be carefully evaluated before subsoiling landings or temporary roads with coarse textured granitic soils. All areas to be subsoiled are finalized by sale administer and the sivilculturist and soil scientist are available for consultation.

Measure 3: Soil Organic Matter

Direct and Indirect Effects—Direct and indirect effects on this indicator include the removal of soil organic matter, potential short-term reduction of soil nutrients, and loss of habitat for organisms inhabiting soil organic matter. The Region 5 Soil Management Handbook is concerned with maintaining soil organic matter in the amounts sufficient to prevent significant short- or long-term nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. The Region 5 Soil Management Handbook provides recommend indicators and thresholds for determining sufficient amounts of soil organic matter. Indicators include fine organic matter and large woody material.

Fine organic material includes plant litter, duff, and woody material less than 3 inches dbh. Large woody material consists of down logs that are least 20 inches in diameter and 10 feet long. Down logs decay slowly over time and provide structural habitat for organisms that produce nitrogen and are an excellent growth medium for mycorrhizal fungi. Fine organic matter and large woody material are components of soil cover. Therefore, the direct and indirect effects to fine organic matter are the same as the effects to soil cover (see "Measure 1: Effective Soil Cover" in Section 3.10.7.1).

Cumulative Effects— On going research has been published on the effects of the removal of soil organic matter to long term soil productivity. Powers et al (2005) recently published the ten year results of The Long Term Soil Productivity (LTSP) study. This is a national and international study initiated in 1989 and is comprised of 62 study sites, including sites in the Sierra Nevada. The goals of the study are to gain understanding of a site's potential soil productivity and effects of land management activities. The study focuses on two key components readily affected by management, soil porosity and soil organic matter. The LTSP study has 1-acre study plots with 3 levels of organic matter removal (bole only, whole tree, whole tree and all forest floor), in factorial combination with 3 levels of compaction (none, intermediate, and severe). The national ten year results indicate that bole only and whole tree OM removals have had no detectable effects on soil nutrition or biomass productivity. At whole tree plus complete removal of all surface organic matter, there was a decline in soil Carbon concentration to 20 cm depth and reduced nutrient availability, due to the loss of the forest floor. In 4 of the California sites (spanning the range of textures) investigated for Nitrogen availability, there was a decline in Nitrogen availability at the whole tree plus forest floor removal level (personal communication with David Young, graduate research work conducted by Terry Craigg). In regards to biomass productivity with the California sites: (1) in clay loam sites there is a slight but significant decline in biomass productivity at the extreme OM removal level, (2) in loam sites there is no difference in biomass productivity between treatments, and (3) in sandy loam sites there is a slight increase in biomass productivity at progressive levels of OM removal (personal communication with David Young.

The HFQLG 2004, 2005, and 2006 soil monitoring data reports included data collection on large woody material. In 2004 nine thinning treatments were post monitored and large down woody material decreased form 10.5 logs per acre to 4 logs per acre (Westmoreland and McComb 2004). In 2005, 20 thinning treatment units and 11 group selection units were post monitored and large woody material decreases from an average of 10 logs per acre to 2 logs per acre, usually due to follow-up fuels treatments (Westmoreland and McComb 2005). Typically, prescribed underburning treatments reduce the quantity of large woody material, but do not entirely eliminate it. In 2006 three group selection treatment units and 11 thinning treatment units were post monitored and large woody material decreased from an average of 9 logs per acre to 4 logs per acre. The reduction was most likely caused during follow up fuel treatments (prescribed burning) (Westmoreland and McComb 2006).

The majority of proposed treatment units expected to have follow-up prescribed burning. The HFQLG soil monitoring reports show a trend in reduction of large woody material in burning treatment units. However, no statistical analysis has been performed to determine confidence interval. There are proposed treatment units under the existing condition that are below the Region 5 recommended threshold for large woody material, and several proposed treatment units could be below recommended threshold following proposed treatments. The Region 5 guidelines allow for the adjustment of this threshold when fuel management treatments are needed.

Recently there have been new research presentations by PSW on the importance of large woody material to soil nutrients (personel communication with David Young, research conducted by Robert Powers). One study occurred on the Blacks Mountain Experimental Forest in northeast California in eastside pine ecotypes. Conclusions from the study include: Organic carbon and nitrogen concentrations are much higher in decaying wood material than mineral soil. However, soil beneath all log decay classes has no greater carbon or nitrogen content than beneath other cover types, so large woody material is not considered important for nutrient storage or cycling with respect to soils. Even when very high amounts of coarse large woody material occur, annual inputs of nitrogen from nonsymbiotic fixation are very low. Large woody material does provide habitat for fungi, and retain plant available water.

Conclusions: Results from the HFQLG Soil Monitoring study are inconclusive for quantifying the decreases in large woody material in timber stands with thinning and group selection treatments. Large woody material has no importance on soil nutrients (personal communication with Robert Powers). However large woody material plays a large role for wildlife habitat, and retention of large down logs would be mitigated for wildlife Forest Plan standards and guidelines. The cumulative quantity of fine organic matter was estimated in total removal of soil cover. Soil cover is expected to meet Forest Plan standards and guidelines in all proposed treatment areas. Effects of the removal of soil organic matter are expected to be short-term and have no effects to long term soil

Indicator 2: Soil Hydrologic Function

Direct, Indirect, and Cumulative Effects—Infiltration rates and permeability rates can be reduced by various management activities. Compaction, puddling, and hydrophobic conditions caused by fire can change infiltration rates and permeability. Effects include slowed plant growth, impeded root development, and increased overland flow during high precipitation events. The EHR is used to asses the project effects to soil hydrologic function. Under all action alternatives, soil hydrologic function is not expected to be altered by proposed management activities. Soil cover is expected to meet or exceed Forest Plan standards and guides in all proposed treatment units following management activities. Mitigation measures have been designed to decrease the risk of detrimental soil compaction and puddling. Prescribed burning treatments are expected to use low intensity fires, which typically do not result in hydrophobic conditions. For these reasons, there are no anticipated cumulative effects to soil hydrologic function.

Indicator 3: Soil Buffering Capacity

It is not expected that soil buffering capacity within the Sugarberry Project area would be changed by proposed management activities. No chemicals or materials would be added to the soil that would alter reaction classes, buffering or exchange capacity.

3.10.8.3 Alternative C

Indicator 1: Soil Productivity

Direct, indirect, and cumulative effects of soil productivity under Alternative C are expected to be the same or similar to Alternative B. Since there is a reduction of proposed treatments, a reduction in effects to soil cover, soil porosity, and soil organic matter are expected to be less under Alternative C than Alternative B. The same mitigation measures under Alternative B apply to proposed treatment units under Alternative C.

Indicator 2: Soil Hydrologic Function

Direct, indirect, and cumulative effects to soil hydrologic function under Alternative C would be the same as Alternative B.

Indicator 3: Soil Buffering Capacity

Direct, indirect, and cumulative effects to soil buffering capacity under Alternative C would be the same as Alternative B.

3.10.8.4 Alternative G

Indicator 1: Soil Productivity

Direct, indirect, and cumulative effects of soil productivity under Alternative G are expected to be the same or similar to Alternative C. The same mitigation measures under Alternative B apply to proposed treatment units under Alternatives C and G. The additional road decommissioning would reduce the total area of compacted roadbed, and return these areas to the productive forest land base.

Indicator 2: Soil Hydrologic Function

Direct, indirect, and cumulative effects to soil hydrologic function under Alternative G would be the same as Alternatives B and C.

Indicator 3: Soil Buffering Capacity

Direct, indirect, and cumulative effects to soil buffering capacity under Alternative G would be the same as Alternatives B and C.

Reasonable Foreseeable Future Actions

The proposed DFPZ treatments for the Sugarberry Project would eventually be connected to other DFPZ projects currently being implemented.

Irreversible, Irretrievable Effects

There are no irreversible or irretrievable effects associated with Alternatives A, B, C or G. Disturbances to soil productivity would be short-term with recovery expected through natural processes and/or mitigation. To minimize effects of the action alternatives, standards, guidelines, mitigation measures, and BMPs would be applied.

3.10.8 Summary of Cumulative Effects

3.10.8.1 Alternative A – No-Action Alternative

In all proposed treatment units, effective soil cover exceeds Forest Plan standards and guidelines. Under Alternative A, soil cover would not be removed and would continue to accumulate at its current rate. However, a reduction of fuel loading would not occur. It has been a detriment that fuel loading conditions are high within the Sugarberry Project and there is a need to create a DFPZ. If a high intensity fire were to ignite in the untreated DFPZ, then it could result in significant reduction in soil cover that would likely exceed changes expected under the action alternatives.

Past land management activities have caused detrimental soil compaction, which has resulted in a decrease in soil porosity. Under Alternative A, no new detrimental compaction would occur to further effect soil productivity and soil hydrological function (the capacity of a soil to intake, retain, and transmit water).

Under the existing condition fine organic matter and large woody material meets or exceeds the Region 5 Soil Management Handbook recommended thresholds in the majority of the proposed treatment units surveyed. Under Alternative A, fine organic matter would not be removed and would continue to accumulate at its current rate. Existing large woody material would remain and continue to accumulate if there are trees with the stand at least 12 inches dbh. In most plantations there are no trees of sufficient size available to create large woody material. Continued management of timber stands as part of the Sugarberry Project would accelerate the diameter and height growth of residual trees, provide periodic inputs of woody debris from thinning operations, and provide for future opportunities for recruitment of snags and down woody material. It has been detrimental that fuel loading conditions are high within the Sugarberry Project and there is a need to create a DFPZ. Increased organic matter, especially fine organic matter, would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event. Fires instantaneously combust organic matter and causes the rapid acceleration of decomposition rates and nutrient cycling processes that are essential for plant growth and soil organisms. The effects of fire have short- and long-term adverse effects (Neary et al. 2005). If a high intensity fire were to ignite in the untreated DFPZ it could result in a significant reduction in organic matter that would likely exceed changes expected under the action alternatives.

Treatments used to regenerate fire-resilient species using an uneven-aged management strategy would not occur under Alternative A. Therefore, the accelerated development of soil cover, fine organic matter, and large woody material in proposed treatment units would not occur in deficient areas, such as plantations.

Implementation of transportation system improvements, aspen regeneration, black oak stand enhancement, and watershed restoration would not occur under Alternative A. These would represent lost opportunities to benefit the soil resource long-term

3.10.8.2 Alternative B – Proposed Action

Short-term reductions in soil cover are expected within proposed thinning, ITS, group selection, and prescribed burning treatment units. Reductions in soil cover would reduce the high fuel loading conditions and fire risk. Effective soil cover in all proposed treatment units is expected to meet or exceed Forest Plan standards and guides. Based on the cumulative effects analysis, proposed group selection treatment unit 908 has a high risk for reduction of effective soil cover below Forest Plan standards and guides. Mitigations would be used to ensure Forest Plan standards and guidelines are met. These mitigation measures would include seeding and mulching bare soil caused by disturbances during treatment operations.

Within the Sugarberry soil analysis area legacy detrimental compaction was observed in the majority of the proposed treatment units surveyed. It is expected than proposed thinning, group selection, and ITS treatments with ground-based mechanical equipment use would cumulatively increase the level of detrimental compaction. Skyline and helicopter operations due not effect soil porosity. Most of the analysis area contains soils classified as loam or sandy loam, with some occurrence of clay loams. The current LTSP study suggests that soil compaction does not affect soil productivity, except with poorly drained or perennially wet soils (unusual occurrence for general forest soils). Regardless, project design mitigations have been included to decrease the level of detrimental soil compaction that would occur as a result of proposed treatments (see Section 6.2.1.2). To reduce the risk of detrimental compaction effecting long term soil productivity, a Limited Operation Period (LOP) would be applied to the entire Sugarberry Project. The LOP would only allow ground-based harvest equipment to operate only when soils are considered dry. Soil is defined as “dry” when the upper 8 inches is not sufficiently moist to allow a soil sample to be squeezed and hold its shape, or crumbles when the hand is tapped. Dryness would be determined by the sale administrator upon the recommendation of a soil scientist. In addition to the LOP, subsoiling would occur on all landings used, 200 feet of the main skid trail approach to the landing, and temporary roads. Subsoiling on skid trails would not exceed a 25 percent slope, to prevent unacceptable risks of soil erosion and to tree health. Ground-based mechanical equipment operations within proposed mastication treatment units are not expected to increase detrimental soil compaction. Proposed mastication treatments are also included in the LOP and equipment specifications would be included in the service contract.

The cumulative quantity of fine organic matter was estimated in total removal of soil cover. Soil cover is expected to meet Forest Plan standards and guidelines in all proposed treatment areas. Effects of the removal of soil organic matter are expected to be short-term and have no effects to long term soil productivity.

There are proposed treatments units under the existing condition that are below the Region 5 Soil Management Handbook recommended threshold for large woody material. A reduction of large woody material is expected in treatments units with secondary prescribed burning treatments. The Region 5 guidelines allow for the adjustment of this threshold when fuel management treatments are needed. It has been determined that the Sugarberry Project is needed for fuel management. Large woody material has no importance on soil nutrients (personal communication with Robert Powers). However large woody material plays a large role for wildlife habitat, and retention of large down logs would be mitigated for wildlife Forest Plan standards and guidelines.

There are no anticipated cumulative effects to soil hydrologic function as a result of the incorporated mitigation measures used to prevent increased detrimental soil compaction.

It is not expected that soil buffering capacity within the Sugarberry Project area would be changed by proposed management activities. No materials would be added to the soil that would alter reaction classes, buffering, or exchange capacity.

The goal of road decommissioning, as described in the proposed action, is to restore the designated land base to natural conditions. This would uncompact the roadbed and restore soil porosity and hydrologic function, which would allow natural revegetation to occur and increases in soil cover and organic matter. Through time these changes would reduce surface erosion and greatly benefit long-term soil productivity.

Black oak and aspen enhancements would remove competing vegetation to allow for the recruitment of black oak or aspen, and reduce the high fuel loading conditions. Treatments are hand thinning or helicopter removal, which do not cause decreases in soil cover, or soil organic matter, or soil porosity. These treatments would not adversely affect soil resources.

3.10.8.3 Alternative C

Effects of proposed treatments under Alterative C are expected to be the same or similar to Alternative B. There is a reduction in proposed thinning, group selection, and ITS treatments under Alternative C. Cumulative effects from these treatments are expected to be less than the cumulative effects under Alternative B.

3.10.8.4 Alternative G

Effects of proposed treatments under Alterative G are expected to be the same or similar to Alternatives B and C. There is an increase in miles of road decommissioning, which would act to restore the landscape to a more national condition and improves soil properties.

3.11 Wildlife and Fish

3.11.1 Introduction

This Wildlife and Fish section summarizes the effects to listed species (threatened, endangered, proposed), Forest Service sensitive species, Management Iindicator Species (MIS), Neotropical migratory birds (NTMBs), and some general wildlife species as a result of the proposed action and action alternatives, provides a determination of the effects and a rationale for how the effects determination was reached. This information was summarized from the Biological Assessment/Evaluation (BA/BE), and MIS reports that are incorporated by reference and included in the Sugarberry Project record.

The purpose of the BA/BE is to review the proposed Forest Service action in sufficient detail to determine if the proposed action, the Sugarberry Project, will result in a trend toward federal listing of Candidate and/or Sensitive species, to document effects on Proposed species to determine if conferencing is required, and to document effects on Threatened and Endangered species to determine if consultation is required. The MIS Report addresses MIS to determine the effects to habitat and population trends at the Forest level. NTMBs are also addressed to determine the effects to suitable habitat and to ensure compliance with the Forest Service's Landbird Strategic Plan. For definitions of Threatened, Endangered, Proposed, Candidate and Forest Service Sensitive Species refer to the Wildlife and Fish BA/BE in the project file.

The BA is prepared to determine the effects of proposed projects on species listed by the USFWS and National Marine Fisheries Service as Endangered, Threatened or Proposed for listing. It is prepared in accordance with legal requirements set forth under Section 7 of the *Endangered Species Act* (19 U.S.C. 1536 {c}), 50 CFR 402, and standards established in FSM direction (FSM 2672.42). The BE provides a process to review all Forest Service planned, funded, executed, or permitted programs and activities for possible effects on regionally listed Forest Service Sensitive species (FSM 2672.42). This document combines the BA and BE for fish and wildlife (including invertebrates, amphibians, reptiles, birds, and mammals).

Table 3-52 lists MIS and NTMB species that potentially occur on the Sugarberry Project. MIS species such as the California spotted owl, Northern goshawk and American Marten that are Forest service Sensitive species are addressed under the "Threatened, Endangered or Forest Service Sensitive Species" sections. There is no known habitat for, and/or there have been no observations of, and/or the proposed project will not affect the prairie falcon, Canada goose, golden eagle or largemouth bass. Therefore, these species are not discussed further in this document. The proposed activities in the Sugarberry Project area may affect the habitat for MIS and NTMB species.

Table 3-52. MIS and NTMB species that potentially occur on the Plumas National Forest and could be affected by the project.

Species	Category
Deer group (*Odocoileus hemionus*)	MIS
Trout (*Oncorhynchus mykiss, Salvelinus fontinalis* and *Salmo trutta*)	MIS
Swainson's thrush (*Catharus ustulatus*)	NTMB

The reports for MIS and NTMBs discuss the possible effects on habitat for these species. Any effects on the MIS species are expected to be minimal and are therefore not discussed in detail in this section.

Table 3-53 lists the Threatened, Endangered, and Sensitive species for which habitat availability and suitability were considered for this project. The table includes determinations based on the analysis for the Sugarberry Project as disclosed in the BA/BE, available data, and on the assumption that full implementation of identified mitigations would be in complete compliance with the 1988 Plumas National Forest LRMP (commonly called the "Forest Plan"), as amended. The determinations are discussed in more detail below in "Section 3.11.5: Determinations."

Table 3-53. Status of federal Threatened, Endangered, and Candidate species and Species of Concern and Forest Service Sensitive species that potentially occur within the Sugarberry Project area.

Species	Scientific Name	Category	Summary of Effects	
			No-Action Alternative	Action Alternatives
Fish				
Hardhead minnow	*Mylopharodon conocephalus*	Sensitive	WNA[c]	MAI[b]
Amphibians				
Foothill yellow-legged frog	*Rana boylii*	SOC[d]/Sensitive	WNA	MAI
Mountain yellow-legged frog	*Rana muscosa*	Candidate/Sensitive	WNA	MAI
Reptiles				
Western pond turtle	*Clemmys marmorata marmorata*	SOC/Sensitive	WNA	WNA
Birds				
Northern goshawk	*Accipiter gentilis*	SOC/Sensitive/MIS[a]	WNA	MAI
California spotted owl	*Strix occidentalis occidentalis*	SOC/Sensitive/MIS	WNA	MAI
Willow flycatcher	*Empidonax trailii brewsteri*	SOC/Sensitive	WNA	WNA
Mammals				
Pacific fisher	*Martes pennant pacifica*	Candidate/Sensitive	WNA	MAI
American Marten	*Martes americana*	Candidate/Sensitive	WNA	MAI
Pallid bat	*Antrozous pallidus*	Sensitive	WNA	MAI
Townsend's big-eared bat	*Corynorhinus townsendii*	Sensitive	WNA	MAI
Western red bat	*Lasiurus blossevillii*	Sensitive	WNA	MAI

Notes:

a. MIS = Management Indicator Species.

b. MAI = May affect individuals but not likely to result in a trend toward federal listing or loss of viability.

c. WNA = Will not affect.

d. SOC = Species of Concern.

In Section 3.11.4: "of Environmental Consequences" the potential effects of the proposed action alternatives on those species listed in Table 3-53 are discussed (see the Wildlife and Fish BA/BE for additional discussion of effects for these species).

Species not listed in Table 3-53, were eliminated from detailed study in the EIS and the BA/BE on the basis that (1) they are not known to be located on the Plumas National Forest; (2) they are known to be found at much lower or higher elevations, or much further north or south of the project area; (3) suitable habitat is not found in the project area; and (4) surveys in or near the project area did not locate any individuals. The following species were not analyzed in detail for the Sugarberry Project FEIS or BA/BE: winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Delta smelt, Central Valley steelhead, Lahontan cutthroat trout, Sierra Nevada red fox, Carson wandering skipper, valley elderberry longhorn beetle, California wolverine, northern leopard frog, greater sandhill crane, American peregrine falcon, and Swainson's hawk.

The following species are found on the Plumas National Forest and have potential suitable habitat in the Sugarberry Project: the bald eagle, California red-legged frog, and great gray owl. These species are omitted from further discussion and will not be discussed further in this document on account of: no detections from surveys, and/or, limited habitat availability, and/or applied mitigation measures, and/or that proposed treatments would not impact habitat.

The following species are found on the Plumas National Forest and/or there is suitable habitat within the Sugarberry Project: California spotted owl, northern goshawk, Pacific fisher, American marten, mountain yellow-legged frog (MYLF), foothill yellow-legged frog (FYLF), western pond turtle, pallid bat, western red bat, Townsend's big-eared bat, willow flycatcher and hardhead minnow. Effects to these species as a result if implementing the proposed Sugarberry Project are analyzed and discussed below.

3.11.2 Methodology for Assessing Impacts on Wildlife and Fish

Scope of the Analysis

Past activities are considered part of the existing condition and are discussed in "Section 3.11.3: Affected Environment (Existing Conditions)."

The terrestrial wildlife analysis area for determining cumulative effects on terrestrial wildlife includes 38,545 acres of National Forest System land and 11,223 acres of private land for a total of 49,768 acres. The cumulative effects analysis looks at ll past, present, and future treatments in the analysis area.. The terrestrial wildlife analysis area for determining direct and indirect effects on terrestrial wildlife includes 38,545 acres of National Forest System land. The Sugarberry Project area is surrounded by private land and/or other HFQLG projects. Private land accounts for approximately 22.6 percent of the area which includes a high degree of commercial timber production and harvest.

The analysis area for terrestrial wildlife was chosen based on the project treatment locations and the natural topography. Relative to the species discussed in this document their breeding, nesting, foraging and home ranges can vary in extent depending on the species.

The home range of the owl is representative of the home range of avian and/or 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 mature/late serial stage species. Therefore, the owl is used as a surrogate for American marten, Pacific fisher and the northern goshawk. California spotted owl Protected Activity Centers (PAC) and/or Home Range Core Areas (HRCAs), and northern goshawk PACs that fall partially or entirely within the respective project area boundary and those PACs/HRCAs that fall within ½ mile of a treatment unit considering topographic features were included in the wildlife anaylsis. The analysis area addresses the effects (direct, indirect, and cumulative) to owls at the PAC/HRCA scale. 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 cumulative effects analysis area includes past, present, and reasonably foreseeable future projects occurring within the Sugarberry Project terrestrial wildlife analysis area. Past actions were considered which have occurred in and around the proposed Sugarberry Project treatments, such as timber sales and fuel reduction projects on Forest

Service and on private lands. Limitations of the analysis include future activities on private land.

The aquatic analysis area for determining direct, indirect, and cumulative effects on fisheries and aquatic habitat-dependent wildlife includes 43,800 acres of National Forest System lands and 14,290 acres of private land for a total area of 58,088 acres. The aquatic analysis area is comprised of 44 subwatersheds ranging from 510 to 2,350 acres, and is the same as the CWE analysis area described in the Sugarberry Project "Hydrology Report" (USDA Forest Service 2007a). A watershed is a naturally occurring and easily distinguishable division of landscapes. It is particularly well-suited as a spatial analysis unit when considering direct, indirect, and cumulative effects on aquatic species because these effects generally will not extend beyond the physical boundary of the watershed. The aquatic analysis area includes all subwatersheds within which Sugarberry Project activities are proposed. Because upstream activities can have substantial effects in a given location due to the linkage and movement of water and materials from headwaters to downstream areas, the aquatic analysis area also includes all upstream subwatersheds which are directly connected to subwatersheds containing treatment activities, including three subwatersheds within which there are no proposed treatments.

Analysis Methods for MIS and NTMB

Guidance regarding Management Indicator Species (MIS) are set forth in the Plumas National Forest LRMP and the 2001 SNFP FEIS 2001 Appendix E, which 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 and the 2001 SNFP FEIS 2001 Appendix E. . A listing of MIS species can be found in the ROD on the 1988 Forest Plan, page 4 and Appendix G (refer to the letter dated May 30, 2006, "Clarification on Plumas National Forest MIS List." A listing of MIS species (not including those species that are threatened and endangered) and habitat rating can be found in Table 3-39 (p. 3-98) of the HFQLG Act FEIS (USDA Forest Service 1999a). That document indicates which MIS species could benefit from Pilot Project treatment activities, which species could experience a loss of habitat values, and which species' habitat value would remain the same. The mule deer analysis resulted in a positive habitat value trend and an increase from moderate to high habitat rating. The trout group was not rated.

The Plumas National Forest MIS that are not federal threatened and endangered species, such as the trout group and mule deer, are addressed individually in the Sugarberry Project "MIS Report."

Neotropical Migratory Birds (NTMB) are of special concern because their breeding area includes the North American temperate zones, and in many cases, they will migrate south of the continental United States during non-breeding seasons (Hunter et al. 1993).

The overall effect of management activities on NTMB species populations has not been specifically studied, unless a species falls within the category of federal Threatened and Endangered or Forest Service Sensitive or MIS. The Forest Service has a legal mandate to provide habitat for viable populations of NTMBs. However, if any NTMBs were not well distributed or had viability concerns, they were included on the 1998 Forest Service Sensitive Species List, which was amended in March 2001 and May 2003. Although current management guidelines under the Landbird Strategic Plan ensure that habitat will be protected for these species, the presence of suitable habitat does not necessarily mean these species are present in that habitat.

Analysis Methods for Threatened and Endangered and Sensitive Species

The wildlife surveys were based on habitat typed as suitable and followed Region 5 survey protocols for California spotted owls, northern goshawk, American marten, Pacific fisher, amphibians, and other target species. Surveys for species varied in scale; for example, the California spotted owls surveys for suitable habitat, (nesting and foraging) which included analysis of the Home Range Core Areas (HRCA) and extended as much as 0.5 mile from the outer boundaries of the treatment units. Whereas surveys for amphibians targeted typical habitat conditions found in and along streams and ponds that are in or near treatment units. Survey status and protocol are described below for those species with a “may affect individuals” determination.

Surveys were conducted in and adjacent to aquatic habitats throughout the aquatic analysis area by contract consultants between 2001 and 2006. Stream surveys followed Fellers and Freel (1995) protocol and specifically targeted California red-legged frogs, mountainyellow legged frogs, foothill yellow legged frogs and the western pond turtle. Pond surveys followed either “Western Pond Turtle Survey Methods” by Reese (1993) or “Guidance on Site Assessment and Field Surveys for California Red-legged Frogs” by USFWS (1997). Of 278 miles of perennial and intermittent streams in the aquatic analysis area, 192 miles (69 percent) were surveyed, with priority placed on areas near and downstream of proposed project activities. Seven pond surveys were conducted using either USFWS (1995) or Reese (1993) protocol to determine presence of California red-legged frogs or western pond turtles, respectively, although surveyors were instructed to record sightings of all amphibian and reptile species. Koo and Vindum’s (1999) fieldwork and survey of major American museum collections yielded additional species occurrences in the aquatic analysis area, as did formal surveys and anecdotal observations by U.S. Forest Service and other agency personnel documented in fisheries and wildlife files at the Feather River Ranger District. Surveys were conducted by May & Associates 2001, Galloway Consulting, Inc. 2005, and Klamath Wildlife Resources/MGW Biological 2006.

Mountain Yellow-legged Frog. Twenty-six sightings of MYLFs were documented in streams and ponds throughout the Slate Creek watershed at elevations above 4,000 feet, although there was a record of two tadpoles in Slate Creek at an elevation of 3,920 feet MYLFs are not known from Canyon Creek or South Fork Feather River watersheds.

Foothill Yellow Legged- frog. Thirty-seven sightings of FYLFs were documented, with the majority from the Slate Creek watershed, but both the South Feather River and Canyon Creek watersheds were represented.

Western Pond Turtle. Five ponds were surveyed with the Reese (1993) protocol, and two ponds have been surveyed with the USFWS (1997) protocol, depending on habitat suitability. No western pond turtles were observed. There have been no historic observations of western pond turtles from within the Sugarberry Project aquatic analysis area. The closest documented occurrence is in New Bullards Bar Reservoir, which is about 1 mile downstream of Slate Creek via North Yuba River.

California Spotted Owl. Across the Forest project-related surveys, at various levels (i.e. not all areas, not all years), have been conducted for the California spotted owl. Surveys followed the “Protocol For Surveying For Spotted Owls In Proposed Management Activity Areas And Habitat Conservation Areas”; Region 5; March 12, 1991 (revised February 1993) (USFS 1993).

There are 22 known California spotted owl Protected Activity Centers (PAC), and their associated HRCAs, in the Sugarberry Project area. Surveys in the Sugarberry Project area began in April and were completed in August (2004–2006). In 2004 through 2006, there were 13 owl pairs reported. All pairs, with the exception of one, were found in a historical site. During reproductive visits, 4 nestlings were found and later 6 fledglings were detected. There were 4 nests located and 13 activity centers established. In 2001, the Lower Slate BE/BA reported 7 pairs, 2 nests, 1 fledgling and 13 activity centers from historical surveys (1990–1998).

In 2000–2001, Foster Wheeler Environmental Corporation conducted surveys for Slate Creek watershed (Lower Slate and Upper Slate). In 2000, surveys for the Upper Slate Project located 2 owl pairs, 1 nest and 3 juveniles. On seven occasions, spotted owls were detected and/or observed in the Lower Slate area. Two of those detections were a pair. On five occasions, spotted owls were detected and/or observed in the Upper Slate area. Two of those detections were a pair. Follow-up visits were preformed on all previous survey locations where spotted owls were detected. An additional two spotted owl were located in Lower Slate. Survey records (1990–1998) for Lower Slate report 13 activity centers, 7 pairs, 2 nests, 1 fledgling, and 1 single male detection.

Male sparred owls were detected several times in 2004 and 2005 during the Sugarberry Project surveys. In 2000–2001 during other field surveys 6 barred owl detections were recorded in the Sugarberry Project area. Many of the observation were visual and others were based on verbal detections. For further discussion of barred owls, see “Species Effects of the Action Alternatives” on page 179 under California spotted owl.

Within the 38,545 acre terrestrial wildlife analysis area (not including private), there are approximately 33,813 acres classified as suitable California spotted owl habitat. Approximately 10,498 acres classified as suitable California spotted owl nesting habitat (5M, 5D) and approximately 23,315 of acres classified as suitable California spotted owl foraging habitat (4M, 4D). There is also approximately 4,732 acres of non-suitable habitat within the analysis area. There are a total of 22 PACs, and associated HRCAs, and five SOHAs established in the wildlife analysis area. Of the 10,498 acres of suitable nesting habitat, 6,110 acres are in PACs and 2,139 acres in SOHAs.

Northern Goshawk. Four goshawk surveys were conducted periodically in the Sugarberry Project. Surveys areas occurred in Lower Slate and Upper Slate, and Strawberry and Sugar. Lower and Upper Slate were projects that preceded the Sugarberry Project. There were also a few smaller scale surveys completed in the project area. Surveys adhere to the “Survey Methodology for Northern Goshawks in the Pacific Southwest Region,” U.S. Forest Service, draft 14 May 2002.

There are 20 goshawk PACs in the Sugarberry Project area. A summary of the activity centers are as follows: 34 northern goshawks have been either visually detected or confirmed audibly in addition to 21 fledglings and 18 nests sites. The total numbers reflected may overlap with previous years (see the project file BE/BA for a comprehensive breakdown).

Within the 38,545 acre wildlife analysis area, there are 33,813 acres classified as suitable nesting habitat (5M, 5D, 4M, 4D) and approximately 4,732 acres classified as suitable foraging habitat (3M, 3D, 4P, 5P, and 6), including designated PACs. Within the analysis area, there are 3,382 acres of habitat designated as northern goshawk PACs.

Pallid, Western Red, and Townsend’s Big-eared Bat. Surveys followed an interim protocol approved by Forest Service Region 5.

In 1991, independent forest-wide surveys were conducted in June and September. This was the first intensive bat survey work conducted on the PNF. Two western red bats were found at French Creek, approximately 10 miles from the project area boundary.

From 1996 to 1999, the Sierra Nevada Field Station (SNFS) conducted bat surveys within Plumas and Sierra Counties. Several different species were located, including pallid bats, although none of these sites were near the project area. In 2001 and 2002, bat surveys were conducted for several HFQLG projects, including Upper Slate DFPZ, Lower Slate DFPZ, South Fork DFPZ, Bald Onion DFPZ, Brush Creek DFPZ, and Sugarberry DFPZ. Sly Creek and Woodleaf-Palermo Transmission Line Projects (FERC NOS. 4851 and 2281) (Pacific Gas & Electric Company 2004-2005) located pallid bats but not within or close to proposed treatments.

In 2006 Pallid Bats were detected using acoustic recordings outside the Sugarberry Project: Cedar Flats, Four Trees, Little Onion Valley and Hartman Bar Bridge. Outside the Sugarberry project area around the Moorville Ridge and Hartman Bar Ridge 69 pallid bat calls were recorded in various lactations in Plumas National Forest in 2006. These areas are approximately 8 miles from the Sugarberry project boundary.

In 2007, Eco-Tech Consultants, Inc. (ETC), conducted surveys in the southern two-thirds of the Plumas National Forest. The areas within Sugarberry that had either acoustical or capture sites include Provery Hill, Port wine, Lucky mine, Cedar Creek, Sugar Loaf, Table Rock and Howland flat. Fifteen pallid bat captures occurred within the Sugarberry Project. All but one was captured within a spotted owl PAC. The remaining one was captured near Potosi Creek where there are no treatments proposed.

Section 3.11.4: in Environmental Consequences discusses potential affects on habitat for the pallid, western red, and Townsend’s big-eared bats. If bats are found at a later date, appropriate protection measures would be applied before implementation of DFPZ treatments or group selection in the Sugarberry Project area.

Little Willow Flycatcher. There are 5 meadows (≥15 acres) in the project area that are considered suitable willow flycatcher habitat found on approximately 55 acres. One meadow is being proposed for enhancement by conifer removal. If nesting little willow flycatchers are found later, appropriate protection measures would be applied before implementation of proposed project treatments. Surveys followed “A Little Willow Flycatcher Survey Protocol for California” (Bombay, Benson, and Valentine 2003). Surveys from 2004 through 2005 were limited to areas with historical observations and potentially suitable habitat. Although no little willow flycatchers have been observed in the Sugarberry Project area, potential habitat may occur in the RHCAs.

Pacific Fisher and American Marten. No Pacific fisher or American marten have been observed in the Sugarberry Project area, even though potential habitat exists. Carnivore surveys conducted in the winter of 1999 on the Plumas National Forest did not find the target species. Potential sites were assessed using on-the-ground habitat typing or topographical maps and aerial photos. Foster Wheeler Environmental Corporation conducted surveys in the Lower Slate area, using camera stations, between May and July 2001. No target carnivore species were detected during either the spring or the fall camera surveys. An incidental marten sighting occurred during the survey period, but no martens were recorded on camera. Surveys follow the “American Marten, Fisher, Lynx, and Wolverine: Survey Methods for their Detection” (Zielinski/Kucera, PSW-GTR-157, August 1995) There additional detection methods discussed in the Wildlife BE/BA 2007 Status/Distribution/ Occrrence report, page 83.

Hardhead Minnow. Surveys have not been conducted for hardhead minnows for the Sugarberry Project. The Sugarberry Project is in the boundaries of the South Fork Feather Project area (Federal

Energy Regulatory Commission Project Number 2088) and numerous consultants have completed biological studies within the hydropower project area (South Fork Feather Water and Power Agency 2006). Known and suspected distributions of hardhead minnows are found in the Forest Fisheries GIS layer, atlases, and stream files. A suspected distribution may exist although there is no data to verify presence since suitable habitat includes no barriers to prevent migration, and hardhead minnows are present below or above these reaches. Hardhead minnows are not known to occur in the aquatic analysis area, but their presence is suspected in the lower-most reach of Slate Creek near the confluence with North Yuba River.

3.11.3 Affected Environment (Existing Conditions)

Introduction

This analysis considers the affects of the three action alternatives on wildlife and fisheries species and their associated habitats. It includes discussions of how changes in habitat components can reduce habitat suitability, for specific specialized species. It also discusses the potential effects of road density and wildfire for all habitat types. This document analyzed those species that would be affected by the Sugarberry Project (see Table 3-53). The following sections discuss the existing conditions for wildlife and fisheries.

Existing conditions in the Sugarberry Project area are highly related to natural events (fire, insects, and disease), past clear-cuts, thinning, salvage projects and old mining town sites. Species associated with mature/old-forest structure and composition occupy home ranges of widely varying sizes, from small areas occupied by small mammals to large landscape areas required by raptors (such as the California spotted owl) or carnivores (such as the Pacific fisher) (SNFPA FEIS 1999, Chapter 3, p.111). Aquatic habitat has been shown to have an overall high wildlife diversity and density when compared to the general forest matrix.

General Habitat

Functional characteristics of late-succession forests include large decadent trees as well as snags, and large down logs. Large trees, and the snags they produce, have been found to be critically important to wildlife species. Discussion about the project areas general habitat composition and stand structure can be found in Section 3.3.4: Affected Environment (Existing Conditions). Refer to the Wildlife and Fish BA/BE Appendix E for habitat requirement discussions for individual species.

Habitat Components and Structure. The HFQLG FEIS and ROD and the SNFPA FEIS and FSEIS RODs and associated Wildlife and Fish BA/BEs identify and discuss in detail the components of the following habitat.

The analysis of general effects on wildlife habitat focuses on changes to CWHR 4 and 5 stands as a result of proposed treatments because of the importance of these size classes to a wide variety of wildlife species. Wildlife habitat assessments are based on the CWHR system. The CWHR system describes forest habitats through tree size and canopy closure. Although shrub and herbaceous layers are decidedly important wildlife habitat attributes, they are not used by the CWHR system as a means to describe habitat. Resulting classes are then rated in regard to habitat value for various wildlife species.

The CWHR classes with the highest habitat value for mature and old-forest-dependent species considered in this document are:

- CWHR Size 4 (11–24 inches dbh)

- CWHR Size 5 (greater than 24 inches dbh)
- CWHR Size 6 (multilayered stand with a Size Class 5 over a distinct layer of Size Class 3 or 4, total tree canopy greater than 60 percent closure)
- Density of M (moderate canopy closure with 40–59 percent cover)
- Density of D (dense canopy closure with 60–100 percent cover)

Canopy Cover. Existing canopy cover across Sugarberry Project analysis area is comprised primarily of CWHR 4M (40–59 percent canopy cover) and 4D (60–80 percent canopy cover). Including private and public lands, the analysis area is approximately 60 percent CWHR 5s and 20 percent CWHR 4s.

Large Trees. The large tree component with the Sugarberry Project can be classified as stands of CWHR size 5. Within the Sugarberry Project, size 5 stands make-up 10,498 acres. Existing trees in the Sugarberry Project area would require approximately another 10 years for a maximum-sized CWHR 4 (24 inches dbh) stand to reach the minimum CWHR 5 (25 inches dbh). It takes 30–50 years to grow a CWHR 4 (11–24 inch dbh) stand and approximately 100 years to grow a CWHR 5 (greater than 24 inches dbh) (Oliver et al. 1996; Dunning and Reineke 1933). Large trees contribute in ways such as; protection from adverse weather, protection from the sun, cavities for nesting, limbs for resting and perching, bark for roosting bats, and vegetation and insects as food. In addition, the number of large trees affects the numbers of trees available as recruitments for future large snags (dead trees) and large woody material (logs).

Snags. Field data shows existing snags in treatment units in the Sugarberry Project average 3.1 snags per acre. The average dbh size of snags per acre is approximately 18.2 inches. Snag data is collected using the Forest Inventory and Analysis (FIA) plots (see Sugarberry Project – Vegetation, Fire and Fuels Report, 2006). For snag retention, Standards and Guidelines from Table 2 (page 69) of the SNFPA ROD will be followed for this project.

Information regarding the abundance or lack of snags on private lands is unavailable. Generally, private lands are treated with different objectives than National Forest System lands and therefore are minimally or not suitable as habitat for mature/older-forest dependent species. Urban areas and immediate surrounding are not now or ever expected to be suitable habitat for the owl.

Large Woody Material. Natural tree mortality, which includes trees killed by insects, disease, or injury, provides snags to the forest environment. Snags eventually deteriorate, collapse, and become logs. These materials furnish cover and serve as sites for feeding, reproducing, and resting for many wildlife species (Maser et al. 1979). Wildlife species are known to use dead and down woody materials as either a primary or a secondary component of their habitat requirements. Down logs and large woody debris is also an important component of aquatic habitats in forested areas (Swanson et al. 1976). Large woody material affects channel morphology through such processes as the storage and routing of sediment, bank stabilization, and pool formation (Bisson et al. 1987).

High quantities of downed large woody material are not expected to exist equally across the landscape. Overall, less productive soil types, such as exposed sites including ridge tops or south-facing slopes, serpentine sites, and areas with shallow or erosive soils, are expected to have less downed large woody material due to more open forest cover and slower growth rates of vegetation.

Productive sites are capable of growing vegetation more quickly and produce high tree densities associated with mortality. Large woody material was estimated using Forest Inventory Analysis data. Down woody material averages approximately 17 tons per acre. Not all project units were surveyed for large woody material; the approximant large woody material reported reflect estimations of other units of similar condition that were not inventoried. Quantities of downed large woody material are not expected to exist equally across the landscape. Where available Management Direction for large woody material require to leave 8–12 logs per acre, which generates approximately 10–15 tons per acre, that are 20 inches or greater in small end diameter and 10-feet long or longer.

Black Oak Habitat. Montane hardwoods or mixed conifer-hardwood forests are minor vegetation types in the analysis area and may consist of black oak and conifers. Some areas in the Sugarberry Project are not conducive to oak and do not retain oak. The average number of black oak in the Sugarberry Project is approximately 257 trees per acre. The majority of black oaks found in the project area are less than 1 inch. Approximately 8 percent of the stands proposed for treatment have oak. See the Wildlife BE/BA for discussion of oak and its connection to wildlife species.

Road Density. The total length of roads in the Sugarberry Project wildlife analysis area are 319 miles and the total in the aquatic analysis area are 396 miles. The road density within the Project area is at 4.24 miles per square mile, whereas the road density is at 4.5 miles per square mile in the aquatic analysis area.

The network of roads across the Forest has altered and continues to alter vegetative communities and habitat for wildlife species. Direct and indirect effects of the road network include: (1) increased soil erosion; (2) degradation of air and water quality; (3) spread of invasive species; (4) mortality, avoidance, and displacement of wildlife; and (5) habitat fragmentation.

Roads are the largest single human-caused source of aquatic habitat degradation in the Pilot Project area (HFQLG FEIS, p. 3-7). The most obvious effect of roads on aquatic habitat quality relates to increased surface erosion rates (Reid and Dunne 1984; Duncan et al. 1987) and sediment delivery (Beschta 1978; Bilby et al. 1989).

Wildfires. One of the most obvious consequences of fire in forests is the impact on wildlife habitat.

> "*Fire has the immediate effect of changing the structural and compositional features of wildlife habitat, but this does not mean the habitat has been "destroyed." The wide range of fire types dictated by fuel loads, fuel moisture, and weather conditions produce a wide range of post-burn results. Many low- to moderate-intensity fires can actually have a net positive effect on wildlife habitat. Large destructive fires, on the other hand, can seriously affect habitats and require years for recovery. Bigger, hotter fires destroy more of the seed base and cause a greater loss of topsoil, both of which make habitat recovery slower and more difficult, whereas low-intensity fires generally have a positive impact on habitats by creating mosaics of differing successional stages that promote plant and animal diversity. Low-intensity fires also thin out dense understories, improve vegetation heath, and allow for easier wildlife movement*" (University of California Cooperative Extension 2004).

Aquatic and Riparian Habitat. Sugarberry Project aquatic analysis area elevations range from 1975 feet above sea level at the confluence of Slate Creek and the North Yuba River to 7,715 feet at

Mt. Fillmore. Annual precipitation ranges from 65 to 80 inches and varies due to elevation from 10 to 90 percent snow (USDA Forest Service 1999b). This precipitation input results in a diverse array of aquatic habitats within the Sugarberry Project area, many of which have been altered by human activities. Naturally occurring aquatic habitats include streams, swales, ponds, springs, seeps, and wet meadows, whereas humans have constructed ditches, pits, and reservoirs.

Streams and associated swales are the most abundant aquatic habitats. The Plumas National Forest GIS shows a total of 627 miles of streams in the Sugarberry Project aquatic analysis area. This total includes stream reaches that course through private land within the Plumas National Forest boundaries. Of this total, the majority consists of swales, or ephemeral channels that generally do not exhibit annual scour (339 miles, 54 percent). Intermittent (137 miles, 22 percent) and perennial (151 miles, 24 percent) streams comprise approximately equal proportions of the remainder. Fish are known or suspected to inhabit 100 miles of streams. Fish bearing waters are generally perennial, although a small fraction of intermittent waters contains fish at least seasonally or within pools that remain in deeper parts of the channel when flows discontinue. Perennial streams that do not contain fish generally are either too steep to provide suitable habitat, or they have barriers such as cascades or large woody debris jams that prevent fish from infiltrating otherwise suitable habitat. Cascades are exceedingly common due to the substantial vertical relief of the area.

Specific Species. The wildlife BA/BE for Sugarberry provides further discussion of the Affected Environment and the Species Account.

3.11.4 Environmental Consequences

Introduction

The treatments proposed for the Sugarberry Project would avoid California spotted owl PACs, SOHAs and occupied MYLFs and FYLFs, and Western pond turtle habitat. There are exceptions for goshawk PACs and RHCAs areas. Treatments such as underburns, hand piling, hand thinning and mastication are allowed in goshawk PACs. Treatments in the RHCAs would be limited. In DFPZ units, treatment in the RHCAs would be limited to underburning, hand piling, and hand thinning, except in some plantations where mechanical treatment (mastication) is prescribed near ephemeral streams. In addition, 50-foot buffers would be applied to 136 miles of ephemeral streams, and treatments in the ephemeral stream would be limited primarily to brush removal. Group selection would avoid RHCAs. Refer to the “Section 3.9: Hydrology” in this FEIS for more discussion about the proposed treatments in RHCAs.

Alternative A (No Action)

The following discussion focuses on the effects of Alternative A on habitat components. This discussion applies to all species considered in this document. Subsequent sections (for example, effects of Alternative A on such species as the northern goshawk and California spotted owl) refer to this discussion rather than repeat the information for each species. In addition, proposed activities that have the potential to improve wildlife habitat, such as black oak enhancement, streambank stabilization, meadow restoration, and road decommissioning, would not be conducted under Alternative A.

Effects on General Habitat

Habitat Components and Structure

Evaluation of forest habitat components and structures under the no action alternative included current historical information and assumptions concerning estimated habitat changes in the absence of disturbances and/or treatments. For example, future wildland fires, amount of yearly rainfall and/or harvesting lumber would produce different landscape progression. The brief discussions below focus on habitat as it relates to wildlife species under the no-action alternative.

Canopy Cover. Canopy cover would continue to become denser, and tree sizes would grow at a slower rate, which could prevent or slow down the potential for stands to move to the next size class. However, the potential effects on mature/old-forest-associated wildlife species of reducing the canopy cover to 40 to 50 percent and lower would not occur. Also, the understory layer would be retained.

Large Trees. Under Alternative A, no trees greater than 30 inches dbh would need to be cut for operability because proposed activities (permanent and temporary roads construction, reconstruction of temporary roads, and construction and reconstruction of landings) would not occur. Depending on individual stand density and tree sizes, tree growth could be affected at varying rates due to competition for nutrients and space. However, the potential effects to mature/old-forest associated wildlife species of removing large trees would not occur. Also, the large trees which provide future recruitment of snags and large woody material would be retained.

Snags. Under Alternative A, no snags would be removed. Depending on stand density and tree sizes, tree growth could be affected at varying rates due to competition for nutrients and space. While maintaining the stand densities in the short term, (not implementing Action Alternative) this competition could reduce the recruitment of large trees and future snags and large wood material for the long term. Whereas, mortality in intermediate and suppressed trees would increase, resulting in more snags and dead and down logs. Snags and down woody material would benefit species such as the California spotted owl, northern goshawk, and forest carnivores, which are associated with late-succession forests.

Large Woody Material. Under Alternative A, no large woody material would be removed. Also, no potential snag recruitment trees (30 inches dbh trees or otherwise) would be lost. However, depending on each stands density and tree sizes, tree growth could be affected at varying rates due to competition for nutrients and space. While maintaining the existing large woody material in the short term, this competition could reduce tree growth and the recruitment of large trees and future large woody material for the long term.

Black Oak Habitat. Under Alternative A, proposed black oak enhancement will not be implemented and retained oaks within DFPZ will not be released. However, under the no-action alternative, black oaks within group selection units will not be removed. The no-action alternative will retain existing oaks but could also negatively affect the overall quality of black oaks for the long term as a result of shade and competition from conifers and dense understory.

Road Density. Under the no-action alternative, new roads would not be constructed and existing roads would not be reconstructed, so there would be no additional disturbance as a result of these activities. In addition, implementing the Action Alternatives would not drastically reduce road density. Areas that have reduced road density are important reservoirs of wildlife habitat and provide critical ecological functions, including: (1) relatively high levels of intact old-growth forests; (2) habitat for species of conservation concern; (3) a broad array of habitat types; and (4) buffer areas from invasive species and edge effects. The network of roads across the Forest has altered and continues to alter vegetative communities and habitat for wildlife species. Direct and indirect effects of the road network include: (1) increased soil erosion; (2) degradation of air and water quality; (3) spread of invasive species; (4) mortality, avoidance, and displacement of wildlife; and (5) habitat fragmentation.

The total length of roads in the Sugarberry Project area would remain at 319 miles and the total in the aquatic analysis area would remain at 396 miles. The road density within the Project area would remain at 4.24 miles per square mile, whereas the road density would remain at 4.5 miles per square mile in the aquatic analysis area. Roads not closed or decommissioned would continue to contribute to accelerating erosion processes, which would alter water quality and aquatic habitat.

Wildfires. Fuel conditions are variable throughout the Sugarberry Project area and can be described by six Northern Forests Fire Laboratory fuel models (see “Fire and Fuels” in Section 3.3.3.2). The action alternatives would each increase the likelihood that wildland fires occurring in the treatment units would be successfully suppressed by initial attack hand crews and engines when compared to the no-action alternative. Fires affect animals mainly through effects on their habitat. See the Wildlife BE/BA for affects on wildlife habitat structure and coposition caused by fires.

Aquatic and Riparian Habitat. Under the no-action alternative, natural succession would continue to modify the condition of aquatic and riparian habitats. This would largely have beneficial effects on the habitat quality of streams affected by past land-use activities, especially those that exhibit degraded riparian habitat and decreased levels of in-stream large woody material. However, vegetation would continue to encroach upon ponds and wet meadows, thereby reducing their size and altering their physical characteristics. No meadow restoration or aspen regeneration projects would occur.

Degraded stream channels and mine sites would continue to recover. Unfortunately, in some of the most extreme cases, this is a process that may last for centuries while continuing to cause adverse resource impacts such as chronic fine sediment deliver to stream courses (James 1999). Streambank stabilization and sediment pond construction projects intended to ameliorate and accelerate recovery processes would not occur.

Stream crossing and culvert improvement projects would not occur, and fish and aquatic wildlife access to suitable upstream habitats would continue to be blocked. New road construction would not occur, and neither would the reconstruction or decommissioning of roads that are currently deteriorating and negatively impacting aquatic habitats. There would be no action to reduce the risk of large or high intensity wildfire.

Effects on Species

Mountain Yellow-Legged Frog and Foothill Yellow-Legged Frog

Direct Effects. There would be no direct effects on MYLFs or FYLFs habitat, as no activities would occur that would cause disturbance to individual frogs, nor any impacts to the existing habitat conditions.

Indirect Effects. The indirect effects of the no-action alternative include the potential for future wildfire and its impact on habitat development and recovery. The currently existing fuel loads that would be left untreated by this alternative would make potential wildfires more difficult to suppress and create a larger and more intense burn than would potentially occur following the fuels treatments of the action alternatives.

The potential short- to long-term effects on riparian and aquatic habitats of an intense wildfire described in detail above that are relevant and would be detrimental to mountain or FYLFs or their habitat include increased sedimentation, increased water temperatures, modified macroinvertebrate fauna, and a decrease in cover provided by riparian vegetation. Over longer time periods (5–10+ years), as negative effects attenuate, aquatic and riparian habitat for frogs could improve as fire-killed trees become in-stream large woody material (assuming that they would not be salvage logged) and riparian vegetation recovers. This scenario assumes that frog populations remain extant through and following a wildfire. Evidence from a frog species from a fire-prone habitat in Africa suggests that frogs may use acoustic cues to detect and seek protective cover from approaching fire, thereby avoiding direct impacts (Grafe et al. 2001).

Cumulative Effects. Assessment of cumulative effects is speculative due to the uncertainty of how past, present, and foreseeable activities affect MYLF/FYLFs. However, it is likely that the effects of a large and intense fire could add to past land-use activities in the aquatic analysis area, especially the legacy effects of late nineteenth-century hydraulic mining and mid-twentieth century logging and road building. Present and future foreseeable actions will likely have low effects due to contemporary protective measures.

Western Pond Turtle

Direct Effects. Refer to MYLF and FYLF discussion above.

Indirect Effects. Refer to MYLF and FYLF discussion above.

The potential short- to long-term effects on riparian and aquatic habitats of an intense wildfire described in detail above that are relevant and would be detrimental to western pond turtles or their habitat include increased sedimentation, modified macroinvertebrate fauna, and a decrease in cover provided by riparian vegetation. Over longer time periods (5–10+ years), as negative effects attenuate, aquatic and riparian habitat for turtles could improve as riparian vegetation recovers and fire-killed trees become in-stream large woody material (assuming that they would not be salvage logged) create pool habitat.

Cumulative Effects. Past land-use has modified the suitability of western pond turtle habitat in the aquatic analysis area in many ways. Sedimentation and removal of riparian vegetation resulting from hydraulic mining, road-building, and indiscriminate logging has probably decreased suitability by reducing the number and quality of pool habitats in lotic (flowing water habitats) waters. On the other hand, the construction of ponds in association with mining and restoration activities may have created suitable aquatic habitat. Present and future foreseeable actions will likely have low effects due to contemporary protective measures.

Hardhead Minnow

Direct Effects. Refer to MYLF and FYLF discussion above.

Indirect Effects. Refer to MYLF and FYLF discussion above.

The potential short- to long-term effects on riparian and aquatic habitats of an intense wildfire described in detail above that are relevant and would be detrimental to hardhead minnows or their habitat include increased sedimentation and modified macroinvertebrate fauna. Severe levels of sedimentation would reduce the depth of large pools favored by these fish (Moyle 2002), possibly rendering the habitat at the mouth of Slate Creek completely unsuitable. Alterations to the macroinvertebrate fauna would have a disproportionate effect on juveniles, which are more dependent than adults on this food source (Reeves 1964). This may not be a factor, however, since juvenile hardhead may be excluded from the aquatic analysis area due to the presence of predatory smallmouth bass (Gard 1994).

Cumulative Effects. Sedimentation caused by the legacy of mining, logging, and road building has no doubt had detrimental effects on the physical habitat structure of potentially suitable habitat for hardhead minnows in the aquatic analysis area. On the other hand, the effect of removing riparian vegetation throughout the basin on increasing water temperature in the lower reach of Slate Creek may actually have improved the thermal characteristics relative to hardhead minnow habitat preferences (Knight 1985). Ultimately, the presence of the non-native predatory smallmouth bass precludes the potential use of lower Slate Creek for hardhead minnow spawning (Gard 1994).

Since temperature is not currently a limiting factor here for hardhead minnows, only negative effects would result from the cumulative effects of past, present, and future activities in combination with an intense wildfire over a large portion of the watershed. The habitat for hardhead minnow is marginal at best, and could be rendered completely unsuitable in the event of a large and intense wildfire, the risk of which is not reduced by the no-action alternative.

California Spotted Owl

Direct Effects. The no Action Alternative would lead to minor changes in known nesting habitat for the California spotted owl. Closed-canopy old growth stands are favored by California spotted Owls and technically less flammable, because of the large tree component and the dense canopies which maintain higher relative humidity within the stands and reduce heating and drying on surface fuels by solar radiation and wind. Recent fires which exhibited 90th percentile fire conditions burned this habitat type at high fire intensities. See “Section 3.3: Vegetation, Fire and Fuels” in this document.

Indirect Effects. Over the long term, forest vegetation would continue to grow, increasing canopy cover of dominant and co-dominant trees. Mortality in intermediate and suppressed trees would increase, resulting in more snags and dead and down logs. However, diseased trees are found most frequently found in overcrowded stands. See “Section 3.3: Vegetation, Fire and Fuels” for the discussion on diseased trees. These changes would benefit species such as the California spotted owl, which are associated with late-succession forests. However, in case of a wildfire the loss of late-succession forests could eliminate habitat for species associated with those forests.

Cumulative Effects. The No Action Alternative for the Sugarberry Project would not provide for the long-term protection of California spotted owl habitat from wildfire. There would be no actions designed to reduce the risk of high intensity wildfire (based on analysis conducted in SNFPA (2001). There would be no thinning that could enhance the growth of dominant and co-dominant trees that may provide future habitat availability.

Northern Goshawk

Direct Effects. Refer to California spotted owl discussion above. There would be no direct effects on goshawks or goshawk habitat because no activities would occur that could cause disturbance to nesting/foraging goshawks or impact existing habitat conditions.

Indirect Effects. 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, which could lead to increased rates of spread resulting in potential loss of suitable goshawk nesting habitat and other important prey habitat attributes such as large trees, large snags, and down woody material. The proposed treatments of thinning out the understory could create or improve habitat available for nesting and foraging.

Cumulative Effects. There would be no actions designed to control 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 (2001).

Pacific Fisher and American Marten

Direct Effects. There would be no direct effects on forest carnivore habitat, as no activities would occur that would cause disturbance to denning, resting, dispersing or foraging animals, nor any impacts to the existing habitat conditions.

Indirect Effects. There would be no indirect effects as no project would be implemented. Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery.

Cumulative Effects. There would be no cumulative effects as no project would be implemented. Cumulative effects from the no-action alternative could come from a stand replacing fire that would alter habitat components needed for the fisher or marten.

Pallid, Western Red, and Townsend's Big-Eared Bat

Direct Effects. There would be no direct effects on bats or bat habitat because no activities would occur that could cause disturbance to denning bats or impact existing habitat conditions.

Indirect Effects. There would be no indirect effects on bats or bat habitat because no activities would occur that could cause disturbance to denning bats or impact existing habitat conditions.

Cumulative Effects. There would be no cumulative effects on bats or bat habitat because no activities would occur that could cause disturbance to denning bats or impact existing habitat conditions.

Willow Flycatcher

Direct Effects. There would be no direct effects on willow flycatcher and/or its habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Indirect Effects. There would be no indirect effects on little willow flycatcher or little willow flycatcher habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Cumulative Effects. There would be no cumulative effects on little willow flycatcher or little willow flycatcher habitat because no activities would occur that could cause disturbance to nesting or foraging birds or impact existing habitat conditions.

Trout Group

Direct Effects. There would be no direct effects on trout or trout habitat, as no activities would occur that would cause disturbance to individual fish, nor any impacts to the existing habitat conditions.

Indirect Effects. The indirect effects of the no-action alternative include the potential for future wildfire and its impact on habitat development and recovery. The currently existing fuel loads that would be left untreated by this alternative would make potential wildfires more difficult to suppress and create a larger and more intense burn than would potentially occur following the fuels treatments of the action alternatives.

The potential short- to long-term effects on riparian and aquatic habitats of an intense wildfire described in detail above that are relevant and would be detrimental to trout or their habitat include change in waterflow timing, reduced seasonal waterflows, elevated water temperatures, increased sedimentation and modified macroinvertebrate fauna. Severe levels of sedimentation could reduce the depth of large pools favored by these trout (Moyle 2002), possibly rendering affected subwatersheds less productive. Alterations to the macroinvertebrate fauna could also reduce productivity near and downstream of severely burned areas.

Cumulative Effects. Sedimentation and degradation and destruction of riparian habitat caused by the legacy of mining, logging, and road building has no doubt had detrimental effects on the physical habitat structure of potentially suitable habitat for trout in the aquatic analysis area. , Trout habitat is currently fair to good throughout most of the project area, but could be rendered less suitable or even unsuitable at subwatershed scales in the event of a large and intense wildfire, the risk of which is not reduced by the no-action alternative

Mule Deer

Direct, Indirect and Cumulative Effects. Under the no-action alternative, deer foraging habitat would remain as is or possibly be lost due to wildfires. There would be no reduction in the 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, [Department of Fish and Game 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 National Forest, and the Sierra Nevada. 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. 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, therefore 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.

Swainson’s Thrush

Direct, Indirect and Cumulative Effects. 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 fire return interval for this area, 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 riparian habitat and simplification of habitat diversity.

3.11.4.5 Action Alternatives

General Management Requirements. Forest structural complexity, which is comprised of late-successional trees, multilayered vegetation and woody material, is an important component for mesocarnivores and avian species. DFPZs, group selection, and ITS treatments could result in the loss of mature/late-successional growth and could introduce additional fragmentation of habitat and wildlife travel corridors. In addition, activities on private lands have been adding to the fragmentation and decline of suitable habitat through urbanization, damming of rivers, construction of roads, and private timber management.

The Sugarberry Project is designed to fulfill the management direction standards and guidelines for fuels and vegetation management activities in the Sugarberry Project. The action alternatives would each increase the likelihood that wildland fires occurring in the treatment units would be successfully suppressed by initial attack hand crews and engines when compared to the no-action alternative.

The action alternatives would provide connectivity with the Bald Onion, Watdog, South Fork, and Slapjack Projects on the Feather River Ranger District. Future Forest Service fuel reduction projects, as well as those currently being designed by the Fire Safe Councils in Plumas, Sierra and Yuba Counties, would lack connectivity without the larger landscape-scale design proposed for the Sugarberry Project. Even though DFPZ effectiveness is not conclusive, and has not been established at the landscape scale (Agee et al. 2000), the Sugarberry Project is part of the HGQLG Act Pilot Project that is intended to evaluate the effectiveness of DFPZs.

DFPZ thinning units are located among other strategically placed treatment acres which together work as defensible places to fight and reduce risk of wildfires and fire spread. Reducing canopy connectivity (sawlog removal) and understory (biomass removal) fuels in these areas creates fuelbreaks which could potentially protect surrounding habitat from wildfire.

General Cumulative Effects. All of the projects discussed in this paragraph are HFQLG Pilot Projects. DFPZ, group selection, and ITS projects are scheduled for areas adjacent to Sugarberry and at other locations within the Feather River Ranger District. Projects implemented in the past within the same Sugarberry Project area were Upper and Lower Slate. The Upper Slate DFPZ is approximately 1,774 acres and the Lower Slate DFPZ is approximately 3,510 acres. The analyses for the Upper and Lower Slate projects concluded that impacts on California spotted owls, northern goshawk and other Forest Service Sensitive species would be low. All of the above projects may have had some low effects on species in the project area, However the determination of effects on Threatened, Endangered, and Sensitive species, would result in effects that would lead to a “trend toward listing” for sensitive species or “adverse effects” on listed species. The majority of effects were determined to be short term with long-term benefits.

General Habitat Effects. The following discussion focuses on the effects of the action alternatives on the mature/old-forest habitat components and black oak habitat, plus the effects of road density and the potential for habitat loss due to wildfires. This discussion applies to all wildlife species considered in this document. Subsequent sections (for example, effects of the action alternatives on the California spotted owl) refer to this discussion rather than repeat the information for each species.

Direct and Indirect Effects. DFPZs are situated along ridge-tops. Ridge-tops are not typically selected for nesting habitat by the California spotted owl or northern goshawk. The Pacific fisher and American marten use ridgetop saddles to cross from one watershed to another but do not typically use ridge-tops for den or rest sites. Headwaters for streams are located on ridgetops and do not typically provide suitable breeding habitat for amphibians and western pond turtles.

All action alternatives would meet the direction of the SNFPA ROD, and ROD on the HFQLG Act FEIS (with additional standards and guidelines). The areas proposed for treatment represent 20 percent of the wildlife direct and indirect effects analysis for the project area; 7 percent of the aquatic analysis area, and only 0.3 percent of the total acres proposed for treatment in the HFQLG Pilot Project area. “Section 3.11.4.6: Effects on Species” below provides a discussion of effects related to specific species.

Alternative B proposes to treat 3,295 acres of vegetative treatments (2,100 acres of DFPZ, 1,040 acres of GS and 155 acres of ITS), in addition to restoration projects (such as 100 acres of black oak and 20 acres of aspen). The proposed 3,295 acres of treatment are 8.5% of the 38,545 acre terrestrial wildlife analysis area (includiing private) and 5.6% of the 58,088 acre aquatic analysis area (includes private). The 3,295 acres of treatment are 0.2% of the 1,528,667 acre Pilot Project area. In addition, surveys were conducted at various levels for potentially effected Threatened, Endangered and Sensitive species.

Treatment prescriptions would call for removal of the smaller, suppressed, and intermediate crown-class trees; removal of some co-dominant and dominant trees; retention of the largest trees to achieve the target canopy cover or spacing guidelines. Thinning in DFPZs would reduce canopy cover to a minimum of 40 percent (in 2 units) and 50 percent in the remaining units. DFPZ treatments include: 250 acres of thinning; 120 acres of plantation thinning; 370 acres of underburning; 750 acres of mastication; 205 acres of mastication and underburn; and 375 acres of hand cut, tractor pile and burn; and 30 acres of hand cut, handpile and burn. Where California black oak is present in units DFPZs, GS an average basal area of 25 to 35 square feet per acre would be retained for oaks over 10 inches dbh,

Oak enhancement and aspen release treatments would remain the same.

The reduction in area of group selection harvest, ITS harvest, mechanical DFPZ treatment and transportation system improvements between Alternative B, and Alternatives C and G would decrease the short-term risk of additional cumulative effects, but the potential long-term benefits of these treatments would also be reduced. In the long term, possible benefits to aquatic and riparian systems associated with the reduced fire risk from fuels reduction, increased fire resiliency from stand improvements and improved hydrologic function from road upgrades would be reduced for Alternatives C and G, compared to Alternative B. However, Alternative G also has a long-term effect of the additional road decommissioning and black oak retention in Group Selections.

Habitat Components and Structure

Canopy Cover. In two DFPZ units canopy cover would be reduced to 40 percent under Alternative B, C, and G. These two units are high recreation areas within the wildland urban interface community of La Porte. All other units would be reduced to 50 percent canopy cover. Plantations units (CWHR 3) have no canopy restrictions.

Mature and old-forest-associated species, in general, have been shown to select stands containing at least 40 percent canopy cover for foraging/dispersal and at least 60 percent canopy cover for nesting/denning habitat. The canopy cover across Sugarberry is comprised primarily of CWHR 4M (40–59 percent canopy cover) and 4D (60–80 percent canopy cover). Most group selection stands (not the group selection unit) maintain minimal foraging habitat and certain group selection treatments would maintain canopy cover at the low end of suitable nesting habitat. Stands that reduce understory will not maintain minimal quality foraging habitat for mature and old-forest dependent species.

Large Trees. Under each action alternative, some trees greater than 30 inches dbh would be removed for operability purposes to accommodate temporary road construction, reconstruction, new landing construction (190 landings), and existing landings (60 landings). Approximately 1,385 trees that are 30 inches dbh and larger would be removed on approximately 120 acres under all action alternatives. It is estimated that 2.4 percent of trees 30 inches dbh and larger may be removed from the project area ("Sugarberry Project Forest Vegetation/Fuels Report," Table A-32 [USDA Forest Service 2007b]). According to the silviculturist, the loss of trees over 30" dbh is over estimated largely due to trees being avoided wherever possible due to ecosystem objectives and removal cost. The HFQLG FEIS and SNFPA FEIS and FSEIS each discuss the importance of retaining large trees for old-forest-associated species. In general, larger trees are utilized more often by wildlife for homes, breeding, and food, and the greater the number of large trees, the more mature/old-forest-dependent wildlife species can use the habitat. [USDA Forest Service 2007b] Sugarberry CWHR 4 and 5 stands (where group selection would predominantly be placed) average 11–12 trees per acre greater than 30 inches dbh. Group selection stands are placed to avoid removing trees with greater than 30 inch dbh.

Snags. The SNFPA FSEIS (HFQLG Land Allocation) standards and guidelines for snags would be followed for the Sugarberry Project. Four of the largest (greater than 15 inches dbh) snags per acre would be clumped or distributed irregularly. It is anticipated that most snags in group selections would be felled for operability and safety reasons, and the standard target level of snags would not be retained within all the groups but would exist on the periphery of the groups and within the DFPZs and ITS units.

Large Woody Material. The SNFPA FSEIS (HFQLG Land Allocation) standards and guidelines for large down woody material would be followed for the Sugarberry Project; that is, 10–15 tons of large down wood per acre with an emphasis on retention of wood that is in the earliest stages of decay. These levels were evaluated for the HFQLG FEIS and SNFPA FSEIS for Threatened, Endangered, and Sensitive species.

Black Oak Habitat. Where oak is present within DFPZs, a minimum of 25 to 35 square feet basal area per acre of oaks greater than 12 inches in diameter will be retained in DFPZ. Under Alternatives B and C. group selections were situated to avoid large and pure oak stands, however, there are no oak retention requirements. Oaks found along the periphery of groups may provide future recruitment by oak seedlings (pers. communication Heald 2004) However, for Alternative G, all oaks greater than 10 inches would be retained within DFPZs and group selection treatment areas.This is a change from the HFQLG Act FEIS which states, "Where oak is present, retain an average of 25 to 35 square feet basal area per acre of oaks over 15 inches dbh." The FEIS also states that site-specific planning will determine feasibility and specific needs and to retain smaller oaks if determined to be necessary for future recruitment. In addition, the action alternatives provide for 100 acres of black oak enhancement in the Sugarberry Project area, thereby improving the quality of existing black oak stands for associated wildlife species.

Roads.

There are approximately 319 miles of roads in the project area. The proposed transportation system improvement work is listed below. Approximately 0.6 miles of new road construction is proposed under Alternatives B, C, and G. Approximately 25.3 miles of existing system roads would be reconstructed prior to project use under Alternatives B, C and G.

Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed. Approximately 21.7 miles of temporary spur roads would be constructed under Alternative B and 21.0 miles under Alternatives C and G. All temporary spurs would be decommissioned after the project is completed; all re-opened spurs would be closed with barriers and allowed to re-vegetate. Under Alternatives B and C, approximately 4.7 miles of existing non-system roads would be decommissioned during project implementation. One of two main differences between Alternatives B and C compared to Alternative G is that approximately 11.34 miles of existing non-system roads would be decommissioned under Alternative G.

Decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope, and/or seeding the affected area. These measures help initiate revegetation and recovery of the road area. Over time, decommissioned roads produce less sediment and surface runoff to adjacent watercourses. Harvest landings in group selection units and DFPZs would be constructed or reconstructed as needed. Approximately, 190 new landings will be constructed and 60 existing landings will be reconstructed. Landsings are not re-vegetated and remain as openings.

As discussed above, approximately 1,385 trees 30 inches dbh and greater would be removed for the construction of permanent and temporary roads, reconstruction of temporary roads, and landings for all Action Alternatives. The 1,385 trees include hazard trees that would be proposed for removal associated with those activities. For the Sugarberry Project area, an average of 3.4 trees per acre for trees greater than 30 inch dbh was marked for removal along road ways. Hazard tree removal has been analyzed as part of the wildlife analysis area.

Wildfires. There would be short-term disturbance and loss of understory from DFPZ and group selection under each action alternative, as well as from mastication and underburning activities. However, the long-term fuel-reduction activities would protect habitat by reducing the risk of stand-replacing fires. Analysis indicates that prescribed underburning would result in 60 to 80 percent mortality in small residual conifers, hardwoods trees (8 inches or less), and would also kill most shrubs. Underburns can also kill trees 20–24 inches dbh, but usually no more than 10 percent of them. The overstory canopy is usually not affected. Large logs are generally reduced in volume, but rarely completely consumed. Prescribed burning could affect wildlife in the short term from treatment disturbances, smoke and loss of understory but in the long term the species should benefit by protection of the habitat from wildfire. Also, in varying degrees, the understory is expected to return. See “Section 3.3.4: Affected Environment (Existing Condition)” above for fire history.

Fuel conditions are variable throughout the Sugarberry Project area and can be described by six Northern Forests Fire Laboratory fuel models. See “Section 3.3.4: Affected Environment (Existing Condition)” above for the discussion on Fire Laboratory fuel models.

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, which could lead to increased rates of spread resulting in potential loss of large trees, large snags and down woody material. The loss of such resources would affect amphibians, reptiles, mammals, and avian species. Wildlife biologists review fire management plans and projects to maximize protection and management of Threatened and Endangered fish and wildlife species.

Fires affect animals mainly through effects on their habitat. Fires often cause short-term increases in wildlife foods that contribute to increases in populations of some animals. These increases are moderated by the animals' ability to thrive in the altered, often simplified, structure of the postfire environment.

Subwatersheds with substantial portions burned at high intensity would be susceptible to many short- and long-term effects that would degrade the suitability of aquatic habitat within the burned subwatershed and possibly in unburned downstream areas. Sediment delivery to aquatic habitats can increase substantially in the year following intense wildfire, and continue to remain elevated for ten or more years (Tiedemann et al. 1979; Helvey 1980). In Williams Creek on the Plumas National Forest, aquatic macroinvertebrates demonstrated a population decline three weeks following an intense wildfire. Macroinvertebrate density had recovered within three years, but the species composition remained altered (Roby and Axuma 1995).

Aquatic and Riparian Habitat

See the Sugarberry Project "Hydrology Report" (USDA Forest Service 2007a) in the project record for expanded discussion of the following effects.

Direct Effects. Meadow enhancement, bank stabilization and stream crossing improvement projects would create short-term direct effects such as increased sedimentation and stream turbidity from the ground-based equipment that would be used in and adjacent to the channel. The proposed aquatic species passage projects would improve watershed connectivity and open up 5 miles of spawning, rearing, and foraging habitat for trout.

Indirect Effects. The meadow enhancement, bank stabilization and stream crossing improvement projects would create long-term indirect downstream beneficial effects by reducing sedimentation and streambank erosion over the long term after project sites have stabilized. There would be a long-term beneficial indirect effect by improving the aquatic connectivity and resizing the culvert to accommodate a 100-year flood in the project area, thereby reducing the risk of mass wasting and sediment delivery associated with failed or washed out culverts.

Cumulative Effects. Although not captured in the CWE analysis, the meadow enhancement, bank stabilization, and stream crossing improvement projects would result in improved hydrologic function and water quality locally and downstream of project sites. Timber harvest, fuels reduction, and road construction components of the Sugarberry Project are expected to increase the risk of CWEs in most subwatersheds in the aquatic analysis area. Specifically, the possibility of increased channel erosion and chronic sedimentation related to increases in runoff and peak flow during high-intensity rain events is greatest within low-gradient, third-order or greater reaches of the channel network or at major confluences in subwatershed that will exceed the TOC with implementation of the action alternatives. If the proposed action is implemented, four subwatersheds would be approaching and two subwatersheds would be exceeding the TOC.

Effects on Species

Effects on Mountain and Foothill Yellow-legged frogs. Refer to general aquatic/riparian habitat effects discussed above and the Wildlife and Fish BE/BA for more detailed information.

Direct, indirect, and cumulative effects to Mountain Yellow-legged Frogs (MYLFs) and Foothill Yellow-legged Frogs (FYLFs) and their suitable habitat are considered below. Suitable habitat for MYLFs is considered to be perennial streams and ponds above 4,000 feet in elevation. Effects to intermittent streams are not directly considered because this habitat type was found to be largely unused by MYLFs in the project area, despite considerable survey effort (May & Associates, Inc. 2001; Galloway Consulting, Inc. 2005). Suitable habitat for FYLF is considered to be perennial and intermittent streams and ponds below 6,000 feet in elevation. All vital life history activities of MYLFs and FYLFs, including breeding, foraging, dispersal, and over-wintering, occur in or adjacent to these habitat types (Stebbins 2003; Wengert et al. 2006). Between 2001 and 2006, Fellers and Freel (1985) protocol surveys were conducted on 68 percent of the perennial and intermittent streams in the Sugarberry Project aquatic analysis area, with priority placed on areas in, near, or downstream of proposed treatment activities.

Direct Effects.

DFPZ—The majority of DFPZ construction will take place outside of yellow-legged frog (YLF) suitable habitat and will therefore not have any direct effects. However, approximately 60 acres of DFPZ treatments will occur within RHCAs of streams with suitable YLF habitat. These treatments and their direct effects are described below.

There are three handcut, pile and burn units totaling 6 acres within suitable YLF habitat on Rabbit Creek, an unnamed tributary to Rabbit Creek, and a tributary to Brushy Creek. MYLFs have been observed on Rabbit Creek. In this unit, piles will not be burned within 75 feet of the channel. Direct effects could include individuals being injured or killed by the hand felling and moving of trees and woody material. When piles are burned, it is possible that overland traveling frogs taking shelter within piles could be injured or killed, but piles would be directionally lit on one side to allow frogs to escape. Evidence that some frog species may be able to hear and react to (i.e., escape from) fire suggests that directional lighting would be an effective design criteria to avoid direct effects to MYLFs (Grafe et al. 2002). Furthermore, whereas these activities may affect a small number of individuals, it is improbable that a population effect would be discernable.

There is no underburning proposed within suitable MYLF habitat, thus no direct effects to that species will occur. There are two units totaling approximately 29 acres proposed for underburning within suitable FYLF habitat on Little Rock Creek and Onion Creek. Individual frogs could be injured or killed by fire, but evidence that some frog species may be able to hear and react to fire suggests that frogs may be able to escape direct impacts (Grafe et al. 2002). Furthermore, whereas underburning may affect a small number of individuals, it is improbable that a population effect would be discernable.

Mastication treatment is largely restricted to ridge tops and away from suitable MYLF habitat, so direct effects are not expected. There are two units totaling 25 acres where ground-based mastication machinery will enter the RCHA of tributaries to Rabbit Creek on Lexington Hill, west of La Porte. These channels are intermittent headwater streams, with excessive accumulation of small woody debris that contributes to fuel loading and fire risk without enhancing riparian structure or function. It is highly unlikely that the habitat supports FYLFs, and direct effects are not expected.

Group Selection and ITS—Group selection and individual tree selection harvest activities are considered together because their effects to suitable YLF habitat are similar. Also, neither of these timber harvest activities is expected to have direct impacts to YLFs because they will not occur within suitable habitat. RHCA buffer widths (150–300 feet) which exclude group selection and ITS treatments are adequate to avoid direct impacts to YLFs, both species of which are closely associated with stream channels (Stebbins 2003). A three-year telemetry study of MYLFs in similar habitat on the Mt. Hough Ranger District found that the vast majority of frog location observations (>80 percent) were within one foot of stream edges and the farthest observation was of an individual 72 feet from the stream edge (Wengert et al. 2006).

Sporax® Treatment—Use of Sporax® in ITS and DFPZ thinning units will not have direct effects on YLFs or their habitat because this activity will occur outside of suitable YLF habitat.

Road System—Direct impacts of all proposed road work may include disturbance to individual frogs, including crushing, during construction activities. Details related to specific activity types are described below. Of the four permanent roads proposed for new construction, two roads are adjacent to suitable YLF habitat streams, and another crosses a perennial stream that is known to contain MYLFs. Four of the temporary roads proposed for new construction will cross suitable YLF habitat streams, and another eight are adjacent to suitable habitat streams. Direct effects of road decommissioning would be limited to eight roads that are within suitable YLF habitat. Four of these roads are within RHCAs of intermittent or perennial channels, and the other four currently cross intermittent or perennial channels. The likelihood of aquatic habitat resource damage from roads such as these is high due to chronic fine sediment delivery from the road surface and cut slopes, increased landslide risk, decreased bank stability, and restricted riparian habitat development. Road reconstruction activities have the potential to disturb individual YLFs at several locations where roads proposed to be maintained cross or are adjacent to suitable YLF habitat streams. Culvert maintenance is the most likely road reconstruction activity to have direct effects on YLFs and suitable YLF habitat. Cleaning large woody material from inlet and outlet areas around culverts may reduce cover. Culvert replacements would have similar impacts as stream crossing improvement effects described below.

Drafting of water from streams for road dust-abatement may cause changes in flow regimes and water quality, especially within deeper pools and off channel waterholes. Changes in flow regimes can cause decreased water surface elevations and expose frog egg masses to desiccating air, resulting in loss of egg viability. Individual tadpoles, egg masses, or frogs could be suctioned up by the "drafting" process, resulting in mortality of individuals. Direct effects to YLFs would be minimized by the implementation of the water-drafting plan which includes the following stipulations: drafting hole pool depth will be maintained; new or existing water drafting sites will be evaluated by a biologist prior to changes and uses; back down ramps will be maintained as necessary to ensure bank stability; sedimentation is minimized; amphibian/fish protection devices such as suction strainer (2 mm gauge or less) will be used during drafting operations to prevent entrainment of tadpoles, egg masses or frogs; and post-project rehabilitation will occur if necessary.

Habitat Enhancement/Restoration—The Black Oak Enhancement project component would have no direct, indirect, or cumulative effects to YLFs because it occurs on ridge tops and other areas that are far outside of suitable YLF habitat.

The majority of the aspen stand enhancement project component would have no direct effects to YLFs because most activities would occur outside of suitable YLF habitat. However, one small (0.7 acres) aspen stand is situated adjacent to a small pond where MYLF tadpoles have been observed (C. Roberts, pers. comm.). At the time that the work of removing conifers occurs, MYLF metamorphose and adults could be crushed by the impact of falling trees or trampled by workers.

The five stream crossing improvement projects are on streams that are suitable YLF habitat. Direct effects are related to local disturbance caused by ground-based heavy equipment coincident and shortly after work occurs. In the immediate vicinity, disturbance to individual YLFs could occur, possibly including crushing by equipment, crossing structures, or fill dirt material. Disturbance to stream channel and banks will cause small amounts of sediment delivery to the streams and increased water turbidity during and shortly after the project. Flood events in the following winter would also likely mobilize additional sediments. Since egg masses will not be present at these times, it is unlikely that sedimentation effects would be detrimental to YLFs.

The two streambank stabilization projects are outside and downstream of suitable MYLF habitat and thus will have no direct, indirect, or cumulative effects on that species. However, both projects would occur within suitable FYLF habitat. Direct effects are similar to those for stream crossing improvement projects detailed above.

The three meadow enhancement projects are within suitable YLF habitat. Direct effects are limited to disturbance to individual frogs by ground-based equipment. Whereas this may affect a small number of individuals, it is improbable that a population effect would be discernable because the meadow restoration would be limited to a small area of currently marginal YLF habitat.

The settling pond construction project would occur in a drainage that contains suitable FYLF habitat and is historically known to contain MYLFs; however, MYLFs have not been observed here since 1960 (Koo and Vindum 1999), despite intensive survey efforts (Galloway Consulting, Inc. 2005; Tatarian and Tatarian 2006). If MYLFs are indeed extant at the site, direct effects of settling pond construction include the local disturbance to individuals by excavators and other ground-based equipment during construction. Whereas this may affect a small number of individuals, it is improbable that a population effect would be discernable.

Indirect Effects.

DFPZ—The majority of DFPZ construction would occur outside of YLF suitable habitat and would not have any indirect effects. However, a few DFPZ treatments would occur within RHCAs of streams with suitable YLF habitat or upstream of suitable YLF habitat. These treatments and their indirect effects are described below.

All of the handcut, pile and burn units are within subwatersheds that support YLF suitable habitat, including two handcut, pile and burn units that are within or upstream of MYLF suitable habitat. It is unlikely that treatment Unit #903, which is located in the headwaters of potentially suitable MYLF habitat, will have any measurable indirect effects. However, the treatment Unit #LP1 straddles Rabbit Creek, a documented MYLF habitat (Koo and Vindum 1999). On this unit, piles would not be burned within 75 feet of the channel. Local indirect effects of removing vegetation could include a short-term (<5 years) decrease in the recruitment of living and fallen vegetative cover available to individual frogs. Alternately, increased penetration of sunlight could enhance basking opportunities and increase individual growth and fitness. However, the project area is so small (less than 330 linear feet of riparian area will be affected) that indirect effects would be negligible at the MYLF population level.

All of the units proposed for underburning are within subwatersheds that contain suitable YLF habitat, including two units which are upstream of suitable MYLF habitat subwatersheds. All units include ephemeral channels and two units upstream of suitable FYLF habitat include RHCAs of intermittent channels. The low intensity fire of prescribed underburns is not expected to result in the severe aquatic and riparian habitat effects that are associated with intense, dry season wildfires, which may include increased sediment delivery and increased water temperatures. There is a small short- to long-term risk of increased sedimentation to downstream aquatic habitats, but due to the minor fractional area of the subwatershed to be burned, and larger fractional hydrological contribution from areas that will not be burned, sediment loads are not expected to be of significance within the reaches containing YLF habitat.

Indirect effects, if any, as a result of mastication, are expected to be negligible due to the distance between mastication units and suitable YLF habitat. Best Management Practices (BMPs) and Management and Mitigation Measures (MMMs) will be applied, to YLFs or their habitat from mastication.

Group Selection and ITS—Through the application of BMPs and MMMs (see Streamside Management Plan, Appendix B, Sugarberry Project "Hydrology Report," 2007), the risk of indirect effects to suitable YLF habitat from group selection and ITS harvest would be negligible to low.

Sporax® Treatment. Toxicity of Sporax® to amphibians has been demonstrated to be low in the manner with which it would be applied for the Sugarberry Project (USDA Forest Service 2006). Furthermore, Sporax® is of similarly low toxicity to invertebrates and it does not bio-accumulate (Ibid.). Amphibians would be at risk in the event of an accidental spill directly to aquatic habitat (Ibid.). However, adverse effects would result only if a large quantity of Sporax® is introduced into a relatively small or unreplenishing (standing) water body (Ibid.). For example, 25 pounds of Sporax® spilled directly into a small pond would only marginally exceed the level of concern (Ibid.). Accidental introduction into surface waters is highly unlikely because application will not be taking place near surface waters.

Road System—All of the permanent and temporary roads proposed for construction are within subwatersheds that contain suitable YLF habitat, thus they will add to the overall subwatershed road densities. Two permanent and four temporary roads cross streams which contain suitable YLF habitat, thus there is a risk of indirect effects through removal of riparian habitat and degradation of aquatic habitat. Two permanent and eight temporary roads are adjacent to suitable YLF habitat streams, and are likely to exhibit the negative long-term effects typically associated with forest roads located near streams: chronic erosion of fine sediments from surface and cut slopes, decreased bank stability, and increased landslide risk. While the indirect effects of permanent roads will last indefinitely, those for the temporary roads should attenuate quickly after the roads have been restored to a natural condition.

All of the roads proposed to be decommissioned are within subwatersheds that contain suitable YLF habitat. Alternatives B and C decommission 4.7 miles of road while Alternative G proposes to decommission 11.34 miles of road. Many roads are located away from stream channels and so indirect effects are expected to be negligible. Also, many roads cross or are adjacent to ephemeral channels. Decommissioning these roads may cause short-term sedimentation to downstream YLF habitat, but this will be vastly outweighed by the long-term beneficial effects of increased bank stability, riparian function, and reduced chronic sedimentation and landslide risk.

The indirect effects of road reconstruction relate to sediment delivery to aquatic habitats. In the short term (<3 years), sedimentation is likely to increase, but over longer periods there will be a net reduction in the level of chronic road-originated sediment delivery. Also, maintenance of road drainage features and culverts will reduce landslide risks.

Indirect effects of drafting water from suitable YLF habitats would not occur; effects would be limited to the direct effects occurring at the time of the activity.

Habitat Enhancement and Restoration. The Aspen Stand Enhancement project component would have minimal indirect effects to FYLF because it occurs outside of suitable FYLF habitat. A short-term increase in local erosion may transport low levels of fine sediment downstream into suitable FYLF habitat on Potosi Creek and East Branch Slate Creek, but over the long term (>2–3 years) it is expected that sedimentation would return to background levels as aspen and other vegetation responds to the treatment.

Relative to MYLFs, there are short-term negative and long-term positive indirect effects associated with this project activity. In the short term, soil disturbance caused by felling and removing conifers in conjunction with erosion into the pond could interfere with frog egg masses by suffocation. Due to the small size and the generally flat slope of the activity area, it is unlikely that enough sediment would be delivered to the pond (located in the Aspen Stand Enhancement project) to cause this effect.

Alternately, the removal of conifers from the west bank of the pond would immediately increase sunlight penetration to the pond and reduce evapotranspiration from the groundwater table. Research by Skelly et al. (1999 and 2005) and Pellet et al. (2004) suggests that both of these effects could be beneficial to MYLFs at least until aspen trees grow to replace the removed conifers. Increased sunlight has two effects. First, it would raise the pond water temperature, leading to increased rate of development of frog eggs and tadpoles. Second, it would increase pond primary productivity, leading to increased food available for tadpoles and frogs. Accelerated development and increased food supply are associated with increased fitness and longevity in individuals, and reproductive output in populations, all of which would benefit the local MYLF population.

Reducing evapotranspiration by removing vegetation would leave more water in the pond until later in the summer. Although this pond never dries completely, summer water depth is usually low enough to create a strip of dry, barren ground between the pond edge and the surrounding vegetation. This situation has the potential to increase predation on tadpoles and adult frogs due to decreased cover and to decrease the food and foraging opportunities available to adult frogs in a more vegetated bank habitat. Although the proposed action would remove larger vegetation on one side of the pond, the net effect to the MYLF population of reducing evapotranspiration for the pond habitat as a whole is expected to be positive.

All of the five stream crossing improvement projects are on streams that contain suitable YLF habitat. Although these projects are designed as improvements to watershed condition, it cannot be assumed that improving passage for aquatic organisms will positively affect YLFs on these streams. The crossings are not known or suspected to be barriers to the movements of YLFs, which can travel overland around barriers after metamorphosis. Fuller and Lind (1991) have shown detrimental effects to FYLFs and their habitat resulting from projects designed to improve stream habitat for fish. Furthermore, improving passage for rainbow trout, the primary taxa for which stream blockages are considered problematic, may be harmful to YLFs above the barrier by increasing trout predation on tadpoles and competition for food resources between trout and adult YLFs. These effects have been hypothesized to cause population declines and even extirpations of MYLFs in formerly fishless alpine lakes where trout have been introduced (Bradford et al. 1993; Knapp and Matthews 2000; Vredenberg 2004). However, an analysis of stream characteristics at MYLF occurrences throughout the Sugarberry Project area revealed that MYLF occur on fishbearing and fishless streams in nearly the same proportion as these habitats are available. This suggests that trout presence in Slate Creek watershed streams may not adversely affect MYLFs to the extent that occurs in alpine lake populations. In the case of FYLFs, this species typically co-exists with trout, and presumably has evolved adaptations to persist in the presence of these potential predators and competitors. In fact, an analysis of stream characteristics at the locations of FYLF occurrences in the Sugarberry Project aquatic analysis area reveals that most FYLF records were on fish-bearing streams. Long-term indirect effects of stream crossing improvement projects to YLFs will likely be neutral at all time scales after project related disturbances subside.

A small amount of fine sedimentation to Fish Meadow Creek and Gold Run Creek may occur for a short time period following the stabilization of banks on these streams. However, these suitable FYLF habitat streams are already a compromised streambank and chronic sedimentation problem at these sites, which this project is intended to mitigate. Over the long term (>3 years), as vegetation takes hold at these restoration sites, sedimentation will decrease substantially and downstream aquatic habitat will improve.

Sedimentation to Rabbit Creek may increase for a short time period following settling pond construction at Dutch Diggings. However, there is already a chronic sedimentation problem associated with the hydraulic mining scarp at this abandoned mine site, which this project is intended to mitigate. Over the long term, sedimentation to Rabbit Creek will decrease substantially and downstream habitat will improve. The creation of a pond may increase the amount and quality of habitat for MYLFs. However, it is probable that trout in Rabbit Creek would colonize the pond, possibly limiting its quality as MYLF habitat.

Cumulative Effects. In order to understand the contribution of past actions to the cumulative effects of the proposed project, 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 for the following reasons. First, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on species-specific impacts of individual past actions, and one cannot reasonably identify each and every action since the start of large-scale environmental modification in the 1850s that has contributed to current conditions. Past residual cumulative effects of natural occurrences may in fact contribute equally to those caused by human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Secondly, the CEQ 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.

Our knowledge of the distribution and abundance of YLFs in the Slate Creek watershed is almost entirely derived from survey data since 2001.

The majority of proposed Sugarberry Project activities would take place far from suitable YLF habitat. These include group selection and ITS timber harvest, most DFPZ construction, most transportation system work, and some of the habitat enhancement and restoration projects. Direct effects of these actions will be nonexistent and indirect effects are expected to be minimal or negligible due to the application of BMPs and MMMs (see Streamside Management Plan, Appendix B, Sugarberry Project "Hydrology Report," 2007).

However, some project components, including some DFPZ construction, transportation system work, and habitat enhancement and restoration projects would take place in suitable YLF habitat and have the potential to directly and indirectly affect individuals and suitable habitat at the population level. Because the total area in which all of these project components will occur is spatially minor relative to the entire area occupied by YLFs in the project area, direct effects to individuals are not expected to accumulate as discernable effects at the population level. Also, the probability of direct effects of these activities on YLFs is low. Short-term direct impacts to individuals and habitat are expected to be outweighed by longer-term indirect impacts that are assumed to favor populations through improved habitat quality and reduced risk of large or intense wildfire. Therefore, any negative cumulative impacts on YLFs and YLF habitat of all Sugarberry Project components would be negligible in the context of past, present, and foreseeable actions, and the accelerated recovery of historically degraded habitats will have the potential to improve conditions for this species.

Effects on Western Pond Turtle—Refer to general aquatic/riparian and terrestrial habitat effects discussed above. Direct, indirect, and cumulative effects of the action alternatives on western pond turtle and suitable western pond turtle habitat are considered below. There is no substantial difference between Alternatives B, C and G in effects on this species.

Direct, Indirect, and Cumulative Effects. Based on the following, direct, indirect, and cumulative effects are not expected to occur or to be negligible. Despite extensive surveys of lentic (still waters i.e. lakes or ponds) and lotic (moving water i.e. rivers or streams) aquatic habitats, no western pond turtle populations are known from the Sugarberry Project aquatic analysis area. The highest quality suitable habitat and area closest to a known population is the lowest reach of Slate Creek, near the confluence with North Yuba River. In the Sugarberry Project "Hydrology Report"

(USDA Forest Service 2007a), this subwatershed was considered to have a very low risk of CWE before and after implementation of the action alternatives. The closest proposed treatment units are group selection harvests on ridge top/headwater areas of Slate Creek tributary streams more than 2.5 river miles upstream from this potentially suitable habitat.

Workers, machinery, trees, or fill material could injure or crush adult or hatchling turtles as they move between aquatic and upland nesting and overwintering sites. If a population of western pond turtles does exist in any streams within the Sugarberry Project aquatic analysis area, it is likely that the distance of individuals' terrestrial movements would likely be limited due to the steep banks that tend to prevail in the area. However, if a turtle population is discovered before or during the implementation of the Sugarberry Project, the loss or injury of individuals would be prevented with protection measures such as LOPs and restrictions limiting access to roads adjacent to occupied aquatic habitat.

Aquatic habitat and RHCAs would not be directly entered with the exception of some components of DFPZ construction, transportation system, and habitat enhancement projects. All of these projects will occur in or near aquatic habitats that have been surveyed and found to be unoccupied by western pond turtles. Furthermore, all of these areas represent, at best, submarginal habitat for the species.

DFPZ construction will promote conditions that would favor upland western pond turtle nesting habitat. The same conditions that increase large and intense wildfire risk—shaded thickets of densely packed stems—may also inhibit successful western pond turtle reproduction.

SAT guidelines for riparian buffer protection would prevent harvest impacts to western pond turtle aquatic and riparian habitat. Due to no direct effects and negligible indirect effects, cumulative effects are also expected to be negligible. There are no known unavoidable adverse effects or irreversible or irretrievable commitments of resources expected to occur.

Effects on Hardhead Minnow—Refer to general aquatic/riparian and terrestrial habitat effects discussed above. Based on the prospective that hardhead minnow may occur in Slate Creek, potential effects to the species were analyzed. Direct, indirect, and cumulative effects of the action alternatives on hardhead minnow and suitable hardhead minnow habitat are considered below. There is no substantial difference between Alternatives B, C and G in effects on this species.

Direct, Indirect, and Cumulative Effects. Based on the following, direct, indirect, and cumulative effects are not expected to occur or to be negligible. Major factors identified as posing a risk to the hardhead minnow include predation by nonnative fishes (especially smallmouth bass) and isolation of populations and habitat loss and alteration caused by impoundments and diversions (Moyle 2002). Although hardhead minnow are not known to occur in the Sugarberry Project aquatic analysis area, comprehensive surveys have not been completed and their presence is suspected in Slate Creek near the confluence North Yuba River. However, any potential hardhead minnow habitat in the Sugarberry Project aquatic analysis area is likely severely degraded for the following reasons: (1) a substantial portion of the flow of Slate Creek is diverted at the Slate Creek Diversion Dam;

(2) any population in the North Yuba River is isolated downstream by New Bullards Bar Reservoir; and (3) smallmouth bass are present in Slate Creek near the confluence with North Yuba River.

The highest quality suitable habitat and area closest to a known population is the lowest reach of Slate Creek, near the confluence with North Yuba River. In the Sugarberry Project Hydrology Report (USDA Forest Service 2007a), this subwatershed was considered to have a very low risk of CWE before and after implementation of the action alternatives. The closest proposed treatment units are group selection harvests on ridge top/headwater areas of Slate Creek tributary streams more than 2.5 river miles upstream from this potentially suitable habitat.

Aquatic habitat would not be directly entered with the exception of some components of DFPZ construction, transportation system, and habitat enhancement projects. All of these projects will occur in or near aquatic habitats that are unsuitable for hardhead minnow.

All proposed Sugarberry Project activities have extremely low potential to directly or indirectly affect hardhead minnows or their habitat. Due to no direct effects and negligible indirect effects, cumulative effects are also expected to be negligible. There are no known unavoidable adverse effects or irreversible or irretrievable commitments of resources expected to occur.

Effects on California Spotted Owl—Refer to “General Habitat Effects” above. Refer to Appendix I for a summary of the HFQLGFRA FEIS/ROD and the SNFPA FEIS and the SNFPA FSEIS/ROD directions, standards and guidelines, and effects discussion for the California spotted owl (CSO). No activity will be conducted within PACs and SOHAs.

Areas of Concern (AOC) were identified in a Technical Assessment of the owl’s current status (also called the CASPO Report 1993). Areas of Concern (AOC) are areas within the range and distribution of the California spotted owl (USDA 1992). These areas are identified simply to indicate the potential areas where future problems may limit owl populations and where future problems may be the greatest if the owl’s status were to deteriorate. The Areas of Concern are all outside of the Feather River Ranger District of the Plumas National Forest. The two AOC's identified in the CASPO report are both on the Lassen National Forest, adjacent to the Plumas National Forest (page 46-49 of CASPO Report). Therefore, the preferred alternative (Alternative G) would not impact identified AOCs.

Action Alternatives B, C and G treatments would not enter known owl sites (PACs and SOHAs). Alternatives B, C and G have DFPZ, group selection and ITS with a 30 inch dbh maximum cut level. Thinning treatments in the 250 acres of DFPZ would reduce canopy cover on 170 acres of CWHR system Size Class 4 stands (trees 11–24 inches dbh) to a minimum of 40 percent and would reduce canopy cover on 80 acres of Size Class 5 stands (greater than 24 inches dbh) to a minimum of 50 percent.

Alternatives B, C and G have similar treatments for DFPZ, GS, and ITS with a 30 inches dbh maximum cut level. Alternative B proposes 2,100 acres of DFPZ, 1,040 acres of group selection and 155 acres of ITS. The action alternatives (B, C and G) propose a treatment down to minimum of 40 percent canopy cover, which is a minimal requirement for spotted owl foraging habitat. However, only two units will be reduced to 40 percent canopy cover and the majority of the units would retain closer to 50 percent canopy cover.

The major difference between Alternatives B, and C and G is that Alternative C and G would have a reduction of 20 acres of group selection. Under Alternative C and G, 5 acres of ITS would be dropped. Under both action alternatives, canopy cover for ITS treatments would be retained at 50 percent, were available.

The difference between Alternatives B and C compared to Alternative G is that Alternatives G proposes to retain black oak 12 inches in DFPZs and GS. Alternative B and Alternative C would retain black oak in DFPZs, but not in GS or ITS. Also, Alternative G would decommission 11.35 miles, while Alternative B and C would decommission 4.7 miles.

Proposed treatment activities could occur as early as 2009 and may continue for five years beyond the initiation of implementation. Any new activity centers would become part of established PACs or new PACs would have been designated. Regional protocols require 2 years of surveys (3 visits per year). If spotted owls are detected during future surveys or project-related activities, PACs and HRCAs would be delineated, and all treatments would be modified to comply with the standards and guidelines of the HFQLG Act FEIS and ROD.

Within the 38,545 acre (National Forest lands) wildlife analysis area, there are 10,498 acres classified as suitable nesting habitat (5M, 5D, and 6) and 23,314 acres classified as suitable foraging habitat (4M, 4D) which includes California spotted owl PACs and SOHAs.

Direct Effects. Direct effects to the California spotted owl are expected to be minimal because: (1) surveys have been completed within the Sugarberry Project wildlife analysis area; (2) proposed treatments are not allowed in PACs and SOHAs; (3) protection measures such as a LOP, are in place to prevent disturbances to nesting owls; (4) any activity centers (such as nest, young, pair) located after surveys will be protected by adjusting existing or creating new PACs and any proposed treatments will be modified or dropped; (5) treatments are predominately along ridge-tops which are not considered preferred nesting habitat; and (6) any activity with the potential for disturbance would be limited to individual treatment units and would last a few days to two weeks in any location. Impacts from disturbance are not expected to substantially affect habitat use or reproductive capacity of this species.

Indirect Effects. Indirect effects to the California spotted owl are expected to be low because: (1) surveys have been completed within the Sugarberry Project wildlife analysis area; (2) proposed treatments are not allowed in PACs and SOHAs, (3) treatments in HRCAs could have low effects to owl's dispersal and foraging habitat based on treatments, (4) mitigation measures would be applied, such as LOPs for road reconstruction activities that occur in PACs; (5) any activity centers (such as nest, young, pair) located after surveys will be protected by adjusting existing or creating new PACs and any proposed treatments will be modified or dropped; and (6) canopy cover would be maintained at 50 percent for the majority of DFPZs, except for two units.

The Sugarberry Project proposes to treat 3,295 acres which is 10 percent of the 33,813 acres of habitat typed as suitable for the CSO, and 8.5 percent of the 38,545 acre terrestrial wildlife analysis area (Forest Service lands). Effects to canopy cover would occur on 1,445 acres (1,040 acres of GS, 250 acres of DFPZ, and 155 acres of ITS) of the 3,295 treated acres, which is 4.3 percent of the 33,813 acres of habitat types as suitable for the CSO, and 3.7 percent of the 38,545 acres of terrestrial wildlife analysis area (Forest Service lands).

There are 22 HRCAs in the wildlife analysis area. Of the 22 HRCAs, 18 HRCAs would be directly affected. 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. A level of uncertainty is acknowledged. The decision assumes some short-term risk because it decreases spotted owl habitat suitability, and potentially, owl use of the treated areas. It is likely 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.

Under Alternative B, there are 3,295 acres proposed for DFPZ/GS/ITS treatment. Of the 3,295 acres, there are 1,057 acres (360 acres of DFPZs, 565 acres of GS, and 132 acres of ITS) of treatments within HRCAs. The 1,057 acres are 8.9 percent of the 11,799 acres of HRCA available within the analysis area.

- Of the 2,100 acres of DFPZ there are approximately 360 acres (3%) of DFPZs that will reduce habitat in HRCAs for Alternative B, C, and G.
  - -Of the 250 acres of DFPZ thinning treatments there are approximately 102 acres in HRCAs, 0.9% of the available HRCA acres.
  - -Of the 1,850 acres of non-thinning (mastication, underburning, plantations, pile burn, etc) DFPZ there are approximately 258 acres in HRCAs, 2.2% of the available HRCA acres.
- Of the 1,040 acres of GS, Alternative B would reduce habitat suitability within approximately 565 acres (4.8%). Alternatives C and G would reduce habitat suitability within approximately 553 acres (4.6 %).
- Of the 155 acres of ITS, Alternative B would reduce habitat suitability for approximately 132 acres (1.1%). Alternatives C and G would reduce habitat suitability by approximately 127 acres (1.1%).

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 influence owl behavior, possibly affecting nesting and reproduction. Because of this, the direct affects on HRCAs could have indirect affects on the adjacent PACs/HRCAs that were not directly affected by the proposed action. This is especially true if the directly affected HRCA overlaps with another HRCA.

The management direction found in the 2004 ROD and HFQLG EIS and applicable standards and guidelines refers to management of owls at the SOHA (1000 ac), PAC (300 ac) and HRCA scale (1,000 ac; which includes the 300 acre PAC). There is no requirement or standard and guideline provided for managing owls at the home range scales beyond 1,000 acres. Therefore, effects analyses are focused on effects to habitat at the SOHA, PAC and HRCA scale. However, the Sugarberry Project BE/BA 2008 does present how the proposed treatment may effect a 500 acre nest area (Blakesley 2005) as well as a larger home range area. Analysis at a larger scale is disclosed when suitable habitat is analyzed at the analysis area scale, since the analysis area sets the bounds for the effects analysis. At this scale, the amount of suitable habitat retained across the analysis area is disclosed. Although, the HRCA standard and guidelines within the SNFPA FSEIS/ROD do not apply to HFQLG FEIS/ROD projects, the term HRCA was used to refer to the GIS-mapped “foraging habitat” for each California spotted owl protected Activity Center (PAC). Foraging habitat for each spotted owl PAC is required to be analyzed under the HFQLG FEIS/ROD.

DFPZs. For Alternatives B, C and G the total acres of all DFPZ (2,100) treatments, including DFPZ mechanical thinning units, account for approximately 5 percent of the acreage in the wildlife analysis area (38,545 acres). Stands classified as ‘dense’ in the CWHR canopy closure classification (>60 percent canopy closure), would convert to ‘moderate’ (40 to 50 percent canopy closure) after thinning activities. Alternatives C and G would alter DFPZ treatments from Alternative B by converting 125 acres of hand cut-tractor pile would to hand cut-hand pile (in portions unit 901A). Those units are partially in HRCAs and neither alternative would radically affect habitat structure or components for wildlife. There are minimal changes in acreage between Alternatives B, C and G. Effects outside of PACs, SOHAs and in HRCAs are expected to be low. The CWHR sizes for the total 2,100 acres are as follows: 1,228 acres of 4Ds; 209 acres of 4M; and 94 acres 5D; and 569 acres of 3D/3P; and no acres of 5Ms.

The DFPZs would be constructed along existing roads, ridge tops, or other suitable terrain (HFQLG Act FEIS, p. 2-20). DFPZs that are constructed on ridge tops would tend not to be nesting or roost habitat preferred by owls. However, disturbance due to construction or maintenance activities could limit use by all old-forest-associated species.

Mastication. Alternatives B, C and G propose mastication on 750 acres and 205 acres mastication with an underburn. Effects are expected to be low in the short term, with a long-term gain of reducing fuel loading and opening up dense stands.

Prescribed underburns. Prescribed underburns are designed to retain large pieces of dead and down material and maintain adequate ground cover to reduce erosion. Burns would primarily remove shrubs and trees that are 0–6 inches dbh. Prescribed light underburns leave a mosaic of burned and unburned areas, so some shrubs would remain to provide cover for prey species using these areas. The retention of snags and down woody material would aid in minimizing effects on the spotted owl and their prey species. The prescription for the RHCAs would minimize the loss of canopy cover and remove some of the dense ground cover by allowing fires to backburn into riparian habitat.

Plantations. Alternatives B, C and G propose 120 acres of treatment in plantations. Treatments include the use of (1) mastication, (2) underburning, and (3) handcut pile burning instead of tractor piling for those areas dominated with shrub cover. These prescription treatments should not affect the habitat long term. Moreover, plantations are considered developing areas that require management prescriptions so that they may continue to grow healthy trees for the future.

Group Selection. There are 565 acres of group selection proposed in HRCAs. Alternative B would reduce habitat suitability within HRCAs by 565 acres. Alternatives C and G would reduce habitat suitability by 553 acres. Additional effects would be from the roads necessary to reach those groups. 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.

Of the 1,040 acres of group selections, there are 334 acres of CWHR 5 (244 acres of CWHR 5Ds and 90 acres of CWNR 5M) and 686 acres of CWHR 4s (587 acres of CWHR 4Ds and 99 acres of CWHR 4Ms). Of those acres, 565 are in HRCAs. The CWHR in HRCAs are 214 acres CWHR 5 (78 acres of CWHR 5M and 136 acres of CWHR 5D) and 344 acres in CWHR 4s (19 acres in 4M and 325 acres of CWHR 4D). In addition, there are 7 acres in CWHR 3D and 3P.

It is uncertain as to what influence these various reductions in habitat would do to owl activity and occupancy in the wildlife analysis area. However, the proposed group selection would not increase any large-scale, high-contrast fragmentation above existing levels. For Action Alternatives B, C and G, the majority of group selections, that is the group itself not the unit, would become CWHR Size Class 1 (trees are in the seedling stage with a dbh of less than 1 inch) post-treatment. In the unit Size Class 4M and 4D 50 percent would become CWHR Size Class 5S and 85 percent of 5M and 5Ds would become Size Class 5S. Overall reduction of canopy cover in the units would be approximately 50–65 percent. This would make some the group selection units minimal for nesting and moderate for foraging.

However, it is not known if spotted owls would use these small openings for foraging. The small mammal component of the Plumas-Lassen Administrative Study is monitoring changes in small mammal density/distribution in survey areas on the Forest that may occur as a result of projects being implemented.

Individual Tree Selection—Individual Tree Selection (ITS), also called area thinning, would be conducted on approximately 155 acres in Alternative B and 150 acres in Alternatives C and G (unit 7). All of the 155 acres are in CWHR size class 4D and would be reduced to CWHR 4Ms. Actual acres in HRCAs include 132 acres in Alternative B and 127 acres in Alternatives C and G. ITS increases the growth rate of the healthier trees in a stand. Generally, thinning increases sunlight penetration to the forest floor, this stimulates understory growth and creates more food and cover for some wildlife species, such as quail and rabbits. Sporax**®—**Sporax® is proposed for use in DFPZ s and ITS. Three of the 6 units are close to a HRCA or a goshawk PAC. Unit 909 is in a HRCA (PAC PL183), unit 33 falls between a goshawk PAC (T12) and spotted owl HRCA (PL187), unit 7 boarders a HRCA (PL240).

The assessment concluded that the use of borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates. See “Section 3.3: Vegetation, Fires and Fuels” of this document for the complete discussion on Sporax®.

Road System—There are approximately 319.15 miles of roads in the Sugarberry Project area. Post-project road mile are approximately 305.07. In general, the existing transportation system of roads, landings, and skid trails would be used to access treatment areas and to remove products. For operability and safety reasons approximately 1,385 trees greater than 30 inches would be removed on the roads, landings and skid trails in the project.

Cumulative Effects. Direct effects and indirect effects are expected to be low. However, a cumulative effect reflects on a number of influences not just the project treatments. Thus, implementation of Alternatives B, C and G would add moderate cumulative effects to the owl’s habitat. This follows the determinations as for the HFQLGFRA FEIS ROD (1999) and FSEIS (2003), and the SNFPS FSEIS ROD (2004).

Cumulative effects from the project occur from logging and road construction, in conjunction with activities on private land. The following discussion looks at the incremental effects caused by implementing DFPZs, group selections, ITS, as well as roads, activities on private lands, and exotic species and disease. In addition, the cumulative effects from past timber harvesting both on private and Forest Lands along with grazing, mining, and disturbances from established roads and recreational uses will be discussed.

The other proposed HFQLG Pilot Projects, which are not adjacent to Sugarberry Project but may alter suitable nesting and foraging habitat. These projects did not enter California spotted owl PACs or SOHAs, and foraging habitat would be maintained at minimal suitability levels. The Forest Service Region 5 Protocol for surveys would be followed.

The HFQLG projects adjacent to the Sugarberry Project are South Fork (which borders the Sugarberry Project), Bald Onion (at the very northern portion of the project), and Slapjack (at the very southern end of the project). See the Wildlife Fisheries BE/BA for project acres. It is unclear what the wildlife and fisheries species cumulative impact will be from these actions but some levels of effects are expected. Proposed treatments for the Sugarberry Project are expected to result in low incremental impact when added to actions on the private land.

Forest Service Projects. Recent projects in Sugarberry include Upper and Lower Slate projects. Lower Slate (2004) proposed approximately 1,575 acres, however only 1,045 acres were treated. The treatments included 816 acres mastication, 188 acres hand cut pile burn, and 41 acres hand thin. Upper Slate (2005) proposed approximately 2,174 acres, however only 977 acres were actually treated. The 926 acres of treatments included mastication, underburn, handcut pile and burn, and commercial tree removal. Approximately 51 acres were commercially thinned in a HRCA for PL185. The Sugarberry Project is proposing a group selection treatment within that same area. The previous treatments of mastication, underburn, and hand cut and pile burns did not affect the canopy cover and were most likely a benefit to the owls by clearing out some of the understory.

From 1884 to 2003, the Forest Service vegetation management treatments have occurred on approximately 4,591 acres. Essentially, all 4,591 acres were clearcuts, commercial thinning, singletree selection, and precommercial thinning. Within those treatments, there were also broadcast burns and tractor pile and burn.

Private. The ongoing private land operations, in conjunction with the Sugarberry Project, could have a negative cumulative impact on the California spotted owl. Most large private landowners in the Sierra Nevada (i.e., Sierra Pacific Industries) have outlined strategies that provide certain owl protections on their land. Of the 49,768-acres wildlife analysis area in the Sugarberry Project area, there are 11,223 acres of private lands. From 1985 to 2005, private vegetative treatments have occurred on 6,677 acres in the project area. The nature of the private lands is that they are urbanized or managed for industrial timber. In general, these private lands are treated with different objectives than National Forest lands and therefore are minimally or not suitable as habitat for mature/older-forest dependent species. Urban areas and immediate surrounding are not now or ever expected to be suitable habitat for the owl.

U.S. Fish and Wildlife Service. Response to Petition to List the California Spotted owl. On May 23, 2006, the USFWS provided a news release stating "LISTING OF CALIFORNIA SPOTTED OWL FOUND NOT WARRANTED - Service finds most owl populations stable or increasing in the Sierra Nevada" (also see Federal Register, May 24, 2006, (Volume 71, Number 100)." The USFWS has concluded that most owl populations in the Sierra Nevada are stable or increasing and is denying a petition to list the California spotted owl under the *Endangered Species Act*.

Demographics/Meta-analysis. California spotted owl surveys conducted for the Sugarberry Project were not designed to be a "demographic study" but were to determine location of activity centers (nest, pair, young, etc.) and reproductive success for the three years surveyed. Demographic studies are being conducted for the California spotted owl in the Sierra Nevada which look at demographic parameters including age-specific nesting and nest success rates, age-specific fecundity, age- and sex-specific survival rates, the finite rate of population change, and sex and age class structure of the population.

Meta-analysis addressed in the “Notice of 12-month petition finding” in the *Federal Register*, May 24, 2006, (Volume 71, Number 100, pp. 13–16) “Our analysis of more recent data up through 2005 (Blakesley et al. 2006) indicates more-positive trends for spotted owls in the Sierras and is discussed at length below.”

The Draft 2006 meta-analysis “Demography of the California Spotted Owl in the Sierra Nevada: Report to the USFWS on the January 2006 Meta-Analysis” has been reviewed by the Plumas National Forest. The 2006 meta-analysis was similar to the 2001 meta-analysis (Franklin et al. 2004) but included 5 years of additional data (2001–2005), excluded the San Bernadino study, and included a population viability analysis.

The 2006 meta-analysis concludes that the potential consequences of the Forest Service management plan to spotted owls are unknown because: (1) the extent of vegetation manipulations is largely under the control of local managers and will likely vary across the Sierra Nevada; and (2) threshold levels of quality habitat necessary to maintain individual pairs of spotted owls on a site are largely unknown. The recommendations from the meta-analysis are to develop well-designed experimental studies coupled with the spotted owl demographic studies. The Plumas-Lassen Administrative Study is mentioned as quasi-experimental limiting the scope of the results of the studies.

Several studies provide insight into spatial availability of habitat for California spotted owls. (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 reproductive output decreased with increasing amount of nonhabitat within the nest area (nest area = 203 hectare scale, or 500 acres). These studies suggest that effects outside of the PAC (on another 200 acres) may influence a site’s “quality” for spotted owls. Based on these studies, it could be assumed that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area.

Blakesley’s November 4, 2005 Declaration for Creeks Project, states “my data show that the average from 67 spotted owl territories in the Lassen National Forest (including territories in the Creeks project area) was 83 percent suitable habitat within the 500 acre nest area, with a standard deviation of 12percent (Blakesley 2003). Anything less than 71percent (the average minus 1 standard deviation) should be unacceptable as a management target.”

In the Sugerberry Project the 500 acre areas were anaylized based on Blakesley’s studies. Seventeen of the twenty-two “500 acre nest areas” have ≥ 71 percent suitable habitat and two were at 68 percent. Post-treatment, of the seventeen “500 acre nest areas” ≥ 71 percent suitable habitat (including FS and Private lands) fifteen would remain ≥ 71 percent suitable habitat from pre-treatment levels, with two “500 acre nest areas” would fall slightly below 71percent suitable habitat: SIE0111 to 69 percent and SI017 to 70 percent. Refer to the Wildlife BE/BA (page 173-177) for complete information regarding the 500 acres. There would be no activities within the 300-acre PAC with the Sugarberry Project.

Barred Owl. 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 USFWS has concluded that barred owls constitute a 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.).

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 in the last three years. Of these 20, 9 have been barred owls, and 11 have been sparred (barred X spotted hybrid). There have been 10 detections in the last 3 years (6 barred and 4 sparred) in the Plumas-Lassen Administrative Study analysis area. Male sparred owls were detected several times in 2004 and 2005 during the Sugarberry Project surveys. In 2000–2001 during other field surveys 6 barred owl detections were recorded in the Sugarberry Project area.

On the Feather River Ranger District of the Plumas National Forest, four observations of barred owls occurred in 1992. In 2000, barred owls were seen and heard in the vicinity of Pats Gulch and Mountain Boy Mine, and in 2001 individual barred owls were documented in Wisconsin Ravine, at Dixon Creek, and near Grass Flat. In 2002 and 2003, there were two sightings each year on the Feather River District. In 2004, a male barred owl was located in the Glazer Ridge area. During the surveys for the Sugarberry Project barred owls were detected during spotted owl calling effort.

The potential for the barred owl to become established and compete with California spotted owls within the Sugarberry Project area is a possible additional cumulative effect, but at this point, it is unknown as to what extent.

West Nile Virus. The petition to list the California spotted owl identified West Nile Virus as a serious potential threat to owls and that its effects on owls be monitored (*Federal Register*, June 21, 2005). West Nile Virus has not yet been detected in a wild spotted owl (Ibid).

Diminished Habitat. Additional spotted owl PACs and HRCAs in the project area would be created in the future, if required. The establishment of additional spotted owl PACs and HRCAs, as well as northern goshawk PACs, would conserve habitat for this species. The project may affect individual California spotted owls and change the distribution of spotted owl habitat because it is part of the larger HFQLG Pilot Project. Projections for the HFQLG Pilot Project area indicate that 123,500 acres of stands with more than 50 percent canopy cover could be reduced to 40 percent canopy cover during the Pilot Project period. Over the longer term (see Table 4.3.2.3g of the SNFPA FEIS), there would be a cumulative growth over current conditions of suitable nesting and foraging habitat for the California spotted owl outside of treatment areas, both inside and outside of the HFQLG Pilot Project area. Based on a low potential for direct and indirect effects, cumulative effects are expected to be low.

Effects on Northern Goshawk. Section 3.1.4.3 Effects on General Habitat discusses specific habitat components and structure. Tree removal activities (group selection, ITS) will not be conducted within

PACs. However, treatments such as understory thinning, mastication, hand-cut /pile/burn and underburns are allowed in goshawk PACs.

The project area provides nesting and foraging habitat outside of goshawk PACs, which could be impacted by proposed treatments. The action alternatives B, C and G could reduce high habitat suitability (4M, 4D, 5M, and 5D). Conversely, some of the project treatments would promote medium habitat suitability for the goshawk. DFPZs would leave an open understory, which goshawks prefer (3M, 3D, 4P, 5P, and 6) for flight maneuverability below the canopy for hunting. Northern goshawks use a wider range of forest types for foraging than for nesting, so habitat that meets the need for nesting also provides foraging habitat.

The effects to potentially suitable nesting habitat outside of established PACs was considered under indirect effects based on the assumption that surveys, following regional protocol, would have detected any activity centers. Any new activity centers would become part of established PACs or new PACs would have been designated. Within the 38,545 acre (National Forest lands) wildlife analysis area, there are 33,813 acres classified as suitable nesting habitat (5M, 5D, 4M, 4D) and approximately 4,732 acres classified as suitable foraging habitat (3M, 3D, 4P, 5P, and 6), including designated PACs. Within the analysis area, there are 3,882 acres of habitat designated as northern goshawk PACs. Currently, there are 20 Northern goshawk PACs (3,882 acres) in the terrestrial wildlife analysis area. Twelve goshawk PACs overlap with spotted owl PAC habitat (goshawk nesting habitat requirements are similar to California spotted owl nesting requirements [HFQLG, p. 3-106]).

This analysis is based on CWHR forest strata types identified as nesting and foraging habitat in the HFQLGFRA FEIS (p. 3-106). The canopy cover reduction would primarily affect nesting habitat for the goshawk. Similar to the California spotted owl, goshawks requires mature conifers with large trees and dense canopy cover for nesting.

Direct Effects. Direct effects are expected to be minimal because: (1) protocol level surveys were conducted for 4 years within the Sugarberry Project wildlife analysis area; (2) PACs have been established to encompass all activity centers; (3) tree removal treatments are not allowed in PACs; (4) protection measures such as LOPs, are in place to prevent disturbances to nesting goshawks; and (5) goshawk nests are generally found on gentle to moderated slopes with a north to east aspect and treatments are predominately along ridge-tops better suited for foraging.

Proposed treatments within northern goshawk PACs are expected to have a beneficial affect on foraging habitat. The analysis of direct effects on northern goshawk is focused on known PACs identified up to and including the 2006 surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the “Indirect Effects” section below.

If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, PACs would be delineated and applicable resource protection measures (such as LOPs) would be applied. Tree removal activities (group selection, ITS and DFPZs) will not be conducted within northern goshawk PACs. However, treatments such as mastication, hand-cut /pile/burn and underburns are proposed. See Appendix E for LOPs on road reconstruction within PACs which require LOPs for Alternatives B, C and G.

Indirect Effects. Indirect effects are expected to be low because: (1) 2,100 acres of fuels reduction (understory thinning, mastication, underburning, handcut/pile/burn treatments occurring are expected to improve habitat conditions; (2) treatments in surrounding foraging habitat should have low effects to goshawk dispersal and foraging habitat based on treatments; (3) protection measures, such as LOPs; and (4) canopy cover would be maintained at 50 percent for the majority (two units will be at 40 percent) of DFPZs.

Nesting and foraging habitat for the goshawk was analyzed by: (1) looking at treatments and their affects within a one-mile buffer around the goshawks territory; (2) taking into consideration PACs, SOHAs, and HRCAs; and (3) the suitable habitat outside of PACs, SOHAs and HRCAs. The majority of goshawk PACs in the project overlap with spotted owl PACs, and SOHAs and HRCAs are shared. Thus all of the suitable nesting and foraging habitat, including owl PACs, SOHAs and HRCAs found in the project for the owl, is also considered suitable habitat for the goshawk.

Under Alternatives B, C and G DFPZ units in CWHR 5s stands may still provide adequate foraging habitat for goshawks because most prescriptions maintain a minimum canopy cover at 50 percent. Under Alternatives B, C and G, DFPZ units in CWHR 4s stands may still provide adequate foraging habitat for goshawks because most prescriptions maintain a minimum canopy cover at 50 percent.

Thinning would convert some CWHR Size Class 4 stands to CWHR Size Class 5. Stands classified as ‘dense’ in the CWHR canopy closure classification (>60 percent canopy closure), would convert to ‘moderate’ (40 to 60 percent canopy closure) after thinning activities. Upper diameter limits maintain the component of large trees that exist in the project area, and thinning from below treatments would create conditions favorable for growth and development of large trees.

Alternatives B, C and G should improve foraging, as well as nesting habitat. Nesting habitat should improve in the long-term, while in the short-term foraging habitat should improve. Alternatives B, C and G would provide more effective fuel reductions treatments, by reducing fuel-loading, provide for safe/effective zones to fight fires, and reduce the potential of stand replacing fires resulting in potential loss of suitable habitat, nesting as well as foraging. Treatments tend to benefit the goshawk by opening up the understory and making the habitat additionally beneficial for hunting. Harvest treatments on the other hand could affect the nesting habitat by reducing the tree component and canopy cover. Within a one-mile buffer (around each goshawk PAC), there is 324 acres harvest, 283 acres mastication/underburn, 742 acres mastication, and 208 acres underburn, 257 acres hand-cut tractor pile, 181 acres hand-cut pile and burn. Also within the one-mile buffer there are 803 acres of group selection included in Alternative B and 790 acres in Alternatives C and G.

For the discussion about mastication and underburning and hand-cut/pile/burn, and plantations see the discussion above under General Habitat and for the California spotted owl.

These prescription treatments should not affect the habitat long term. Moreover, plantations are considered developing areas that require management. Mastication, underburning and hand-cut/pile/burn prescriptions will open up the understudy, which will improve suitable habitat for the Northern goshawk post-treatment and in the long term.

Group Selection. Approximately 1,040 acres of group selection are proposed for treatment, approximately 3 percent of the available suitable northern goshawk habitat (33,812 acres) within the 49,768 acre terrestrial wildlife analysis area. Alternatives C and G proposes to drop 20 acres of the 1,040 acres The SNFPA ROD states to look at the treatments in terms of their proximity to Northern goshawk territories to assess the impacts to prey species. Two studies of habitat used by goshawks for foraging in California indicate that they avoid open areas (Squires and Reynolds 1997). Group selection openings within the forest may be marginal habitat or unsuitable for foraging goshawks.

Individual Tree Selection—Units designated for ITS would be treated by cutting diseased or otherwise unhealthy trees (sanitation cut) combined with a thinning from below. Approximately 155 acres of ITS are proposed for treatment, Alternatives C and G proposes to drop 5 acres of the 155 acres. ITS increases the growth rate of the healthier trees in a stand. Northern goshawks prefer forest with large trees with open understories. The northern goshawk may be affected in the short term, due primarily to disturbance, but benefit in a long term. Therefore, ITS, if applied properly, can favor habitat for the northern goshawk.

Roads System—There are 19 miles of haul roads that cross goshawk territories and less than 1 mile of road reconstruction proposed. Haul roads cause a temporary noise disturbance to the goshawk, however, reconstructed road cause not only disturbance, but in some cases trees are removed for operability and the road is widened. It is anticipated that if there are hazard trees along the route they will be removed. The principle objectives of this action plan are to reduce the potential of hazardous trees falling into Forest system roads that could cause personal injury to contractors. Hazard tree removal has been analyzed as part to the Wildlife analysis area.The Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (drafted March 31, 2003) guidelines would be followed to identify specific trees that pose safety hazards for project operability.

Sporax® Treatment—Sporax® is proposed for use in DFPZ s and ITS. Three of the 6 units are close to a HRCA or a goshawk PAC. Unit 909 is in a HRCA (PAC PL183), unit 33 falls between a goshawk PAC (T12) and spotted owl HRCA (PL187), unit 7 borders a HRCA (PL240).The assessment concluded that the use of borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates. See "Section 3.3: Vegetation, Fires and Fuels" for the complete discussion on Sporax®.

Habitat Enhancement and Restoration—Refer to activities identified and discussions for enhancement and restoration under Effects on General Habitat Section 3.1.4.3. These proposed activities would have some short-term effects from disturbance; however, activities would occur late in the year after the breeding season. These activities would have an overall beneficial effect on habitat for the Northern goshawk.

Cumulative Effects. Direct effects are not expected and indirect effects are likely to be minimal to low, therefore cumulative effects from the Sugarberry Project for the Northern goshawk are expected to be minimal to low when added to other actions. Based on surveys, protection measures and project design features; it has been determined that the cumulative effects will be similar for each action alternative. Thus, Alternatives B, C and G are analyzed together. Based on surveys, protection measures and project design features; it has been determined that the cumulative effects will be similar for the two action alternatives.

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.

The Sugarberry Project could potentially contribute to a cumulative reduction in goshawk nesting habitat in the HFQLG Pilot Project area. It is uncertain as to what influence this reduction in habitat would do to goshawk activity and occupancy in the Wildlife Analysis Area, but it is not anticipated that the cumulative habitat reduction could result in loss of occupancy and productivity of known goshawk PACs. There are 20 goshawk PACs and 4 of those would have treatments, such as mastication and underburns, neither treatment should substantially affect canopy cover. Instead, the treatments should provide an open understory for foraging.

3.11.4.6 Effects on Willow Flycatcher

The 1988 Forest Plan (Plumas National Forest LRMP) does not provide specific management guidelines for this species, but it does instruct the Forest Service to maintain viability of state-listed species. At a minimum, the Forest Service is directed to provide habitat sufficient to maintain existing populations. General Forest Plan guidelines direct the forest to improve habitat capability for hardwood, riparian, and meadow associated species.

Direct Effects. No direct effects are expected. There is a small amount of minimally to marginally suitable habitat in the project area found in RHCAs. There is a small possibility that nesting pairs not detected in surveys (or that have moved to the site after surveys) may be impacted during prescribed fire activities, but occupancy of the habitat by this species would be in the summer, and most prescribed burning would occur in autumn. If nesting little willow flycatchers are found at a later date, appropriate management requirements, such as a LOP, would be applied.

Indirect Effects. Based on the below information, no indirect effects are expected. Treatments would not take place near any little willow flycatcher territories, so treatment-related activities would not disturb any known little willow flycatchers. Implementation of SAT guidelines, RHCA buffers, and BMPs, it is anticipated that there would be no disruption in surface and subsurface flows (see the Sugarberry Project “Hydrology Report,” USDA Forest Service 2007a).

In general throughout the project area, prescribed burning may impact some isolated willows, although willows have been known to respond vigorously after fire (Stein et al. 1992). Fire would not be directly ignited in the required 300-foot RHCA buffer but would be allowed to back in. Low-intensity fire is not expected to cause any long-term reductions in little willow flycatcher habitat.

SAT guidelines, including the creation of RHCA buffers, would serve to protect breeding little willow flycatchers from noise disturbances from road construction and reconstruction, machinery, hauling, and other project-related activities.

Cumulative Effects. By adhering to management directions, standards and guidelines, BMPs, and mitigations, no direct and indirect adverse effects are expected; as a result, cumulative adverse effects are also not expected to occur. DFPZs and group selection would not occur in suitable little willow flycatcher habitat. Overall, increases in urbanization and recreational use of National Forest System lands and use of natural resources on private and federal lands may contribute to habitat loss for the willow fly catcher.

3.11.4.7 Effects on the Pacific Fisher and American Marten

The existing habitat in the Sugarberry Project area could be favorable for the forest carnivores. At this time there are no known forest carnivore den sites in the project area, on the other hand the lack of detections does not mean species absence. One explanation for the lack of presence could be because private lands bordering the project have been either heavily harvested or at least thinned, thereby removing the old growth component and leaving vast areas of open fragmented lands.

The analysis for the Fisher and Martin was designed to comply with the 2004 SNFPA FEIS Record of Decision (ROD) and the 1988 Plumas National Forest Land and Resource Management Plan (Forest Plan) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) EIS and ROD (1999). Both decisions were made to meet the legal requirements of the HFQLG Forest Recovery Act Pilot Project (1998). The draft Forest Carnivore Network that is discussed is not a management requirement in the Plumas LRMP. This network is designed to evaluate habitat connectivity across the Plumas in order to maintain options for linking habitat between the Tahoe and Lassen National Forests.

The draft forest carnivore network in the Sugarberry Project area includes a riparian or movement corridor along Slate Creek and boarders Canyon Creek to the east. This habitat is located within the close proximity to dense riparian corridors and saddles between major drainages, which could be used as trail ways. Moderate to high foraging habitat exists throughout the project area. However, high denning habitat and the best foraging habitat are located only in the southwestern half of the landscape, with only a few scattered patches in the northeastern half. Therefore, distribution of quality denning habitat within the project area is considered poor. This could be a negative affect on the northeasterly dispersal through the draft Forest Carnivore Network.

The proposed Group Selections is not expected to increase any large-scale, high-contrast fragmentation above existing levels. Given that the CWHR size class for Spotted Owls and goshawks are relatively the same habitat components used by marten; the untreated acres for those species are unaffected acres for the marten. Therefore, the protected PACs, and SOHAs augment suitable habitat acreage. Additionally, the habitat for carnivores such as marten, travel and forage primarily along rivers, and streams and den and rest in mature/old forest habitat. Action alternatives would result in a reduction in suitability of <1 percent of potential denning and resting habitat and a reduction of suitability for <1percent of potential foraging and travel habitat for marten and fisher.

Direct Effects. Direct effects are not expected for the following reasons: (1) the Sugarberry Project area does not have any known den sites; (2) there are approximately 8,070 acres of draft forest carnivore network (DFCN) in the Sugarberry Project area, however, only 133 acres of units are actually in the dFCN; and (3) the dFCN is comprised primarily, but not exclusively, of four components:

- riparian zone
- old-forest habitat

- connectors
- known sightings

The potential direct effects on forest carnivores from vegetation management activities consist of modification or loss of habitat or habitat components, especially with regard to denning/resting habitat and foraging/travel habitat. Direct effects could also include behavioral disturbance to denning from logging, road building, or other associated activities. If a den site is found in the future, the site would be protected, and a LOP would be implemented (USDA Forest Service 1999, 2001).

Indirect Effects. Although forest carnivores may be affected, indirect effects are expected to be low for the following reasons: (1) riparian zones (used as travel corridors), in general, would not be altered by the proposed treatments; therefore, indirect effects that could result from implementation of any of the action alternatives would have low effects on nesting or foraging habitat of forest carnivores; (2) only a small overall percentage of suitable habitat is being effect by the project. Within the Sugarberry wildlife analysis area, there are 23,676 acres of suitable denning/resting habitat and 10,139 acres of suitable foraging/travel habitat; (3) the proposed alternatives would not increase any large-scale, high-contrast fragmentation above existing levels; (4) implementation of any of the action alternatives should have little effect on the approximate 758,431 acres of suitable denning and foraging habitat identified in the HFQLG FEIS (p. 3-110); and (5) based on HFQLG Act FEIS, page 3-110; any effects to fisher or marten would be short-term

Of the 133 acres proposed for the dFCN approximately 64 acres are DFPZ (mastication and underburn). Forty unit acres are GS, 18 acres are ITS and 11 acres hand-cut and burn units. Treatments will retain, on average, 49 percent canopy cover. Habitat suitability will be retained at minimum foraging levels or higher. This analysis is based on the HFQLG FEIS p. 3-110.

Of the proposed treatments, group selection would have the greatest impact on fisher habitat, since group selection would create openings from 0.5 acre to 2 acres. Group selection has the potential to create fragmentation of contiguous areas and, because fishers are prone to localized extirpation, colonizing ability is somewhat limited. Habitat connectivity is a key to maintaining fisher populations within a landscape. Avoidance of open areas may restrict fisher and marten movement between habitat patches and decrease colonization of unoccupied yet suitable habitat.

The design features of DFPZs would retain habitat elements within the range of those used by fisher and marten for foraging and dispersal, such that the DFPZs would likely not create large barriers to further expansion and connectivity to fisher habitat (BA/BE for the HFQLG FEIS, p. 243).

Cumulative Effects. Since direct effects are not likely and indirect effects would be low, it is expected that cumulative effects would be low. Cumulative effects on forest carnivore habitat could occur from the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization and 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 methods land managers use to control them, have contributed, and may continue to contribute to loss of habitat for this species.

The eventual implementation of other proposed HFQLG projects could potentially alter habitat within the dFCN. The Basin Project proposal includes 17 acres of ITS and 407 acres of group selection within the DFCN. The Meadow Valley Project proposes to place 420 acres of DFPZs and 123 acres of group selections within the dFCN. The Bald Mountain Project includes group selections that would modify 62 acres and ITS that would occur on 95 acres. These three projects are scheduled to begin in 2006. In the Watdog and Slapjack Project no treatments are proposed within the draft Forest Carnivore Network. In the Basin Project a portion of the corridor runs along the Middle Fork of the Feather River. Out of the 17,034 acres of Draft Carnivore Network in the Basin Project approximately 17 (0.1 percent) acres are proposed for ITS and 407 acres for GS (2.4 percent).

The Zielinski et al. 2005 paper "Selecting Candidate Areas for Fisher Conservation that Minimize Potential Effects on Martens" was considered in the effects analysis for the American marten. However, it is important to note that the Zielinski et al. (2005) paper was unpublished and was written as an evaluation tool. The paper was regarding "potential for negative competitive interactions between the cogeneric fisher and American marten, usually with martens suffering from the interaction".

The paper states in it's discussion section: 1) "…..candidate fisher conservation areas should be subjected to additional evaluation as to their on-the-ground suitability, and the implications of ownership to potential conservation activities"; 2) "The current exercise was designed to identify general areas for consideration, not to identify specific areas for management action; and 3) "Additional evaluations should include further examination of habitat modeling tools". The model presented in the paper was intended to be used as an evaluation tool and not for individual project management, and even if the model shows suitable habitat any proposed activity does not automatically reduce suitability (personal communication William Zielinski 9/5/2007). However, Zielinski also states "Although the areas identified in this exercise may be considered candidate locations for future reintroduction of fishers into the northern Sierra Nevada, the identification of these areas are just as important for planning for the restoration of habitat connectivity for fishers in the Sierra Nevada. This benefit can be achieved even in the absence of planning for reintroduction" The opportunity for Pacific fisher conservation and re-introduction would still be available should the Pacific fisher be found on the Plumas or a decision made to re-introduce Pacific fisher to the Plumas.

The design features of DFPZs would retain habitat elements within the range of those used by fisher and marten for foraging and dispersal, such that the DFPZs would likely not create large barriers to further expansion and connectivity to fisher and marten habitat (BA/BE for the HFQLG FEIS, p. 243). The protection of California spotted owl PACs, SOHAs, northern goshawk habitat, and RHCAs would provide connectivity between large blocks of suitable habitat. In addition, implementation of RMOs would also improve habitat conditions within riparian corridors. Implementation of any of the action alternatives would not increase any large-scale, high-contrast fragmentation above current levels. Habitat of the fisher and marten has been extensively modified by historic fires, timber harvests, recreational use, and fire suppression.

3.11.4.8 Effects on Pallid, Western Red, and Townsend's Big-Eared Bat

The project area contains habitat for all three of the Forest Service Sensitive bat species. The implementation of Management Area direction and habitat prescriptions and allocations for California spotted owl, northern goshawk, forest carnivores, little willow flycatcher, , and amphibians would provide for many acres of untreated mature or old-forest and riparian habitat (see the 1988 Forest Plan, as amended by the 1999 HFQLG Act FEIS and 2004 SNFPA FSEIS). The Standard Management Requirements include the retention of large trees (30 inches dbh or greater), snags (4 per acre of 15 inches dbh or greater), and downed woody material (10–15 tons per acre of the largest diameter) The Sugarberry Project "Forest Vegetation/Fuels Report" (USDA Forest Service 2007b).

The SNFPA ROD contains no specific direction regarding bat species. However, under HFQLG FEIS there are directions such as surveys and Limited Operating Periods (LOP) and the protection of oak that apply to retaining bat habitat. In addition, bat foraging habitat is protected by (HFQLG FEIS and SNFPA ROD) standards and guidelines that maintain aquatic and riparian zones (See Wildlife BE/BA page 81).

Of the three bat species, it is expected that pallid bats could potentially be more directly impacted due to their general use of the forest for roosting and foraging. Western red bats are more dependent on riparian habitat for roosting and foraging, and Townsend's big-eared bats are more closely associated with structures (such as caves, bridges, and buildings) for roosting and riparian habitat for foraging. It is expected that the latter two species would be more indirectly affected.

Direct Effects. For all three bat species direct effects are expected to be low for the following reasons: (1) implementation of the Standard Management Requirements in addition to direction and habitat prescriptions and allocations for other species; (2) retaining snags and employing riparian protection measures would help protect bat habitat and foraging areas; (3) adult bats maybe able to flee from the destruction of their tree roost; (4) underburns are limited to the fall, which minimize the risk of mortality to bats, because by fall the young bats can fly and hibernation has not yet begun.

Conceivably, direct impacts could occur by destruction of active roosts through felling and/or removal of large trees, small trees with hollows, or mature oaks could displace or harm individual bats. Hazard trees, including snags, along the road and those removed for safety or operability reasons, could result in direct mortality of bat species that may be roosting in the tree or snag. Project activities could also result in the loss of structures used by Townsend's big-eared bats; however, surveyors did not find any potentially suitable structures in the project area.

Adult bats may be able to flee from the destruction of their roost tree, but if activities were to take place in spring and early summer, juvenile bats (prior to initiation of flight skills) would have no means of escaping direct disturbance and would be killed if roost trees were felled. Prescribed burns in the spring could affect pallid bats due to their habitat preferences. The use of chain saws or heavy equipment could create ground vibrations that may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment. However, machinery used for mechanized treatment would disturb most tree-roosting bats (potentially cause them to flee the area) prior to tree removal activities, and therefore reduce the potential for direct mortality of these species.

The treated acres could provide many of the habitats attributes necessary to support the sensitive bat species by employing BMP and SAT guidelines and maintaining aquatic/riparian ecosystem processes in the RHCAs. LOP for the California spotted owl and northern goshawk overlap the spring and summer seasons when bats are rearing their young. Where these LOPs are implemented, further minimization of disturbance to bat species is likely.

Indirect Effects. For all three bat species indirect effects are expected to be low for the following reasons: (1) aquatic and riparian zones are protected under the HFQLG Act FEIS and SNFPA FEIS ROD standards and guidelines this would minimize effects on foraging habitat and prey species in RHCAs for the Western bat and Townsend big-eared bat, (2) also, bats primarily forage at dusk or night when project activities would be minimal or not occurring, (3) project activities do not include caves, buildings or bridges and these are areas associated with the Townsend big-eared bat.

It is expected that disturbances due to activities versus habitat modification would likely affect western red and Townsend's big-eared bat species. It is difficult to determine where bats are roosting and foraging because of their small stature and difficulty surveying for them. Ground disturbances, caused primarily by mechanical treatments but also by prescribed fire, may change prey populations or their availability as food, either positively or negatively, in areas outside of riparian habitat. This would have a greater impact on pallid bats since they also forage on shrubs and on the ground. The available insect prey base for bats may have some short-term site-specific reductions following treatment due to direct mortality and/or loss of vegetation.

"Tree roosting has been documented in large conifer snags and bole cavities in oaks" (Sherwin, pers. Comm. 1998). Cavities in broken branches of black oak are very important, and there is a strong association with black oak for roosting (Pierson, pers. Comm. 1996). Logging and prescribed fire would result in a loss of snags that are important for wildlife; however, snag recruitment is also expected with retention of conifers over 30 inches dbh and some recruitment due to fire kill. The recommended standards and guidelines for snag retention (from table 2, p. 69 of the SNFPA ROD) would be followed for this project.

Cumulative Effects. With full implementation of Standard Management Requirements and/or Resource Protection Measures, and mitigations for wildlife and for hydrology, cumulative effects on bats would be low because there would be low direct and indirect effects.

Cumulative effects on these bat species would occur predominately from loss of quantity and quality of habitat (conifer, oak, and riparian) as a result of tree removal and disturbance during roosting attempts and of prey base. Overall, increases in urbanization, recreational use of National Forest System lands, and use of natural resources on state, private, and federal lands may contribute to habitat loss for this species. Activities that result in disturbance to maternal dens or wintering roosts can result in total loss of bat populations within a large area due to the isolated distribution of these sites across the tri-forest area (Plumas, Lassen, and Tahoe National Forests).

Effects on Mule Deer

Direct, Indirect and Cumulative Effects. Under all action alternatives, deer foraging habitat would increase, and populations would likewise tend to increase for the following reasons:

Most recently Upper Slate and Lower Slate DFPZ Projects resulted in opening up stands and regenerating understory browse species. Creating open forest habitat allowing more sunlight and moisture to reach the forest floor, thus creating more forage and brush cover with the action alternatives. 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.

The Slate Creek Landscape Assessment, September 1999, identified the opportunity to improve deer range through broadcast burning, underburning, black oak enhancement projects, and close and decommission roads to reduce open road density and road density in general. Landscape "needed actions" are: (1) within winter deer range, identify thermal cover patches within or outside of DFPZs to be retained during DFPZ construction. Expand DFPZs to include brushfields; (2) adjust group selections across the landscape in a manner that maximizes deer forage benefits; and (3) thin individual trees and place group selections to release hardwoods, to increase deer forage.

Within the Sugarberry Project analysis area (Slate Creek watershed) a vegetation analysis identified 25 percent of the landscape to be available for forage and 75 percent available as cover (this includes private lands). The desired forage:cover ratio, as identified within the Bucks Mountain/ Mooretown Deer Herd Management Plan, within winter range is 60:40, whereas on summer range it is 50:50. The Sugarberry Project is completely within summer range for deer and does not meet the "Plans" desired forage:cover ratio. However, based on the historical landscape perspective for Slate Creek watershed the cover habitat would have historically been higher than the forage habitat.

Within the summer range, as many as 1,040 acres of group openings (1–2 acres) would be created. The Slate Creek Landscape Analysis stated that historically "Overall, there would have been many small openings, 0.05 to 0.6 acre, but relatively few large openings (up to 16 acres in size). These openings could have supported shrubfields long term or as precursors to timbered stands" and that "historical levels of seral stage one for foraging at 19 percent of the landscape." The proposed treatments would be expected to increase forage habitat.

Of the 2,100 acres of DFPZ treatments; 250 acres of open forested stands will be created (mechanical and hand thin). In addition, a portion of the 1,800 acres of DFPZ non-thinning treatments using prescribed fire and other treatments are proposed in old, decadent brushfields, located within summer range, which would result in new, palatable, nutritious and highly palatable forage for deer. The Slate Creek Landscape Analysis (USDA 1999) stated "There is deer habitat throughout the Slate Creek landscape, however, good quality habitat is patchy, especially shrub forage, with most of the landscape in a forested condition. Historically, there were probably the same assemblages of shrub species throughout the landscape that exist today. However, as historic fire regimes have been altered due to fire suppression, the abundance of deer has likely decreased as the quality of the forage has decreased."

Black oak is a major component within the analysis area. Thinning prescriptions implemented in DFPZ's and ITS, with oak retention, would enhance oak health and improve acorn productivity. The largest oaks (12 inches and greater) are to be retained up to 25–35 square feet basal area/acre. Black oaks 10inches and greater will be retained in GS and ITS units. Removal of small diameter trees (oak or conifer) will allow remaining hardwoods to grow more rapidly. This would improve mast production while still providing for forest cover. Group selection units were placed to avoid stands with a high percentage of black oak components. The proposed group selection treatments adjacent to black oak stands would increase health and size of surrounding black oaks.

Changes to the CWHR in the mixed conifer as a result of the action alternatives would result in slight increases in habitat suitability when opening up denser stands, although there is a slight decline in suitability by reducing 4M to 4P (cover reduction). The largest increase in improving forage suitability comes from creating open, younger age stands (1, 2, 4P), as both forage and brush cover is provided at higher levels than older and denser conifer stands. Alternative B improves foraging habitat suitability across the analysis area for deer above than the no action alternative but only slightly better than the action Alternatives C and G.

In the Sugarberry Project analysis area, foraging habitat for mule deer could be improved as a result of implementing all action alternatives and could provide higher quality habitat (from existing conditions) until brush is shaded out or becomes decadent in 12–50 years. With reforestation, brush would be set back through release and plantation thin treatments, allowed to recover and provide a small amount of new browse, and eventually are shaded out by the growing conifers at about 50–60 years. The proposed action alternatives would improve deer foraging habitat within fuel treatment areas through mastication and broadcast/underburning actions.

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 p. 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. Because of this, deer habitat declines by –5.6 to –6.6 percent over a 5-decade period across the Sierra Nevada range. 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.

The action alternatives 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. The short-term cumulative effects would improve the forage base and edge effects that would benefit deer. The long-term cumulative effects of this action would fall in line with the analysis conducted for the SNFPA (described above) and potentially contribute to the decline of mule deer within the project area, the Plumas National Forest, and the Sierra Nevada range.

The action alternatives implement positive habitat manipulations that tend to reduce possible identified limiting habitat factors for California deer herds (creation of brushfields, using prescribed fire, opening up overstocked conifer stands, reducing road densities, Department of Fish & Game 1998). Approximately 1,800 acres of fuel treatment using prescribed fire are proposed in dense timbered stands and old, decadent brushfields that are located within mule deer summer range, which would result in new, highly palatable, nutritious forage for deer. Within these treated areas there could be a short-term increase in brush/forb regeneration that would flourish with group openings and any treated area that would be underburned, prescribed burned, or masticated. This increase in deer use may be more reflective of changes in use patterns by deer than any major increase in animals. On the other hand, other identified limiting factors (predation) could also be increased by the action alternatives. Urban sprawl would not be affected by the proposed action, although human access into deer habitat would be reduced.

Future foreseeable actions include DFPZ maintenance (underburning, hand thinning). These actions would benefit deer for a time by regenerating sprouting brush until the forest canopy closes in and shades out brush.

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. 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.

Based on the direct/indirect effects, implementation of the action alternatives would contribute to an increase in open forest habitat, improving the grass/forb/brush mix resulting in increased forage and decreased forested cover, as well as a very slight decrease in road density. These cumulative effects improve two limiting factors identified by the California Department of Fish & Game that affect deer herd health. It is suspected that the carrying capacity in the analysis area would be improved and deer numbers would respond to the habitat changes such that there would be some upward trend in the Mooretown deer herd population for the next 10–20 years. Winter range would be improved by opening up stands through thinning, prescribed burning in thinned stands, as well as prescribed burning old brushfields, all three actions providing additional high quality forage. 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.

Effects on Trout Group

Direct, Indirect and Cumulative Effects. Implementation of any of the action alternatives may result in small, localized short-term (implementation period plus 2–3 years) increases in fine sediment delivery to aquatic habitats, but fine sediment delivery should exhibit a net decrease over the long term. Through the design of the action alternatives, and by implementation of Standard Management Requirements for soils and streamside management, ground disturbance activities would be minimized. In very few areas, fuels reduction treatments in RHCAs could decrease wood available for ground cover and sediment traps in those RHCAs.

The Scientific Advisory Team guidelines and BMPs would be followed. Implementation of BMPs designed to minimize upslope erosion should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats.

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 large and intense fire.

Trout distribution in Potosi, Pearson Ravine, Gold Run, Whiskey, and Fish Meadow creeks would increase by 4.8 miles with the improvement of five stream crossings to allow for upstream fish passage. In addition to increasing accessible habitat for individual fish, removal of barriers will also decrease fragmentation among populations, resulting in increased productivity and increasing the likelihood of long-term persistence in a particular stream.

Many of the creeks within the area are subjected to mining activities. Localized impacts of mining include disruption of the channel bed and disturbance to individual fish and benthic invertebrates. Sedimentation and increased turbidity may occur downstream. The time frame for dredging season is from the third week of May through October 15 each year. Dredging must be in compliance with state regulations under a permit issued by the California Department of Fish & Game.

Effects on Swainson's Thrush

Direct, Indirect and Cumulative Effect. Direct effects on nesting birds can occur as a result of timber harvest killing young birds in the nest that cannot fly. It is recognized that such projects, when implemented during the breeding season (April–September) could directly affect nesting birds. However, the Sugarberry Project would be expected to result in minimal direct effects to Swainson's thrushes because the majority of their breeding habitat would be protected within RHCAs.

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, such as the Swainson's thrush (USDA - PSW 2006). However, due to the low level of proposed treatments within RHCAs and the potential for wildfires the long-term effects of habitat loss would outweigh the short-term effects of some reduction in habitat suitability.

It is assumed that alternatives that place group selection harvest units (groups) within stands at densities higher than 11.4 percent of the stand would create more edge and reduce forest interior habitat. 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 that Sugarberry wildlife analysis area for certain Neotropical migrants. Neotropical migrants that favor forest interior habitat such as the Swainson's thrush would have reduced habitat capability with the action alternatives that propose group selection harvests. However, since group selection would not occur within RHCAs the effects would be low.

Smoke from burning piled debris in-group selections could indirectly affect Swainson's thrushes. However, this should be minimal since piles would be placed outside of RHCAs. Pile burning is planned for fall and early winter months when these birds are not present in the Sierra, or at least not nesting. Noise from vehicles and equipment and increased human activity and presence adjacent to the RHCAs could affect this species. These forms of disturbance would be limited to individual treatment units and last a few days to 2 weeks in any location. Affects would be very limited and not substantially affect habitat use or reproductive capacity of this species.

The cumulative effect of recent regeneration harvest on private land together with Sugarberry Project group selection harvests and fuel treatments would overall improve habitat conditions for birds that prefer openings and open-canopied habitat across the landscape. However, based on the CWHR model, the Swainson's thrush would have decreased habitat suitability. Allowing group selection treatments to naturally regenerate would ensure that shrub habitat would remain on the landscape longer than with intensive regeneration efforts.

Due to the management requirements in place, the limited scope of the project, and minimal entry into RHCAs, it is not expected to add to cumulative effects in a way that would affect the Swainson's thrush population as a whole or change the distribution of habitat. Management for the willow flycatcher under the proposed Willow Flycatcher Conservation Strategy may benefit the Swainson's thrush because habitat for the two species often overlaps.

3.11.5 Determinations

The proposed activities in the Sugarberry Project area may have some effects on habitat for MIS and/or NTMB species (refer to the MIS and NTMB Reports for discussions of the potential effects on the habitat for these species).

The following are determinations for federal Threatened, Endangered, and Sensitive species based on current available data and on the following assumptions: full implementation of identified mitigations and complete compliance with the Plumas National Forest LRMP, and all applicable amendments, including HFQLG Act FSEIS and ROD and the SNFPA FEIS and ROD (Table 18).

Based on the above analysis of the proposed project and treatments in the Sugarberry Project area, it is the *Forest Service determination* that the activities would not affect the following federally Threatened or Endangered species: California red-legged frog, Valley elderberry longhorn beetle, bald eagle, Carson wandering skipper, delta smelt, Lahontan cutthroat trout, winter-run Chinook salmon, Central Valley spring-run Chinook salmon, or Central Valley steelhead. These species are not known to occur on the Plumas, do not occur within the elevational range of the project area, do not occur in the project area, or have not been located by surveys. Also included are those species for which the following were developed: Resource Protection Measures, BMPs, SAT guidelines and associated RHCAs and RMOs, and applicable standards and guidelines contained in the HFQLG Act FEIS and ROD and the SNFPA FEIS and ROD.

If any federally listed species are found at a later date, or if any new information relevant to potential effects of the project on these species becomes available, the project would be stopped and the Section 7 Consultation process under the *Endangered Species Act* would be initiated.

It is the *Forest Service determination* that the proposed activities in the Sugarberry Project area would "not affect" the following Forest Service Sensitive species: willow flycatcher, western pond turtle, great gray owl, Sierra Nevada red fox, northern leopard frog, greater sandhill crane, Swainson's hawk, peregrine falcon and California wolverine.

It is the *Forest Service determination* that the proposed activities in the Sugarberry Project area "may affect individuals, but are not likely to result in a trend toward federal listing or loss of viability" for the following Forest Service Sensitive species: mountain yellow-legged frogs and foothill yellow-legged frogs, hardhead minnow, California spotted owl, northern goshawk, Pacific fisher, American marten, pallid bat, Townsend's big-eared bat and western red bat.

3.11.6 Past, Present, and Reasonably Foreseeable Future Actions

Under the NEPA, cumulative effects represent 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 other actions" (see Appendix F).

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

Past actions in the area include timber harvest, planting, pre-commercial thinning, recreation use, mining, and grazing. The conditions of the vegetation, streams, wildlife habitat, riparian areas, soil and meadows seen in the Sugarberry landscape today are the product of both natural occurrences as well as post Euro-American settlement activities, dating from the California Gold Rush.

The combined effects of past timber harvest and fire exclusion have changed the tree species composition and structure of the forest. The most important effect is the loss of large trees and snags, which decreases habitat values for pallid bats, goshawks, forest carnivores, and spotted owls as well as cavity dependent species. Other than the loss or reduction in quality of habitat, it is unclear as to the extent of the effect on Threatened and Endangered Species since very little survey work was conducted. When added to the past actions it is expected that the proposed treatments for the Sugarberry Project will result in low incremental impacts for the short term and provide for a long-term gain in habitat protection and quality.

Present Actions. The Sugarberry Project is part of a forest wide plan to place DFPZ in strategic locations. Treatments for this project would be part of DFPZs being implemented or proposed on National Forest lands in the area. The project adjacent to the Sugarberry Project is South Fork (SNFPA 2001). South Fork DFPZ (1,803 acres) is being implemented now and impacts on California spotted owls and other Forest Service sensitive species were minimal.Lower Slate (SNFPA 2001) and Upper Slate (SNFPA 2001) projects occurred in the Sugarberry Project area. Analyses of the Lower and Upper Slate projects concluded impacts on California spotted owls and other Forest Service sensitive species were minimal.

In 2004–2005, Upper and Lower Slate DFPZs were implemented in what is now the Sugarberry Project. Lower Slate (2004) proposed approximately 1,575 acres, however, only 1,045 acres were treated. The treatments included 816 acres mastication, 188 acres hand cut pile burn, and 41 acres hand thin. Upper Slate (2005) proposed approximately 2,174 acres, however only 977 acres were actually treated. The 926 acres of treatments included mastication, underburn, handcut pile and burn, and commercial tree removal. Approximately 51 acres were commercially thinned in a HRCA (HRCA PL185). The Sugarberry Project is proposing group selection, ITS, underburns and Sporax ® applications within the same area. The 51 acres previously treated are only a portion of total acres in that unit. Most of the previous treatments (mastication, underburn, and hand cut and pill burn) did not affect the canopy cover and were most likely a benefit to the owls by serving to clear out the understory.

All of the projects discussed below are HFQLG projects. Projects implemented may have some effects on Threatened and Endangered Species but no project had effects that would lead to a “trend toward listing” for Sensitive species or “adverse effects” to listed species. The majority of effects where determined to be short term with long-term benefits.

DFPZs, group selection, and ITS projects scheduled for areas adjacent to Sugarberry, in addition to other locations in the Feather River Ranger District.

From 1985 to 2005*, private lands vegetative* treatments in the Sugarberry Project have occurred on 6,677 acres. Approximately 876 acres of clearcuts, 1,992 acres of group selection, 25 acres of seed tree removal, 647 acres of shelterwood removal, 63 acres commercial thin, 15 acres sanitation salvage, and 3,059 acres of tree selection. For these projects, it is expected that these acres are not suitable nesting or foraging habitat for the California spotted owl and will not be within the timeframe of the analysis. It is possible that the 63 acres of commercial thin and 3,059 acres of selection are suitable for foraging but it in unknown as to what the dominant size class the tree stands were or what dominant size class was left remaining post harvest. It is expected that the larger trees were removed, reducing whatever size class was on site prior to harvest. Future treatments on private land are proposed for approximately 1,022 acres of land. Future treatments include 13 acres of seed tree removal, 68 acres of sanitation salvage, 73 acres of clearcuts, 51 acres selection, and 107 acres of shelterwood removal, 76 acres rehabilitation, and 634 acres group selection. It is expected that the larger trees were removed, reducing whatever size class was on site prior to harvest.

From 1884 to 2003, the Forest Service vegetation management treatments have occurred on approximately 4,591 acres. Essentially, all 4,591 acres were clearcuts, commercial thinning, singletree selection, and pre-commercial thinning. Within those treatments, there were also broadcast burns and tractor pile and burn.

The ongoing private land operations could have a negative cumulative impact on the California spotted owl. Most large private landowners in the Sierra Nevada (i.e., Sierra Pacific Industries) have outlined strategies that provide certain owl protections on their land. The companies implement such activities such as conducting surveys for spotted owls before timber harvests, and/or buffer nest centers from disturbances, and/or protect forest units with nesting spotted owls from harvest altogether.

Of the 49,768 acres of the wildlife analysis area in the Sugarberry Project area, there are 38,545 acres of National Forest lands and there are 11,223 acres of private lands. The nature of the private lands is that they are urbanized or managed for industrial timber. In general, these private lands are treated with different objectives than National Forest lands and therefore are minimally or not suitable as habitat for mature/older-forest dependent species. Urban areas and immediate surrounding areas not now or ever expected to be suitable habitat for the owl.

Foreseeable Future. The FSEIS 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. DFPZ maintenance methods were developed from criteria in the Final Supplement involving land allocations, slope classes, and vegetation characteristics.

After the completion of the mastication proposed for these areas, manzanita, ceanothus, and other shrub species will re-sprout and could begin reducing DFPZ effectiveness. There would also be some natural regeneration of conifers over time. DFPZ monitoring would not begin for approximately 5 years after construction has been completed, depending upon funding, because DFPZ effectiveness would not be seriously reduced for approximately 5 to 10 years in plantations and 10 to 20 years in older stands. A DFPZ monitoring program would be completed at 2- to 3-year intervals for the Sugarberry Project area until the DFPZ is no longer needed or funding is no longer available. The Forest Service would fully comply with the Council CEQ regulations for implementing NEPA requirements prior to conducting any maintenance activities.

3.11.7 Summary of Cumulative Effects

The cumulative effects of this project on fish and wildlife species include those effects from past, present, and reasonably foreseeable projects occurring in and adjacent to the Sugarberry Project area, which includes 38,545 acres of National Forest System land for the wildlife analyses area and 43,800 acres for the aquatic analyses area. Past activities are considered part of the existing condition and are discussed in the “Affected Environment (Existing Conditions)” and “Environmental Consequences” sections for each resource.

Mountain and Foothill Yellow-legged Frogs. By adhering to management directions, standards and guidelines, BMPs, and mitigations, impacts on MYLF and FYLF habitat would be prevented or strictly controlled, and beneficial aquatic and riparian habitat restoration would result from proposed activities. The proposed activities in the Sugarberry Project area would not result in substantial or widespread direct effects but could result in low indirect effects. Therefore, any negative cumulative impacts on YLF and YLF habitat of all Sugarberry Project components would be negligible in the context of past, present, and foreseeable actions, and the accelerated recovery of historically degraded habitats will have the potential to improve conditions for this species.

Western Pond Turtle and Hardhead Minnow. By adhering to management directions, standards and guidelines, BMPs, and mitigations, impacts on western pond turtle and hardhead minnow habitat would be prevented or strictly controlled, and beneficial aquatic and riparian habitat restoration would result from proposed activities. The proposed activities in the Sugarberry Project area would not result in direct effects but could result in very low indirect effects. There would also be no discernable incremental cumulative effects.

California Spotted Owl. The determination is “low effect not likely to lead to a trend toward listing.” This follows the determinations for the 1999 and 2003 Records of Decision on the HFQLG Act FEIS and FSEIS, respectively, and the 2004 ROD on the SNFPA FSEIS. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct effects are not expected, and indirect and cumulative adverse effects are expected to be low.

Northern Goshawk. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct adverse effects are not expected and indirect effects are expected to be minimal to low, therefore cumulative effects are expected to be minimal to low.

Little Willow Flycatcher. By adhering to management directions, standards and guidelines, BMPs, and mitigations, no direct, indirect, or cumulative adverse effects are not expected.

Pacific Fisher and American Marten. By adhering to management directions, standards and guidelines, BMPs, and mitigations, direct effects are not expected, and any indirect and cumulative effects would be low.

Pallid, Western Red, and Townsend's Big-eared Bat. By adhering to management directions, standards and guidelines, BMPs, and mitigations, any direct, indirect, and cumulative adverse effects are expected to be low.

Chapter 4. Consultation and Collaboration

4.1 Preparers and Contributors

The Forest Service consulted the following individuals; federal, state, and local agencies; tribes; and non-Forest Service persons during the development of this environmental impact statement:

4.1.1 Interdisciplinary Team Members

Name	Title	Education / Responsibility / Experience
James Arrigoni	Wildlife and Fisheries Biologist	B.S. in Wildlife Biology from University of Vermont, Burlington, VT; M.S. in Conservation Biology from State University of New York College of Environmental Science and Forestry, Syracuse, NY; 6 years of experience in wildlife and fisheries biology.
Jo Anna Arroyo	Wildlife Biologist	M.S. in Wildlife Management and B.S. Wildlife Management, New Mexico State University, Las Cruces, New Mexico; 3 years of combined experience in wildlife.
Sara Ashkannejhad	Forester	B.S. in Forest Management from Oregon State University, Corvallis, OR. M.S. in Forest Biology from State University of New York Environmental Science and Forestry, Syracuse, NY; 4 years of experience in forest management.
Luke Brandy	Planner	B.S. Forestry, Northern Arizona University.
Rick Case	District Fuels Specialist	Fire and fuels – 25 years of experience.
Deirdre Cherry	Fuels Technician	B.S. in Athletic Training, Boise State University, ID; 15 years of experience in fire and fuels.
Chris Christofferson	Assistant District Botanist	B.S. in Biology, with an emphasis in Ecology, California State University, Chico; M.S. in Integrated Pest Management, University of California, Davis; 6 years of experience in botany.
Jerry Gott	District GIS Coordinator	B.A. in Natural Sciences, California State University, Chico; A.A. in English, Shasta College; 6 years of experience in GIS; 21 years of experience in timber sale planning, preparation, and administration; 4 years of experience in fire management (Helitack); 2 years of experience in recreation (trails).
Karen Hayden	District Ranger	B.S. in Wildlife and Fisheries Biology form University of California at Davis, 27 years experience with the Forest Service including Fire Suppression, Fuels Management, Law Enforcement, Recreation, Range, Burn Area Emergency Rehabilitation for Threatened and Endangered Species, and 18 years of Wildlife/Fish/Rare Plant management.
Pete Hochrein	Forest Transportation Engineer	B.S. in Forest Resource Management, University of California, Berkeley; M.S. in Forestry, Oregon State University; 26 years of Forest Service experience.
Kristina Hopkins	Forest Fisheries Biologist	Plumas National Forest.
Susan Joyce	Planner	B.S. in Anthropology, Franklin and Marshall College, Lancaster, PA; M.S. in Forestry, Michigan Technological University, Houghton, MI; 3 years of experience in community development and 2 years in planning.

Name	Title	Education / Responsibility / Experience
Fred Levitan	Hydrologist	B.S. in Geology, Stanford University, Stanford, CA; M.S. candidate in Environmental Systems, Humboldt State University, Arcata, CA; 15 years of experience.
Bob Lowdermilk	Logging Systems / Transportation Planner	B.S. in Business Management, Western Carolina University, Cullowhee, NC; 34 years of experience in timber sale planning, preparation, and administration.
Mike Mateyka	Silviculture and Economics	B.S. Forestry Management, University of Wisconsin; 30 years of Forest Service experience; emphasis in vegetation management, silviculture, and planning.
Linda Morehouse-Braxton	Assistant Resource Officer	Various resources – 26 years of Forest Service experience in recreations/lands/minerals management, timber sale preparation/administration, and business administration.
Cindy Roberts	District Wildlife Biologist	M.S. in Wildlife Management; B.S. in Wildlife Biology, Sacramento State University, Sacramento, CA; 16 years of experience in wildlife management.
Daniel Roskopf	Forester, Silviculturist	B.S. Forest Resource Management, Minor Natural Resources, Humboldt State University, 1984; Silviculture Institute, Oregon State University, and University of Washington, 1992; California Certified Pesticide Applicator; 22 years of experience in fire, timber, and silviculture.
Deborah Tibbetts	Assistant District Archaeologist	B.A. in Anthropology, University of California Berkeley; M.A. In Anthropology, California State University, Chico; 15 years of experience in archaeology.
Kelly Whitsett	District Hydrologist	M.S. in Hydrogeology, University of Arkansas–Fayetteville; B.S. is Geology and Geophysics, University of Missouri–Rolla; 3 years of experience in forest hydrology.
John Zarlengo Jr.	NEPA Coordinator	B.S. Forest Management, Humboldt State University, 1986; M.S. candidate Ecosystem Management, Utah State University, 2008; 21 years of experience in Fire Suppression and Timber Management.
Judy Welles	District Silviculturist	B.S. Forestry, University of Massachusetts, Amherst. 25 years of Forest Service experience
Carol Spinos	Writer-Editor	13 years experience in NEPA planning with the Forest Service with an extensive background in Forestry, Biology, and Communications; 3 years experience as environmental private consultant.
Sharen Parker	NEPA Planner	BS Environmental Studies with an emphasis in Ecology, Charter Oak State College, New Britain, CT; 10 years forest genetics 17 years combined experience with the Forest Service

4.1.2 Federal, State, and Local Agencies

The Forest Service consulted with the following federal and state agencies during the development of this final environmental impact statement.

4.1.2.1 United States Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) issued the species list for the Plumas National Forest on April 23, 2003 (USFWS reference 1-1-03-SP-1810), and updated the computer database on August 30, 2005. The list fulfills the requirement to provide a current species list pursuant to Section 7(c) of the *Endangered Species Act*, as amended.

Wildlife. Early involvement between the Forest Service and USFWS began on September 15, 2006. Communications between the Forest Service and USFWS have been ongoing since initial contact with the USFWS.

Telephone discussions between the Forest Service and Amy Fesnock of the USFWS have occurred regarding the bald eagle, California red-legged frog, valley elderberry longhorn beetle and great gray owl. It has been determined through early involvement that the limited habitat available, and/or no detections from surveys, and/or applied mitigation measures, and/or that proposed treatments would not impact the habitat of these species.

Botanical. The Forest Service has not initiated formal consultation with the USFWS for threatened, endangered, or proposed plants because no such species were found to occur within the Sugarberry Project area.

4.1.2.2 California Department of Fish and Game

The department was contacted during scoping for the Sugarberry Project and was provided with the proposed action. The department manages wildlife populations for the state of California, with an emphasis typically on game species such as the local deer herds and associated habitats.

4.1.3 Tribes

The following federally recognized tribes and interested and affected tribes were consulted regarding the Sugarberry Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu.

4.1.4 Organizations and Individuals

The Forest Service began collaboration in 2006 by hosting community meetings for individuals and organizations interested in reducing wildland fire risk, cutting timber and creating jobs, recreation, and protecting the environment in Plumas, Sierra, and Yuba Counties. The Sugarberry Project continues to develop through collaborative effort.

4.2 Distribution of the Final Environmental Impact Statement

The *Sugarberry Project Final Environmental Impact Statement* was either distributed hardcopy or is available to agencies, organizations, and individuals as required by the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1502.19) that implement the *National Environmental Policy Act* (NEPA) at the following website address: http://www.fs.fed.us/r5/plumas/projects_and_plans/Sugarberry_project/. Hardcopies are to be sent to the following federally recognized tribes, and EPA offices in San Francisco and Washington DC. The complete mailing list is on file at the Feather River Ranger District Office.

4.2.1 Federal, State, and Local Agencies

Council on Historic Preservation

Director for Planning and Review Advisory, Washington, DC

Environmental Protection Agency

Region 9 Federal Activities Office, Karen Vitulano, San Francisco, CA

EIS Filing Section, Washington, DC

Federal Aviation Administration, Western-Pacific Region, Lawndale, CA

Federal Highway Administration

California HDA-CA, Sacramento, CA

National Marine Fisheries Service, Longbeach, CA

State of California

Butte and Yuba Units of the California Department of Forestry and Fire Protection

University of California, Davis, Cooperative Extension

U.S. Department of Homeland Security

U.S. Coast Guard, Washington, DC

U.S. Department of Agriculture

APHIS PPD/EAD, Riverdale, MD

Forest Service, Ecosystem Management Coordination, Washington, DC

National Agricultural Library, Beltsville, Maryland

Natural Resources Conservation Service, Washington, DC

Pacific Southwest Forest Research Station

U.S. Department of Defense

Army Engineer Division, CESPD-CMP, San Francisco, CA

U.S. Department of Energy

Office of NEPA Policy & Compliance, Washington, DC

U.S. Department of the Interior

Fish and Wildlife Service, Wayne S. White, Sacramento, CA

Director, Office of Environmental Policy & Compliance, Washington, DC

4.2.2 Tribes, Local Agencies, Nongovernmental Organizations, and Individuals

The *Sugarberry Project Final Environmental Impact Statement* hardcopies were either distributed or are available on the aforementioned website. Additional copies are available by request by calling or visiting the Feather River Ranger District, Plumas National Forest, 875 Mitchell Avenue, Oroville, CA, 95965, 530/534-6500.

Tribes	Berry Creek Rancheria
	Chico Band of Mechoopda Indians
	Enterprise Rancheria
	Konkow Valley Band of Maidu
	Mooretown Rancheria
Local Agencies	Butte County Fire Safe Council
	Counties of Lassen, Plumas, Shasta, Sierra, and Tehama QLG Forester
	County of Yuba, Office of the Board of Supervisors
	Dobbins/Oregon House Fire Protection District
	Plumas County Fire Safe Council
	Yuba County Rural Fire Joint Powers Agency
	Yuba Watershed Protection and Fire Safe Council
Nongovernmental Organizations	American Forest Resource Council (AFRC)
	Dobbins/Oregon House Action Committee (DOACT)
	John Muir Project
	Lake Francis Grange #745
	Lassen Forest Preservation Group
	Plumas County Museum
	Sierra Nevada Forest Protection Campaign
	Sierra Pacific Industries

South Feather Water and Power

Individuals

Cliff Beumel
Doug Parsons
Edith Kingdon
J R Stoffer & Autumn Meadows
J. Michael Dousman
John Anderson
Larry Packard
Leslie John Cox
Linda Blum
Marty Gabriel
Moira Burke
Ormonde Sheehan
Susan Britting

Acronyms

AQMD	Air Quality Management District
BA	biological assessment
BE	biological evaluation
BMP	Best Management Practices
CARB	California Air Resources Board
CDWR	California Department of Water Resources
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRWQCB	California Regional Water Quality Control Boards
CWE	cumulative watershed effects
CWHR	California wildlife habitat relationships
dbh	diameter at breast height
DEIS	draft environmental impact statement
DFCN	Draft forest carnivore network
DFPZ	Defensible Fuel Profile Zone
EHR	Erosion Hazard Rating
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERA	Equivalent Roaded Area
FEIS	final environmental impact statement
FM	fuel model
FMA	Fire Management Analyst
FSEIS	final supplemental environmental impact statement
FSH	Forest Service Handbook
FSM	Forest Service Manual
FYLF	Foothill yellow-legged frog
GIS	Geographic Information System

HFQLG	Herger-Feinstein Quincy Library Group
HFQLG Act	*Herger-Feinstein Quincy Library Group Forest Recovery Act*
HRCA	Home Range Core Area
HUC	Hydrologic Unit Code
IDT	Interdisciplinary Team
KV	Knutson-Vandenburg
LOP	Limited operating period
LRMP	Land and Resource Management Plan
MIS	Management Indicator Species
mmbf	Million board feet
MMM	Management and Mitigation Measures
MYLF	Mountain yellow-legged frog
NEPA	National Environmental Protection Act
NFFL	Northern Forests Fire Laboratory
NHPA	*National Historic Preservation Act*
NOI	Notice of Intent
NTMB	Neotropical migratory birds
OHV	Off-highway vehicle
PAC	Protected Activity Center
PM	Particulate matter
PO	Plans of Operation
RHCA	Riparian Habitat Conservation Area (under HFQLG)
RI&D	Route Inventory and Designation
RMO	Riparian Management Objective
ROD	Record of Decision
ROS	Recreational Opportunity Spectrum
SAT	Scientific Analysis Team
SERA	Syracuse Environmental Research Associates
SMZ	Stream Management Zone

SNFPA	Sierra Nevada Forest Plan Amendment
SOHA	Spotted Owl Habitat Area
SRSCSD	Secure Rural Schools and Community Self-Determination [Act]
SUA	Special Use Authorization
SWRCB	State Water Resources Control Board
TOC	Threshold of Concern
USDA	U. S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Services
VQO	Visual Quality Objective
YLF	Yellow-legged frog

Glossary

active crown fire — the independent movement of flames from a fire through the branches and top of the trees.

age class — a distinct aggregation of trees originating from a single natural event or regeneration activity.

all-aged — see uneven-aged.

allelopathic — the suppression of growth of one plant species by another due to the release of toxic substances.

> primary bald eagle habitat – land within a 0.25 mile radius of a nest tree.
>
> secondary bald eagle habitat – land adjacent to the primary habitat that is used predominantly for roosting and perching and also to a lesser degree for foraging.
>
> tertiary bald eagle habitat – areas used by eagles for foraging.

basal area — the combined area of the cross sections of tree boles at a height of 4.5 feet above the ground, generally given as square feet per acre.

biomass — limbs and foliage (parts of trees other than logs) that can be collected, chipped, or ground; exported from the forest; and used for power production or manufacture of wood fiber products.

bole — the main stem of a conifer tree, which becomes a log or logs when the tree is cut.

California Wildlife Habitat Relationships (CWHR) — a system developed jointly by Forest Service Region 5 and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities and 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. Tree size and canopy cover classes are:

Tree Size Classes

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

S	=	Sparse Cover (10–24 percent canopy closure)
O	=	Open Cover (25–39 percent canopy closure)
M	=	Moderate Cover (40–59 percent canopy closure)
D	=	Dense Cover (greater than 60 percent canopy cover)

canopy — the branches and foliage of trees (as distinct from the stem or bole).

Canopy base height — the height above the ground of the first canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire.

canopy cover — the ground area covered by tree crowns, or the degree to which the canopy blocks sunlight or obscures the sky, expressed as a percent of ground area; also referred to as canopy closure or crown cover.

chain — A chain is a measurement of distance. One chain = 66 feet.

closed road — a road from which mechanical equipment is excluded. A Forest Service road in closed status is a road that is still part of the Forest Service road system but has been closed to traffic by some type of barrier, such as a gate, berm, or boulder(s).

crown — see canopy.

canopy base height — for a single tree, it is the height from an imaginary line drawn across the trunk to the bottom of the obvious lowest live foliage.

crown bulk density — canopy weight per unit volume.

crown cover — see canopy cover.

decommission — closing a road to mechanical use and returning the road to a natural or semi-natural condition. This could include removing stream crossing fills and structures (e.g., culverts or bridges), recontouring to natural topography obliteration (e.g., replacing fill slope material against cut slopes), surface shaping (e.g., constructing in-road water bars), and/or surface scarification.

Defensible Fuel Profile Zone (DFPZ) — a zone approximately 0.25 mile wide accessible to firefighters (usually along roads) in which fuel loads are light enough to cause approaching crown fires to drop to the ground where it may successfully be attacked by ground forces during 90th percentile weather conditions.

diameter at breast height (dbh) — the diameter of a tree measured at 4.5 feet above the ground on the uphill side.

direct economic impact — effects caused directly by forest harvest or processing or by forest uses.

direct attack — A method of suppression that treats the fire as a whole, or all its burning edge, by wetting, cooling, smothering, or by chemically quenching it or mechanically separating it from unburned fuel. A suppression strategy in which resources are directed to work close to the fire edge.

disturbance — a natural event such as a fire, flood, or earthquake.

dripline — the perimeter of the vertical projection of a tree canopy upon the ground.

duff / duff layer — Decaying leaves and branches on the forest floor.

effective ground cover — is the amount of ground cover left after the fire; it is expressed in percent.

endemic — in the context of this environmental impact statement, refers to localized pockets within a small area, such as a pocket within a stand or a small stand.

Equivalent Roaded Area (ERA) — a conceptual unit of measure used to assess ground-disturbing activities. All landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent 100 percent hydrologic disturbance, with maximum rainfall-runoff potential. Other ground-disturbing activities are assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same roaded area. Disturbance coefficients are assigned based on local conditions. In a given watershed, disturbances are added together to determine a cumulative equivalent roaded area and compared to the Threshold of Concern.

fire brand — burning material, such as foliage, that is carried by the wind to start new fires outside the main fire (spotting).

fire frequency — the average number of years between fires.

fire regime and condition class — a classification of the amount of departure from the natural fire regime. Assessing fire regime and condition class can help guide management objectives and set priorities for treatments.

fire type — a description of how a fire burns, such as on the forest floor (surface) or in the tree crowns.

flame length — the length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

fuel arrangement — how fuels are distributed in the fuel bed.

fuel bed — The fuels both living and dead that are available to burn.

fuel loading — the weight of fuel (vegetative matter both living and dead) present at a given site; usually expressed in tons per acre. This value generally refers to the fuel that would be available for consumption by fire.

fuel model — A mathematical representation of a fuelbed, that includes fuel depth, fuel load (<3 inch fuel), heat content, and surface:volume ratio.

fuel strata — this is the vertical and horizontal continuity and arrangement of the fuel bed.

grapple pile — gathering and piling of thinnings, harvest slash, and brush using mechanical equipment.

group selection — a silvicultural system that involves harvest of small areas of trees (generally less than 2 acres). Implementation results in uneven-aged (all-aged) forests consisting of small even-aged (same-aged) groups. Harvest openings must be large enough to allow for sufficient sunlight for regeneration tree seedlings to establish and grow.

grubbing — removal of vegetation at or below ground level with hand tools.

guild — used to group plant species that use similar resources in a similar way. Plant species in the same guild are found in similar habitat types and have similar environmental requirements.

hand piling — piling branches and limbs from tree harvests or thinnings by hand for burning at a later time.

hand line — fire lines created by forest workers using shovels and hand tools to remove organic materials and expose mineral soil. The line width generally ranges between 2 and 3 feet.

Home Range Core Area — mapped foraging area.

horizontal arrangement — the horizontal distribution of fuels at various levels and planes.

Hydrologic unit code — HUC is an acronym for Hydrologic Unit Code. Hydrologic unit codes, are a way of identifying drainage basins, or watersheds, in the United States in a nested arrangement from largest (Regions - HUC-2) to smallest (Sub-Catchments - HUC-8). HUC-6 delineations (Subwatersheds) averaging approximately 30,000 acres are used in several instances to define analysis areas in the Sugarberry Chapter 3 analyses; they are further subdivided for cumulative watershed effects (CWE) analysis into 7th-field delineations of 500 to 2,500 acres.

indirect attack — A method of suppression in which the control line is mostly located along natural firebreaks, favorable breaks in topography (ridge tops, lakes, rock outcroppings), or at a considerable distance from the fire, and all intervening fuel is backfired or burned out.

indirect economic impact — an effect that occurs when supporting industries sell goods or services to directly affected industries.

individual tree selection (ITS) — a type of tree harvest designed to prevent the spread of insects and disease, reduce overstocking, and generally improve or maintain health of forest stands.

induced economic impact — an effect that occurs when employees or owners of directly or indirectly affected industries spend their income within the economy.

initial attack- The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

Integrated Pest Management — A process that determines an economic or environmental threshold for managing pest populations and prescribes the management technique to reach desired conditions. An IPM includes four broad categories of techniques: biological, cultural, mechanical, and chemical.

Interdisciplinary Team (ID Team) — The team of Forest Service resource specialists involved in project planning and analysis. The ID Team members for the Slapjack Project are listed in at the beginning of this chapter.

ladder (fuel) — shrubs or trees that connect fuels at the forest floor to the tree crowns.

landings — forested openings that are cleared of vegetation, leveled, and graded and used to store (deck) logs and eventually to load log trucks for haul to the mill.

late-successional old-growth ranks 4 and 5 — late mature successional stages of forest trees, as defined by the Sierra Nevada Ecosystem Project (volume II, appendix 21.1).

leave trees — the trees that are purposefully left in a stand that is thinned or harvested.

lotic — of, relating to, or living in actively moving water.

mast — the fruit of the oak and other forest trees used as food by wildlife.

mastication — mechanical grinding of harvest residue or thinnings; masticated material is usually left scattered on the harvest site.

matrix — the untreated area between group selections within a stand or treatment unit.

mechanical thinning — the use of tractors, cable systems, or helicopters to remove trees that have been cut by chainsaws; also refers to the use of feller-bunchers—wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site.

midden — refuse heap, dunghill, or a small pile of seeds, bones, or leaves gathered by a rodent.

multilayer — stand with three or more distinct foliage layers (canopies). Trees in the different layers may or may not be in the same age class.

mycorrhiza — the mutually beneficial association of a fungus and the roots of a plant, such as a conifer or an orchid, in which the plant's mineral absorption is enhanced and the fungus obtains nutrients.

natural fire regime — a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it also includes the influence of aboriginal burning (Agree 1993; Brown 1995).

90th percentile weather conditions — hot, dry, and windy weather conditions that are exceeded only 10 percent of the time during fire season; 90th to 97th percentile conditions are considered *high*; 99th to 100th percentile are considered *extreme*.

Off Base and Deferred Lands — federal lands identified in the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act from which timber harvest and road construction are excluded during the term of the HFQLG 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.

particulate matter — the general term used for a mixture of solid particles and liquid droplets found in the air. Some particles are large enough to be seen as dust or dirt. Others are so small they can be detected only with an electron microscope. $PM_{2.5}$ describes the “fine” particles that are less than or equal to 2.5 µm in diameter. “Coarse fraction” particles are greater than 2.5 µm, but less than or equal to 10 µm in diameter.

passive crown fire — the movement of fire through groups of trees; it usually does not continue for long periods of time.

phylogenetic — the development of a species, genus, or group as contrasted with the development of an individual.

piling and burning — piling harvest or thinning residues (branches and limbs) and burning them when moisture content has been reduced through evaporation, wildfire hazard is low, and atmospheric conditions are favorable for dispersal of smoke.

prescribed burning — 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.

present net value — includes only the benefits and costs of producing primary outputs, excluding secondary benefits.

primary skid trails — skid trails over which equipment has skidded or will skid logs three or more times.

production rates — the amount of fireline distance expressed in chains that a suppression resource can establish in a given time period.

quadratic mean diameter — the upper story diameter of a tree of mean basal area within dominant or codominant positions in the stand. In other words, instead of being an arithmetic average of tree diameters, it is a weighted average based on the basal area of each tree in the upper story within the stand.

rate of spread — the relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire. For this document, it is expressed as rate of forward spread of the fire front and is measured in chains per hour.

reconstruction — rebuilding of an existing road in or adjacent to its current location to improve capacity and/or correct drainage problems.

Reference condition — term used in the Slate Creek Landscape Assessment (1999) to refer to a desired vegetation condition. The environmental conditions under this reference condition are assumed to have existed over the landscape for extended periods of time (with fire regimes, elevational, aspect, and soil conditions present). Hence this condition would represent the best chance for sustainability into the future. Generally the reference condition involves vegetative conditions similar to those that existed in pre-settlement times.

regeneration — tree seedlings and saplings that have the potential to develop into mature forest trees.

release — in the context of this environmental impact statement, giving large, old pines more space to grow, to "release" them from crowded conditions.

residual trees — trees that are left to grow in a stand following treatment or fire.

resistance to control — the relative difficulty of constructing and holding a control line as affected by resistance to line construction and fire behavior; also called "difficulty of control."

resource type — Refers to resource capability. A type 1 resource provides a greater overall capability due to training, experience, size, power, capacity, etc. than would be found in a type 2 resource.

Riparian Habitat Conservation Areas (RHCA) — zones of specified widths along streams and watercourses and around lakes and wetlands that vary according to stream or feature type, as described in the Scientific Analysis Team guidelines.

sanitation — tree removal or modification operations designed to reduce damage caused by forest pests and to prevent their spread.

Scientific Analysis Team (SAT) Guidelines — This is a report written in 1993 on the viability assessments and management considerations for species associated with late-successional old-growth forests of the Pacific Northwest. These guidelines were adopted into the HFQLG final supplemental EIS.

scorch-to-kill height — the maximum vertical height at which lethal scorching of foliage occurs. Below this height, all foliage is brown and dead; above it, live and green.

serpentine substrate — a dull green or brownish mineral consisting of hydrous magnesium silicate. It is often used as an ornamental stone.

seral — relating to a series of ecological communities formed in ecological succession.

shade intolerant — species (such as ponderosa pine) that require full, open sunlight on the forest floor to establish and grow.

silviculture — a branch of forestry dealing with the development and care of forests.

size class — a classification of forest stands based on the average diameter of trees in the stand.

snag — a dead standing tree.

stocking — the number of regenerated trees per acre in a tree-harvest unit.

subsoiling — performed after vegetation treatments, wherein mechanized equipment is used to till compacted soil to reduce soil compaction and consequent soil erosion.

surface fire — a fire that burns surface litter, debris, and small vegetation.

thinning from below — the process of thinning a conifer stand by removing the smallest diameter trees and successively removing larger diameter trees until a canopy cover or basal area retention standard is met for the stand.

Threshold of Concern (TOC) — describes the amount of disturbance when detrimental responses may begin to occur. Estimates of watershed "tolerance" to land use may be established based on basin-specific experience, comparison with similar basins, and modeling of watershed response. These indices of allowable levels of disturbance are called Thresholds of Concern. The tolerance of a watershed is used to prescribe mitigation measures to prevent detrimental responses. The TOC does not represent an exact level of disturbance above which cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed. It is compared to the equivalent roaded area score, and its units of measure are expressed as percent disturbed and percent of TOC.

torching — (1) the envelopment in flame of live or dead branches on a standing tree or group of trees; (2) fire burning a single or very small group of trees.

tree mortality — is the probability that a live tree will die expressed in percent.

ultramafic — extremely basic; very low in silica and rich in iron and magnesium minerals.

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.

uneven-aged — a stand of trees of three or more distinct age classes, either inter-mixed or in small groups. Uneven-aged silvicultural systems are a planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

vertical arrangement — is the arrangement of fuels above the ground in their relationship to one another.

whole tree yarding — the whole-tree harvest method is where trees are felled at the stump and skidded to the landing for de-limbing, bucking, and processing. Large trees may be bucked in the treatment unit to facilitate removal to the landing and reduce skidding damage to residual trees. Most activity slash would be removed to the landing.

Wildland Urban Interface — the 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.

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Appendix A

Proposed Vegetation Treatment Schedules

Appendix A
Proposed Vegetation Treatment Schedules

Generalized Silvicultural Prescription Schedules

Table A-1 displays an example of a proposed treatment schedule for a typical Defensible Fuel Profile Zones (DFPZ) stand. In general, the first treatment for the DFPZ would be thinning from below through sawlog and biomass whole-tree removal (harvest) or mechanical mastication (non-harvest). The next treatment would be to hand cut (thin) and pile the slash in the steep (greater than 45 percent slope) and within the riparian habitat conservation areas (RHCA). Hand cutting and hand or tractor piling of small trees and shrubs would also be completed at this time. After the thinning activities are completed, firelines would be constructed and the machine and hand piles would be burned. Once all of the piles are burned, the proposed underburn stands would be re-evaluated to determine if underburning is necessary to treat any remaining slash and competing vegetation. In addition, approximately 5 years after mastication or hand treatment, those stands would be re-evaluated to determine if an underburn would be necessary to further reduce the fuel loading.

Table A-1. Example of a proposed treatment schedule for a defensible fuel profile zones stand.

Defensible Fuel Treatment Zone Proposed Treatment Schedule		
Year	**Activity**	**Method**
1	Harvest – DFPZ	Whole-tree sawlog and biomass removal
1	Non-harvest - DFPZ	Masticate
2	Fuels Pre-Treatment	Hand cut and pile slash (riparian zones/steep areas)
2	Fuels Pre-Treatment	Hand cut and tractor or hand pile small trees and shrubs (selected stands)
3	Fuels Pre-Treatment	Fireline construction (manual or mechanical)
3	Fuels Treatment	Burn piles
4	Fuels Treatment	Underburn or masticate to reduce fuels
5–9	Fuels Treatment	Underburn mastication units if needed

Table A-2 displays an example of a proposed treatment schedule for a typical group selection harvest. Group selection harvest areas would be harvested or logged in conjunction with the DFPZ stand that the group is located in. Site preparation would be the next treatment and consists of grapple piling, burning the piles, followed by underburning or mastication. After site preparation is completed, reforestation or hand planting of various conifer species would occur. Once the seedlings are established, two release treatments would be implemented to reduce competing vegetation and ensure seedling survival.

Table A-2. Example of a proposed treatment schedule for a group selection harvest.

Group Selection Harvest Proposed Treatment Schedule		
Year	**Activity**	**Method**
1	Tractor or Skyline Harvest – Group Selection	Whole-tree sawlog and biomass removal (where prescribed)
1	Helicopter Harvest – Group Selection	Conventional sawlog removal
2	Site Preparation	Machine or hand pile slash or shrubs
3	Site preparation	Burn piles
4	Site preparation	Underburn or masticate to reduce fuels
5	Reforestation	Hand plant and natural regeneration
6	Release (1^{st})	Hand Grub – grasses, forbs, and shrubs
8	Release (2^{nd})	Hand Cut – larger shrubs

Table A-3. Alternative B prescriptions and acres by unit.

Acreage of DFPZ and ITS thinning may not equal total unit acreage due to treatment overlap and avoidance of protected resources or unsuited timber types.

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
55	4D	—	19	Group Selection	4
500	4D	WUI	325	Group Selection	33
504	4D	WUI	19	Group Selection	2
505	4D	WUI	63	Group Selection	6
506	4D	WUI	24	Group Selection	1
507	4D	WUI	32	Group Selection	5
508	4D	WUI	15	Group Selection	2
510	5M	WUI	25	Group Selection	1
513	4D	WUI	32	Group Selection	5
516	4D	—	10	Group Selection	2
519	4D	—	9	Group Selection	2
523	4D	WUI	17	Group Selection	3
524	4D	WUI	9	Group Selection	1
526	4D	WUI	146	Group Selection	15
530	4M	WUI	36	Group Selection	5
533	4D	WUI	352	Group Selection	35
535	4D	WUI	84	Group Selection	8
539	4D	—	10	Group Selection	2
540	4M	—	42	Group Selection	2
542	4D	WUI	251	Group Selection	38
543	4M	—	143	Group Selection	7
544	4D	WUI	24	Group Selection	2
547	4D	WUI	8	Group Selection	1
550	4D	WUI	12	Group Selection	2
552	4D	—	32	Group Selection	5
556	4D	—	244	Group Selection	24
558	4D	—	18	Group Selection	2
563	4D	—	18	Group Selection	2
566	4D	—	9	Group Selection	2
573	4M	WUI	28	Group Selection	1
577	4D	WUI	148	Group Selection	15
579	4D	WUI	94	ITS, Group Selection	14
584	4D	—	50	ITS, Group Selection	2
585	4D	—	19	Group Selection	1
587	4M	—	9	Group Selection	2
590	4D	WUI	158	Group Selection	16
599	4D	WUI	31	Group Selection	2
601	4D	—	34	Group Selection	3
608	5D	—	92	Group Selection	5
610	4D	—	26	Group Selection	5
612	4D	—	16	Group Selection	1
613	4D	—	54	ITS, Group Selection	5
614	5M	—	42	Group Selection	4
615	5D	—	183	Group Selection	9

Table A-3. Alternative B prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
618	4M	—	34	Group Selection	2
619	4M	—	6	Group Selection	1
624	4D	—	107	Group Selection	5
626	4D	—	31	Group Selection	2
627	4D	—	25	Group Selection	1
628	4D	—	44	Group Selection	2
634	4D	WUI	14	Group Selection	2
636	4D	WUI	58	ITS, Group Selection	3
637	5M	—	13	Group Selection	2
647	5D	WUI	36	Group Selection	2
649	3D	—	46	Group Selection	5
650	4P	—	56	Group Selection	6
900	4M	WUI*	151	Group Selection	8
910	4D	*	80	Group Selection	8
911	4D	WUI, DFPZ	81	Mastication	0
912	4D	WUI, DFPZ	170	Underburn, Group Selection	9
913	3D	WUI, DFPZ	69	Underburn	0
915	3P	DFPZ	152	Mastication	0
79i	5M	—	143	Group Selection	7
901A	4D	WUI, DFPZ	160	Hand Cut and Tractor Pile, Group Selection	16
901B	4D	WUI*	65	Group Selection	7
914A	3P	WUI, DFPZ	51	Mastication	0
914B	3P	DFPZ	37	Mastication	0
914C	4D	—	101	Group Selection	10
A	4M	—	8	Oak Enhancement	0
A2	4M	—	2	Oak Enhancement	0
A3	4D	—	2	Oak Enhancement	0
B	4D	—	33	Oak Enhancement	0
B2	4D	—	6	Oak Enhancement	0
D	4M	—	16	Oak Enhancement	0
E	4D	WUI	17	Oak Enhancement	0
F	3D	—	13	Oak Enhancement	0
SBA1	4S	WUI	2	Aspen	0
SBA2	4M	WUI	1	Aspen	0
SBA3	4D	WUI	1	Aspen	0
SBA4	4D	WUI	17	Aspen	0
SBA5	4M	WUI	1	Aspen	0
2	4M	WUI	49	Group Selection	10
3	4D	WUI	198	Group Selection	20
7	4D	WUI	47	ITS, Group Selection, Sporax	2
15	4M	WUI	85	Group Selection	4
18	4M	WUI	16	Group Selection	1
19	5M	WUI	41	Group Selection	2
21	4D	WUI	124	Group Selection	12

Table A-3. Alternative B prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
27	4D	WUI	173	Group Selection	17
28	4D	WUI	7	Group Selection	0
29	5D	WUI	325	Group Selection	16
30	5D	WUI	17	Group Selection	2
32	5D	WUI	13	Group Selection	1
33	4D	WUI	308	ITS, Group Selection, Sporax	31
35	4M	WUI	53	Group Selection	8
37	4D	WUI	69	Group Selection	7
37	4D	WUI	5	Group Selection	0
53	5D	WUI	72	Group Selection	7
902	4M	WUI, DFPZ	122	Hand Cut and Tractor Pile, Group Selection	6
903	2S	WUI, DFPZ	3	Hand Cut Pile Burn	0
904	4D	WUI, DFPZ	149	Mastication	0
14A	4D	WUI	268	Group Selection	27
14B	4D	WUI, DFPZ	43	Mastication, Group Selection	2
905a	4D	WUI, DFPZ	53	Overstory Thin 40% Canopy, Group Selection, Sporax	3
905b	4D	WUI, DFPZ	115	Overstory Thin 40% Canopy, Group Selection, Sporax	6
907a	3D	WUI, DFPZ	93	Plantation Thin, Mastication, Group Selection	5
907b	3D	WUI, DFPZ	30	Plantation Thin, Mastication, Group Selection	0
LP1	4M	WUI, DFPZ	6	Hand Cut Pile Burn	0
LP2	4D	WUI, DFPZ	39	Mastication	0
41	4D	WUI	12	Group Selection	2
42	4D	WUI	27	Group Selection	4
43	5D	WUI	59	Group Selection	6
44	4M	WUI	8	Group Selection	1
45	5D	WUI	12	Group Selection	2
46	5M	WUI	414	Group Selection	62
57	4D	WUI	81	Group Selection	8
58	5D	WUI	24	Group Selection	4
59	5D	WUI	32	Group Selection	2
61	5M	WUI	44	Group Selection	4
62	5D	WUI	66	Group Selection	10
65	5D	WUI	45	Group Selection	5
68	5D	WUI	23	Group Selection	3
70	5D	WUI	153	Group Selection	15
72	4D	WUI	24	Group Selection	4
87	4D	—	17	Group Selection	3
90	5D	—	23	Group Selection	3
92	4M	—	28	Group Selection	4

Table A-3. Alternative B prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
97	4P	—	12	Group Selection	2
98	4D	—	30	Group Selection	3
100	5D	—	33	Group Selection	3
102	4M	—	49	Group Selection	7
103	5D	WUI	38	Group Selection	6
107	5M	WUI	13	Group Selection	3
107	5M	WUI	7	Group Selection	1
108	4D	WUI	8	Group Selection	2
109	4D	WUI	15	Group Selection	2
110	4D	WUI	7	Group Selection	1
111	5D	WUI	167	Group Selection	25
113	5D	WUI	10	Group Selection	1
117	4D	WUI	120	Group Selection	12
118	5D	WUI	8	Group Selection	2
119	5D	WUI	47	Group Selection	5
120	5D	WUI	28	Group Selection	3
127	4D	WUI	55	Group Selection	8
128	5D	WUI	46	Group Selection	5
130	5D	WUI	32	Group Selection	2
134	5D	—	21	Group Selection	4
140	5M	—	28	Group Selection	4
141	4M	—	202	Group Selection	30
147	4P	—	11	Group Selection	2
154	5D	—	133	Group Selection	13
161	5D	—	78	Group Selection	8
906	4D	*	148	Group Selection	15
908	5D	*	161	Group Selection	16
909	5D	DFPZ	80	Overstory Thin 50% Canopy, Underburn, Group Selection, Sporax	4
11G	4D	WUI, DFPZ	204	Mastication, Underburn, Group Selection	20
11K	4D	*	81	Group Selection	4
11P	3S	DFPZ	7	Hand Cut Pile Burn	0
12G1	5D	DFPZ	187	Mastication, Group Selection	9
12G2	4D	DFPZ	41	Underburn, Group Selection	4
12P1	2S	DFPZ	6	Hand Cut Pile Burn	0
12P2	3S	DFPZ	2	Hand Cut Pile Burn	0
12P3	3M	DFPZ	8	Mastication	0
12P3	3M	DFPZ	5	Hand Cut Pile Burn	0
13T	4M	DFPZ	87	Underburn	0
14o	4D	*	136	Group Selection	7
150a	5D	—	62	Group Selection	6
150b	5D	—	264	Group Selection	40
15P2	3P	DFPZ	3	Mastication	0
15T	5D	DFPZ	40	Hand Cut and Tractor	0

Table A-3. Alternative B prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
				Pile	
15TA	5D	DFPZ	54	Hand Cut and Tractor Pile	0
79iii	4D	—	188	Group Selection	28
Total Sum of Acres			**11,438**		**1,040**

Note: *These units are part of the HFQLG DFPZ network but have been treated to meet fuels objectives in other projects.

Table A-4. Alternative C and G prescriptions and acres by unit.

Acreage of DFPZ and ITS thinning may not equal total unit acreage due to treatment overlap and avoidance of protected resources or unsuited timber types.

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
55	4D	—	19	Group Selection	4
500	4D	WUI	325	Group Selection	33
504	4D	WUI	19	Group Selection	2
505	4D	WUI	63	Group Selection	6
506	4D	WUI	24	Group Selection	1
507	4D	WUI	32	Group Selection	5
508	4D	WUI	15	Group Selection	2
510	5M	WUI	25	Group Selection	1
513	4D	WUI	32	Group Selection	5
516	4D	—	10	Group Selection	2
519	4D	—	9	Group Selection	2
523	4D	WUI	17	Group Selection	3
524	4D	WUI	9	Group Selection	1
526	4D	WUI	146	Group Selection	15
530	4M	WUI	36	Group Selection	5
533	4D	WUI	352	Group Selection	35
535	4D	WUI	84	Group Selection	8
539	4D	—	10	Group Selection	2
540	4M	—	42	Group Selection	2
542	4D	WUI	251	Group Selection	37
543	4M	—	143	Group Selection	7
544	4D	WUI	24	Group Selection	2
547	4D	WUI	8	Group Selection	1
550	4D	WUI	12	Group Selection	2
552	4D	—	32	Group Selection	5
556	4D	—	244	Group Selection	24
558	4D	—	18	Group Selection	2
563	4D	—	18	Group Selection	2
566	4D	—	9	Group Selection	2
573	4M	WUI	28	No Treatment	0
577	4D	WUI	148	Group Selection	15
579	4D	WUI	94	ITS, Group Selection	14
584	4D	—	50	ITS, Group Selection	2
585	4D	—	19	Group Selection	1
587	4M	—	9	Group Selection	2
590	4D	WUI	158	Group Selection	16
599	4D	WUI	31	Group Selection	2
601	4D	—	34	Group Selection	3
608	5D	—	92	Group Selection	5
610	4D	—	26	Group Selection	5
612	4D	—	16	Group Selection	1
613	4D	—	54	ITS, Group Selection	5
614	5M	—	42	Group Selection	4
615	5D	—	183	Group Selection	9
618	4M	—	34	Group Selection	2
619	4M	—	6	Group Selection	1

Table A-4. Alternative C and G prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
624	4D	—	107	Group Selection	5
626	4D	—	31	Group Selection	2
627	4D	—	25	Group Selection	1
628	4D	—	44	Group Selection	2
634	4D	WUI	14	Group Selection	2
636	4D	WUI	58	ITS, Group Selection	3
637	5M	—	13	Group Selection	2
647	5D	WUI	36	Group Selection	2
649	3D	—	46	Group Selection	5
650	4P	—	56	Group Selection	6
900	4M	WUI*	151	Group Selection	8
910	4D	*	80	Group Selection	8
911	4D	WUI, DFPZ	81	Mastication	0
912	4D	WUI, DFPZ	170	Underburn, Group Selection	9
913	3D	WUI, DFPZ	69	Underburn	0
915	3P	DFPZ	152	Mastication	0
79i	5M	—	143	Group Selection	7
901A	4D	WUI, DFPZ	160	Hand Cut and Tractor Pile, Group Selection	0
901B	4D	WUI*	65	Group Selection	6
914A	3P	WUI, DFPZ	51	Mastication	0
914B	3P	DFPZ	37	Mastication	0
914C	4D	—	101	Group Selection	10
A	4M	—	8	Oak Enhancement	0
A2	4M	—	2	Oak Enhancement	0
A3	4D	—	2	Oak Enhancement	0
B	4D	—	33	Oak Enhancement	0
B2	4D	—	6	Oak Enhancement	0
D	4M	—	16	Oak Enhancement	0
E	4D	WUI	17	Oak Enhancement	0
F	3D	—	13	Oak Enhancement	0
SBA1	4S	WUI	2	Aspen	0
SBA2	4M	WUI	1	Aspen	0
SBA3	4D	WUI	1	Aspen	0
SBA4	4D	WUI	17	Aspen	0
SBA5	4M	WUI	1	Aspen	0
2	4M	WUI	49	Group Selection	10
3	4D	WUI	198	Group Selection	20
7	4D	WUI	47	ITS, Sporax	2
15	4M	WUI	85	Group Selection	4
18	4M	WUI	16	Group Selection	1
19	5M	WUI	41	Group Selection	2
21	4D	WUI	124	Group Selection	12
27	4D	WUI	173	Group Selection	17
28	4D	WUI	7	Group Selection	0
29	5D	WUI	325	Group Selection	16
30	5D	WUI	17	Group Selection	2
32	5D	WUI	13	Group Selection	1

Table A-4. Alternative C and G prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
33	4D	WUI	308	ITS, Group Selection, Sporax	31
35	4M	WUI	53	Group Selection	8
37	4D	WUI	69	Group Selection	7
37	4D	WUI	5	No Treatment	0
53	5D	WUI	72	Group Selection	7
902	4M	WUI, DFPZ	122	Hand Cut and Tractor Pile, Group Selection	6
903	2S	WUI, DFPZ	3	Hand Cut Pile Burn	0
904	4D	WUI, DFPZ	149	Mastication	0
14A	4D	WUI	268	Group Selection	27
14B	4D	WUI, DFPZ	43	Mastication, Group Selection	2
905a	4D	WUI, DFPZ	53	Overstory Thin 40% Canopy, Group Selection, Sporax	3
905b	4D	WUI, DFPZ	115	Overstory Thin 40% Canopy, Group Selection, Sporax	6
907a	3D	WUI, DFPZ	93	Plantation Thin, Mastication, Group Selection	5
907b	3D	WUI, DFPZ	30	Plantation Thin	0
LP1	4M	WUI, DFPZ	6	Hand Cut Pile Burn	0
LP2	4D	WUI, DFPZ	39	Mastication	0
41	4D	WUI	12	Group Selection	2
42	4D	WUI	27	Group Selection	4
43	5D	WUI	59	Group Selection	6
44	4M	WUI	8	Group Selection	1
45	5D	WUI	12	Group Selection	2
46	5M	WUI	414	Group Selection	62
57	4D	WUI	81	Group Selection	8
58	5D	WUI	24	Group Selection	4
59	5D	WUI	32	Group Selection	2
61	5M	WUI	44	Group Selection	4
62	5D	WUI	66	Group Selection	10
65	5D	WUI	45	Group Selection	5
68	5D	WUI	23	Group Selection	3
70	5D	WUI	153	Group Selection	15
72	4D	WUI	24	Group Selection	4
87	4D	—	17	Group Selection	3
90	5D	—	23	Group Selection	3
92	4M	—	28	Group Selection	4
97	4P	—	12	Group Selection	2
98	4D	—	30	Group Selection	3
100	5D	—	33	Group Selection	3
102	4M	—	49	Group Selection	7
103	5D	WUI	38	Group Selection	6
107	5M	WUI	13	Group Selection	3
107	5M	WUI	7	Group Selection	1

Table A-4. Alternative C and G prescriptions and acres by unit (continued).

Unit Number	CWHR Size and Density Class	Management Zone	Total Unit Acreage	Prescription	Estimated Group Selection Acres
108	4D	WUI	8	Group Selection	2
109	4D	WUI	15	Group Selection	2
110	4D	WUI	7	Group Selection	1
111	5D	WUI	167	Group Selection	25
113	5D	WUI	10	Group Selection	1
117	4D	WUI	120	Group Selection	12
118	5D	WUI	8	Group Selection	2
119	5D	WUI	47	Group Selection	5
120	5D	WUI	28	Group Selection	3
127	4D	WUI	55	Group Selection	8
128	5D	WUI	46	Group Selection	5
130	5D	WUI	32	Group Selection	2
134	5D	—	21	Group Selection	4
140	5M	—	28	Group Selection	4
141	4M	—	202	Group Selection	30
147	4P	—	11	Group Selection	2
154	5D	—	133	Group Selection	13
161	5D	—	78	Group Selection	8
906	4D	*	148	Group Selection	15
908	5D	*	161	Group Selection	16
909	5D	DFPZ	80	Overstory Thin 50% Canopy, Underburn, Group Selection, Sporax	4
11G	4D	WUI, DFPZ	204	Mastication, Underburn, Group Selection	20
11K	4D	*	81	Group Selection	4
11P	3S	DFPZ	7	Hand Cut Pile Burn	0
12G1	5D	DFPZ	187	Mastication, Group Selection	9
12G2	4D	DFPZ	41	Underburn	4
12P1	2S	DFPZ	6	Hand Cut Pile Burn	0
12P2	3S	DFPZ	2	Hand Cut Pile Burn	0
12P3	3M	DFPZ	8	Mastication	0
12P3	3M	DFPZ	5	Hand Cut Pile Burn	0
13T	4M	DFPZ	87	Underburn	0
14o	4D	*	136	Group Selection	7
150a	5D	—	62	Group Selection	6
150b	5D	—	264	Group Selection	40
15P2	3P	DFPZ	3	Mastication	0
15T	5D	DFPZ	40	Hand Cut and Tractor Pile	0
15TA	5D	DFPZ	54	Hand Cut and Tractor Pile	0
79iii	4D	—	188	Group Selection	28
Total Sum of Acres			**11,438**		**1,021**

Note: *These units are part of the HFQLG DFPZ network but have been treated to meet fuels objectives in other projects.

Appendix B

Defensible Fuel Profile Zone
Monitoring and Maintenance Guidelines

Appendix B

Sugarberry Defensible Fuel Profile Zone Monitoring and Maintenance Guidelines

Defensible Fuel Profile Zone Monitoring

A. Forest-Wide Defensible Fuel Profile Zone (DFPZ) Monitoring

The Herger-Feinstein Quincy Library Group (HFQLG) Record of Decision (ROD) (p. 13–14) outlines the monitoring strategy for the HFQLG Pilot Project. This strategy will also be applied to DFPZ maintenance projects and no additional monitoring will be required as a result of the HFQLG ROD (HFQLG, Final Supplemental Environmental Impact Statement, ROD, p. 3).

B. Project Level DFPZ Monitoring

While DFPZ effectiveness should not be seriously reduced for approximately 5 years in plantations and 10–20 years in natural stands, DFPZ monitoring would begin no later than 5 years after construction is completed, depending upon funding (see No DFPZ Maintenance).

A DFPZ monitoring program would be completed at 2 to 3 year intervals for the west side (less than 5,000 feet elevation) and 3 to 4 year intervals for the east side (greater than 5,000 feet elevation) of the Sugarberry Project area, until termination of the DFPZ or funding (see Long-Term DFPZ Maintenance). The east side of the Sugarberry Project area has a longer monitoring interval as it is in the true fir vegetation type, receives more snow load, and brush response is slower than the west side.

C. DFPZ Site-Specific Monitoring Criteria

Objectives for DFPZs include retaining surface fuels, less than 3-inch diameter, around 5 tons per and retaining large down woody material, where available, at 10–15 tons per acre, after treatment.

When both surface fuels (i.e., needles, twigs, and branches) and fuel ladders (i.e., shrubs, brush, understory trees) exceed predetermined levels (Table B-1), then DFPZ maintenance treatments may be evaluated and scheduled (see Short or Long-Term DFPZ Maintenance) on a site-specific basis. Priority for DFPZ treatment would entail stands that meet (1) both surface fuels and fuel ladder criteria, followed by (2) stands that meet the surface fuel criteria, and lastly, (3) stands that meet the fuel ladder criteria.

Table B-1. DFPZ monitoring criteria.

Surface Fuels	Treat if Surface Fuels Exceeds:	Retain After Treatment
0–3-inch diameter	Greater than 7 tons per acre	Around 5 tons per acre
Large down wood	Greater than 15 tons per acre	10–15 tons per acre
Fuel Ladder	**Treat if Fuel Ladder Exceeds:**	**Fuel Height**
Shrubs/brush	Greater than 25 percent ground cover	Greater than 5 feet
Understory trees	Greater than 15 percent canopy cover	Greater than 8 feet

Defensible Fuel Profile Zone Maintenance

A. Short-Term (Foreseeable) DFPZ Maintenance

Irretrievable commitments of resources are losses of productivity or use for a period of time. One example is road construction on suitable timber lands. Timber growth on the land is irretrievably lost while the land is used as a road, but the timber resource is not irreversibly lost because the short term, where DFPZ objectives are not met with mastication and underburn would be the final treatment. Based on site-specific analysis of land allocations, slopes, vegetation types, and previous underburning treatments in the Sugarberry Project area, the foreseeable maintenance of the DFPZ would consist of prescribed fire, mechanical (i.e., mastication, grapple pulling), and hand treatments. The Forest Service will fully comply with National Environmental Protection Act (NEPA) requirements prior to conducting any maintenance activities.

B. Long-Term (Future) DFPZ Maintenance

Given the fact that this DFPZ project is part of a 5-year pilot project, it is uncertain if the Forest Service will decide to maintain these DFPZs when the time for maintenance of the natural stands is reached (approximately 10–20 years after initial treatment). By that time, the DFPZ prescription may be modified or even discontinued. If the Forest Service wishes to maintain these DFPZs in the future, sufficient funding and staffing may not be available, or other Forest Service priorities may prevent maintenance projects from being completed. Even if funding and staffing are available, it is not clear which method would be used – brush cutting by hand or heavy equipment, mastication of brush and down woody material with heavy equipment, livestock treatment, prescribed burning, or herbicide treatment. Because there are no specific plans for long-term maintenance at this point and many questions as to the timing, extent, and method of maintenance remain open, no specific DFPZ maintenance project is reasonably foreseeable and further analysis at this time is not practical. The Forest Service will fully comply with *National Environmental Policy Act* (NEPA) requirements prior to conducting any maintenance activities. Therefore, decisions about maintenance for a specific DFPZ would only be made at the time DFPZ maintenance is actually necessary (HFQLG, Final Supplement EIS, ROD, p. 3).

C. No DFPZ Maintenance

Even if no maintenance is conducted in these DFPZs in the future, the DFPZs should be effective for many years. In the natural stands, DFPZ effectiveness should not be seriously reduced for 10–20 years. In the plantations, DFPZ effectiveness should not be reduced for approximately 5 years. And, after these periods, the DFPZs will retain many of their beneficial characteristics for fighting fire and reducing fire intensity. For example, even if significant amounts of understory vegetation grow in the treated stands over the next several years, the proposed action will remove a significant amount of ladder fuel, such that the net amount of fuel will be reduced over time. Additionally, should there be a situation where a DFPZ has not been maintained for several years but the Forest Service determines that the DFPZ would provide a safe position from which to fight an oncoming wildfire, Forest Service staff could conduct emergency maintenance at the time of the wildfire, such that the DFPZ would regain full efficacy by the time the fire reached the area.

Appendix C
Proposed Road Treatments for the Sugarberry Project

Appendix C

Sugarberry Road Length and Density Statistics - (Alternative G)

Project Area = 48,128.03 acres	Project Area road miles = 319.16		Miles/Sq. Mile = 4.24			Project Area road miles (post-project) = sq. mi =4.05 miles		Road Miles Compared to existing condition (post-project): 95%				
Subwatershed No	**Subwatershed Name**	**Acres**	**Sum_ERA**	**Sum Miles**	**Miles/Sq. Mile**	**Miles Natural Rehab**	**Miles Decommission**	**Total Miles of Roads**	**Miles Post-Project**	**Miles/Sq. Mile Post-Project**	**Change in Miles**	**Change in Miles/Sq. Mi.**
1	Whiskey Creek	1024.66	17.01	7.05	4.40	0.00	0.0000		7.1	4.40	0.00	0.00
2	Headwaters East Branch Slate Creek	831.16	7.71	3.19	2.46	0.00	0.0000	0.0	3.2	2.46	0.00	0.00
3	Slate Creek Canyon 1 - Upper Slate Creek	2223.69	27.47	11.37	3.27	0.00	0.0000	0.0	11.4	3.27	0.00	0.00
4	Gibson Creek	1185.62	16.44	6.87	3.71	0.30	0.0000	0.3	6.6	3.55	-0.30	-0.16
5	East Branch Slate Creek	2081.92	11.00	4.54	1.40	0.08	0.0000	0.1	4.5	1.37	-0.08	-0.02
6	Wallace Creek	1305.95	24.49	10.31	5.05	0.48	0.0000	0.5	9.8	4.82	-0.48	-0.23
7	Potosi Creek	2269.94	15.56	6.44	1.82	0.66	0.0000	0.7	5.8	1.63	-0.66	-0.19
8	Sacketts Gulch	767.40	5.34	2.21	1.84	0.02	0.0000	0.0	2.2	1.82	-0.02	-0.02
9	Upper Canyon Creek 1	1801.83	5.09	2.10	0.75	0.00	0.0000	0.0	2.1	0.75	0.00	0.00
10	Slate Creek Canyon 2 - St. Louis	2076.17	27.87	11.53	3.55	0.00	0.1253	0.1	11.4	3.52	-0.13	-0.04
11	East Branch Rabbit Creek	760.14	19.63	8.19	6.90	0.00	0.0000	0.0	8.2	6.90	0.00	0.00
12	Cedar Grove Ravine	1602.47	16.10	6.67	2.66	0.00	0.0784	0.1	6.6	2.63	-0.08	-0.03
13	Unnamed tributary S Little Grass Valley Reservoir	584.95	14.45	6.38	6.98	0.00	0.0000	0.0	6.4	6.98	0.00	0.00
14	Upper Lost Creek	1716.70	24.59	10.20	3.80	0.00	0.0000	0.0	10.2	3.80	0.00	0.00
15	Rabbit Creek	1408.33	27.55	11.52	5.24	0.00	0.0000	0.0	11.5	5.24	0.00	0.00
16	Unnamed tributary Rabbit Creek	576.52	9.42	3.90	4.33	0.00	0.0000	0.0	3.9	4.33	0.00	0.00
17	Slate Creek Canyon 3 - French Camp	1295.50	23.05	9.53	4.71	0.00	0.0000	0.0	9.5	4.71	0.00	0.00
18	Wisconsin Ravine	595.74	12.96	5.38	5.78	0.00	0.0000	0.0	5.4	5.78	0.00	0.00
19	Deacon Long Ravine	752.05	15.50	6.43	5.47	0.00	0.0000	0.0	6.4	5.47	0.00	0.00
20	Valley Creek	1714.27	32.20	13.33	4.98	0.00	0.1540	0.2	13.2	4.92	-0.15	-0.06
21	Clarks Ravine	1354.83	28.03	11.62	5.49	0.00	0.2987	0.3	11.3	5.35	-0.30	-0.14
22	Pats Gulch	1051.29	15.65	6.70	4.08	0.05	0.3712	0.4	6.3	3.82	-0.42	-0.26
23	Upper Canyon Creek 2	2342.52	42.25	17.59	4.81	0.00	4.5471	4.5	13.0	3.56	-4.55	-1.24
24	Slate Creek Canyon 4 - Lucky Hill	1300.32	17.80	7.39	3.64	0.36	0.0000	0.4	7.0	3.46	-0.36	-0.18
25	American House Ravine	685.15	13.85	5.75	5.37	0.00	0.0945	0.1	5.7	5.28	-0.09	-0.09
26	Slate Creek Canyon 5	1697.71	21.21	8.77	3.31	0.00	0.3623	0.4	8.4	3.17	-0.36	-0.14
27	Onion Creek	1294.19	35.48	14.79	7.32	0.00	1.7638	1.8	13.0	6.44	-1.76	-0.87
28	Slate Creek Canyon 6	1137.83	19.38	8.04	4.52	0.46	0.0000	0.5	7.6	4.27	-0.46	-0.26
29	Upper Rock Creek	2178.18	45.08	18.73	5.50	0.00	0.0000	0.0	18.7	5.50	0.00	0.00
30	Gold Run Creek	1617.74	34.59	14.34	5.67	0.00	0.0000	0.0	14.3	5.67	0.00	0.00
31	Canyon Creek - Sawmill Ravine	843.62	14.67	6.06	4.60	0.00	0.2525	0.3	5.8	4.41	-0.25	-0.19
32	Slate Creek Canyon 7 - Diversion Dam	1051.91	17.54	7.28	4.43	0.00	0.0000	0.0	7.3	4.43	0.00	0.00
33	Slate Creek Canyon 8 - Stowman Ravine	1164.21	35.11	14.60	8.03	0.00	0.0000	0.0	14.6	8.03	0.00	0.00
34	Lower Rock Creek	2349.60	56.88	23.57	6.42	0.69	1.7802	2.5	21.1	5.75	-2.47	-0.67
35	Buckeye Creek	567.61	16.91	7.03	7.92	0.00	0.0000	0.0	7.0	7.92	0.00	0.00
36	Brushy Creek	1867.67	44.64	18.49	6.34	0.00	0.2645	0.3	18.2	6.24	-0.26	-0.09
37	Middle Canyon Creek	830.36	6.96	2.88	2.22	0.01	0.3731	0.4	2.5	1.93	-0.38	-0.29
38	Unnamed tributary Rock Creek	654.65	19.11	8.03	7.85	0.35	0.0000	0.4	7.7	7.51	-0.35	-0.34
39	Slate Creek Canyon 9 - North Star	1416.38	26.98	11.20	5.06	0.00	0.0000	0.0	11.2	5.06	0.00	0.00
40	Upper Deadwood Creek	2044.53	50.13	21.16	6.62	0.00	0.0000	0.0	21.2	6.62	0.00	0.00
41	Slate Creek Canyon 10 - Oak Flat	509.53	7.50	3.11	3.91	0.00	0.5394	0.5	2.6	3.23	-0.54	-0.68
42	Lower Canyon Creek	729.79	3.61	1.49	1.30	0.00	0.0000	0.0	1.5	1.30	0.00	0.00
43	Slate Creek Canyon 11 - Lower Slate Creek	1904.24	15.55	6.48	2.18	0.00	0.4630	0.5	6.0	2.02	-0.46	-0.16
44	Lower Deadwood Creek	918.80	9.85	4.13	2.88	0.00	0.0000	0.0	4.1	2.88	0.00	0.00
	Totals	**58087.67**	**952.19**	**396.39**	**4.51**	**3.47**	**11.47**	**14.93**	**381.5**	**4.37**	**-14.93**	**-0.14**

Additional miles of roads restored compared to Alt. B:	**6.78**
Total road miles post-project compared to existing condition:	**96.80%**

Appendix C

Proposed Road Treatments for the Sugarberry Project

The table below demonstrates roads in detail projected to be decommissioned comparing Alternatives C and G.

ID	**NAME**	**Length**	**Alt_C**	**Alt_G**
20N01	STAGE	0.11	RECON	DECOM
20N07	VAN	0.55	EX	DECOM
20N13	DRONE	0.27	not part of timber sale	DECOM
20N18	LITTLE ROCKY	0.42	EX	DECOM
20N35A		0.24	EX	DECOM
20N35C	SCALES SPUR C	2.56	not part of timber sale	DECOM
20N35D	SCALES SPUR D	0.55	HAUL	DECOM
20N92	CRAWDAD	0.60	EX	DECOM
21N18G	BERNARD DIGGINGS SPUR G	0.09	not part of timber sale	DECOM
21N32	JOHNSON RD	1.40	not part of timber sale	DECOM
U1068		0.22	DECOM	DECOM
U1068		0.08	DECOM	DECOM
U1082		0.15	DECOM	DECOM
U1119		0.05	DECOM	DECOM
U1124		0.18	DECOM	DECOM
U1133		0.08	DECOM	DECOM
U1153		0.23	DECOM	DECOM
U1153		0.34	DECOM	DECOM
U1169		0.34	DECOM	DECOM
U1169		0.23	DECOM	DECOM
U1219		0.37	DECOM	DECOM
U1220		0.36	DECOM	DECOM
U1329		0.16	DECOM	DECOM
U1333		0.12	DECOM	DECOM
U1390		0.10	DECOM	DECOM
U1420		0.15	DECOM	DECOM
U1420		0.24	HAUL/DECOM	HAUL/DECOM
U1420		0.03	DECOM	DECOM
U1431		0.15	DECOM	DECOM
U1433		0.58	DECOM	DECOM
	Total	**10.95**		

Appendix D

Economic Analysis for Alternatives B, C and G

Appendix D

ECONOMIC ANALYSIS
Worksheet Sugarberry Alternative B

			Total Acres =	1580	acres			
VALUE - Groups			Total Acres =	1040		Low mbf/	$0	
PP 23"-29.9" sawtimber *	4.0%	1248	mbf X (	$350	/mbf +	$0	/mbf)	$436,800
SP 23"-29.9" sawtimber *	5.0%	1560	mbf X (	$350	/mbf +	$0	/mbf)	$546,000
WF 23"-29.9" sawtimber *	28.0%	8736	mbf X (	$180	/mbf +	$0	/mbf)	$1,572,480
DF 23"-29.9" sawtimber *	2.0%	624	mbf X (	$310	/mbf +	$0	/mbf)	$193,440
IC 23"-29.9" sawtimber *	2.0%	624	mbf X (	$430	/mbf +	$0	/mbf)	$268,320
ALL 9"-22.9" sawtimber **	59.0%	18408	mbf X (	$130	/mbf +	$0	/mbf)	$2,393,040
	100.0%	31200	mbf	30.0	mbf/acre			
Biomass Value when Removed		0	acres X	15.0	tons/acre X	$15.00	/ton =	$0

VALUE - Aspen			Total Acres =	10		Low mbf/	$0	
PP 23"-29.9" sawtimber *	15.0%	42	mbf X (	$350	/mbf +	$0	/mbf)	$14,648
SP 23"-29.9" sawtimber *	10.0%	28	mbf X (	$350	/mbf +	$0	/mbf)	$9,765
WF 23"-29.9" sawtimber *	55.0%	153	mbf X (	$180	/mbf +	$0	/mbf)	$27,621
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$310	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	5.0%	14	mbf X (	$430	/mbf +	$0	/mbf)	$5,999
ALL 9"-22.9" sawtimber **	15.0%	42	mbf X (	$130	/mbf +	$0	/mbf)	$5,441
	100.0%	279	mbf	27.9	mbf/acre			
Biomass Value when Removed		0	acres X	15.0	tons/acre X	$15.00	/ton =	$0

VALUE - Thin to 40 % Canopy Cover			Total Acres =	170.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$350	/mbf +	$0	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$350	/mbf +	$0	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$180	/mbf +	$0	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$310	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	$0	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	1020	mbf X (	$130	/mbf +	$0	/mbf)	$132,600
	100.0%	1020	mbf	6.0	mbf/acre			
Biomass Value when Removed 3-8.9"		170	acres X	13.0	tons/acre X	$15.00	/ton =	$33,150

VALUE - Thin to 50 % Canopy Cover			Total Acres =	240.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	5.0%	60	mbf X (	$350	/mbf +	$0	/mbf)	$21,000
SP 23"-29.9" sawtimber *	2.0%	24	mbf X (	$350	/mbf +	$0	/mbf)	$8,400
WF 23"-29.9" sawtimber *	27.0%	324	mbf X (	$180	/mbf +	$0	/mbf)	$58,320
DF 23"-29.9" sawtimber *	1.0%	12	mbf X (	$340	/mbf +	$0	/mbf)	$4,080
IC 23"-29.9" sawtimber *	5.0%	60	mbf X (	$430	/mbf +	$0	/mbf)	$25,800
ALL 9"-22.9" sawtimber **	59.0%	709	mbf X (	$130	/mbf +	$0	/mbf)	$92,170
	100.0%	1200	mbf	5.0	mbf/acre			
Biomass Value when Removed 3-8.9"		300	acres X	13.0	tons/acre X	$15.00	/ton =	$58,500

VALUE - Plantation Thin (CWHR Size Class 3)			Total Acres =	120.0	acres	Low mbf/	($52)	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	$0	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	$0	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$220	/mbf +	$0	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$340	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	$0	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	60	mbf X (	$150	/mbf +	$0	/mbf)	$5,880
		60	mbf	0.5	mbf/acre			
Biomass Value when Removed 6-8.9"		120	acres X	10.0	tons/acre X	$15.00	/ton =	$18,000
TOTAL HARVEST VALUE		**33759 mbf**						**$5,931,453**

COSTS	Acres	(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Add sawtimber skyline cost	260	7800	mbf X	$115	/mbf =			$897,000
Additional Cost - Heli	69	2070	mbf X	$250	/mbf			$517,500
Additional Cost - Long Skid	20	600	mbf X	$20	/mbf			$12,000
		Average Unit Size =		20	acres	$68	/acre	
		Contract Length =		10	years	($360)	/acre	
		Months Operation =		0	months	$40	/acre	
Acres of 6"-9.9" biomass-tractor		120	acres X (	$340	/acre +	$0	/acre)	$40,800
Acres of 3"-9.9" biomass-tractor		470	acres X (	$400	/acre +	$0	/acre)	$188,000
Acres of 6"-9.9" biomass-skyline		0	acres X (	$1,000	/acre +	$0	/acre)	$0
Acres of 3"-9.9" biomass-skyline		0	acres X (	$2,000	/acre +	$0	/acre)	$0

		590	Biomass Acres	12.4	tons/acre =	7310	tons	
# of sawtimber loads		33759	mbf /		4	mbf/truc	8440	
Additional Haul Cost (4 hr avg)		1	hours/trip X	$75	/hour X	8440	trips	$633,000
# of biomass loads	590	acres X	12.4	tons/acr	25	tons/truc	292	
Haul Cost Biomass		5.5	hours/trip X	$75	/hour X	292	trips	$120,450
Surface Replacement-sawtimber		33759	mbf X			$6.00	/mbf =	$202,554
Surface Replacement-biomass		590	acres X	12.4	tons/acre X	0.67	/ton =	$4,898
Subsoiling Costs		192	acres X	$230	/acre			$44,076
BD Costs		33759	mbf X	$7.20	/mbf			$243,065
Road Construction		26.0	miles X					$311,730
Temp Roads		21.0	miles X	$4,800	/mile			$100,800
Advertised Rate-sawtimber		33759	mbf X			$61.55	/mbf	$2,077,966
Advertised Rate-biomass		590	acres X	12.4	tons/acre X	$0.20	/ton	$1,462
Yield Tax		$5,931,453	X	2.9%				$172,012
Scaling Sawtimber		8440	trips	$17	/trip			$143,480
Scaling Biomass		292	trips	$3	/trip			$876
Other Costs:								
Potosi Creek; Pearson Ravine, County Rd Improvement							$100,000	
Cedar Grove Crossing							0	
CedGrve Cnty 690 improvement							0	
Deficit Engineering Deposit Reduction		26.0	miles of road X	$3,333	$/mile =		$86,658	
TOTAL HARVEST COST								**$5,562,989**
NET HARVEST VALUE								**$368,464**
					PERCENT ABOVE VALUE			**6%**
Groups:					Acre/job	Direct	Indirect	
Reforestation Costs (planting)	624	acres X	$400	/acre	110	6	8	$249,600
Grapple Pile Tractor Groups	533	acres X	$490	/acre	150	4	5	$261,293
Hand Pile Skyline/Helicopter Groups	332	acres X	$550	/acre	120	3	4	$182,600
Exams, w 1 Release	1040	acres X	$650	/acre	120	9	12	$676,000
WO/RO/SO Overhead Costs	50.5%	of above costs						$691,594
Subtotal								$2,061,086
DFPZ:								
Tractor Pile Site Preparation	0	acres X	$490	/acre	150	0	0	$0
Mastication	1075	acres X	$400	/acre	150	7	10	$430,000
Hand Cut Tractor Pile	250	acres X	$600	/acre	150	2	2	$150,000
DFPZ Hand Cut, Pile and Burn	155	acres X	$650	/acre	120	1	2	$100,750
Oak HCPB	100	acres X	$650	/acre	120	1	1	$65,000
Aspen HCPB	20	acres X	$650	/acre	120	0	0	$13,000
Hand Prune and Pile	0	acres X	$650	/acre	120	0	0	$0
Underburn	650	$200	$150	/acre	400	2	2	$97,500
Hand Line	0	$200	$65	/chain	200	0	0	$0
Dozer Line	0	$140	$15	/chain	5000	0	0	$0
Pile Burning	0	$260	$200	/acre	120	0	0	$0
Potosi Creek; Pearson Ravine, County Rd Improvement								$400,000
Road Decommissioning	5.0	$150	$5000	mile	40	0	0	$25,000
	%					224	224	
						257	271	
TOTAL NON-HARVEST COST								-$1,281,250

TOTAL PROJECT VALUE	**-$912,786**
TOTAL FULL TIME JOBS	**528**
TOTAL EMPLOYEE-RELATED INCOME	**$22,698,921**

Assumptions:
* Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh
** Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh
*** Timber Values for 9"-13.9" are $25.00/mbf
Deduction if average volume per acre under 5mbf/ac -$25
Skyline Yarding $30/mbf for 23"-29.9"(25% of Volume) $80/mbf for 14"-22.9"(75% of Volume)
Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac
Cost/ac for contract length decreases 10% every year after one year
Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and 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,

ECONOMIC ANALYSIS
Worksheet Sugarberry Alternative C--minimizing WS over TOC

Total Acres = 1550 acres

VALUE - Groups			Total Acres =	1020		Low mbf/	$0	
PP 23"-29.9" sawtimber *	4.0%	1224	mbf X (	$350	/mbf +	$0	/mbf)	$428,400
SP 23"-29.9" sawtimber *	5.0%	1530	mbf X (	$350	/mbf +	$0	/mbf)	$535,500
WF 23"-29.9" sawtimber *	28.0%	8568	mbf X (	$180	/mbf +	$0	/mbf)	$1,542,240
DF 23"-29.9" sawtimber *	2.0%	612	mbf X (	$310	/mbf +	$0	/mbf)	$189,720
IC 23"-29.9" sawtimber *	2.0%	612	mbf X (	$430	/mbf +	$0	/mbf)	$263,160
ALL 9"-22.9" sawtimber **	59.0%	18054	mbf X (	$130	/mbf +	$0	/mbf)	$2,347,020
	100.0%	30600	mbf	30.0	mbf/acre			
Biomass Value when Removed		0	acres X	15.0	tons/acre X	$15.00	/ton =	$0

VALUE - Aspen			Total Acres =	10		Low mbf/	$0	
PP 23"-29.9" sawtimber *	15.0%	42	mbf X (	$350	/mbf +	$0	/mbf)	$14,648
SP 23"-29.9" sawtimber *	10.0%	28	mbf X (	$350	/mbf +	$0	/mbf)	$9,765
WF 23"-29.9" sawtimber *	55.0%	153	mbf X (	$180	/mbf +	$0	/mbf)	$27,621
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$310	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	5.0%	14	mbf X (	$430	/mbf +	$0	/mbf)	$5,999
ALL 9"-22.9" sawtimber **	15.0%	42	mbf X (	$130	/mbf +	$0	/mbf)	$5,441
	100.0%	279	mbf	27.9	mbf/acre			
Biomass Value when Removed		0	acres X	15.0	tons/acre X	$15.00	/ton =	$0

VALUE - Thin to 40 % Canopy Cover			Total Acres =	170.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$350	/mbf +	$0	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$350	/mbf +	$0	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$180	/mbf +	$0	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$310	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	$0	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	1020	mbf X (	$130	/mbf +	$0	/mbf)	$132,600
	100.0%	1020	mbf	6.0	mbf/acre			
Biomass Value when Removed 3-8.9"		170	acres X	13.0	tons/acre X	$15.00	/ton =	$33,150

VALUE - Thin to 50 % Canopy Cover			Total Acres =	230.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	5.0%	58	mbf X (	$350	/mbf +	$0	/mbf)	$20,125
SP 23"-29.9" sawtimber *	2.0%	23	mbf X (	$350	/mbf +	$0	/mbf)	$8,050
WF 23"-29.9" sawtimber *	27.0%	311	mbf X (	$180	/mbf +	$0	/mbf)	$55,890
DF 23"-29.9" sawtimber *	2.0%	23	mbf X (	$310	/mbf +	$0	/mbf)	$7,130
IC 23"-29.9" sawtimber *	5.0%	58	mbf X (	$430	/mbf +	$0	/mbf)	$24,725
ALL 9"-22.9" sawtimber **	59.0%	679	mbf X (	$130	/mbf +	$0	/mbf)	$88,205
	100.0%	1150	mbf	5.0	mbf/acre			
Biomass Value when Removed 3-8.9"		264	acres X	13.0	tons/acre X	$15.00	/ton =	$51,480

VALUE - Plantation Thin (CWHR Size Class 3)			Total Acres =	120.0	acres	Low mbf/	($52)	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	($52)	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	($52)	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$220	/mbf +	($52)	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$340	/mbf +	($52)	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	($52)	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	60	mbf X (	$130	/mbf +	($52)	/mbf)	$4,680
		60	mbf	0.5	mbf/acre			
Biomass Value when Removed 6-8.9"		120	acres X	10.0	tons/acre X	$15.00	/ton =	$18,000
TOTAL HARVEST VALUE		**33109**	**mbf**					**$5,813,548**

COSTS	Acres	(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Add sawtimber skyline cost	255	7650	mbf X	$115	/mbf =			$879,750
Additional Cost - Heli	68	2040	mbf X	$250	/mbf			$510,000
Additional Cost - Long Skid	20	600	mbf X	$20	/mbf			$12,000
		Average Unit Size =		20	acres	$68	/acre	
		Contract Length =		10	years	($360)	/acre	
		Months Operation =		0	months	$40	/acre	
Acres of 6"-9.9" biomass-tractor		120	acres X (	$340	/acre +	($252)	/acre)	$10,560
Acres of 3"-9.9" biomass-tractor		434	acres X (	$400	/acre +	($252)	/acre)	$64,232
Acres of 6"-9.9" biomass-skyline		0	acres X (	$1,000	/acre +	($252)	/acre)	$0
Acres of 3"-9.9" biomass-skyline		0	acres X (	$2,000	/acre +	($252)	/acre)	$0
		554	Biomass Acres	12.4	tons/acre =	6842	tons	
# of sawtimber loads		33109	mbf /		4	mbf/truc	8277	
Additional Haul Cost (4 hr avg)		1	hours/trip X	$75	/hour X	8277	trips	$620,775

# of biomass loads	554	acres X	12.4	tons/acr	25	tons/truc	274	
Haul Cost Biomass		5.5	hours/trip X	$75	/hour X	274	trips	$113,025
Surface Replacement-sawtimber		33109	mbf X			$6.00	/mbf =	$198,654
Surface Replacement-biomass		554	acres X	12.4	tons/acre X	0.67	/ton =	$4,584
Subsoiling Costs		189	acres X	$230	/acre			$43,386
BD Costs		33109	mbf X	$7.20	/mbf			$238,385
Road Construction		26.0	miles X					$311,730
Temp Roads		21.0	miles X	$4,800	/mile			$100,800
Advertised Rate-sawtimber		33109	mbf X			$61.56	/mbf	$2,038,142
Advertised Rate-biomass		554	acres X	12.4	tons/acre X	$0.20	/ton	$1,368
Yield Tax		$5,813,548	X	2.9%				$168,593
Scaling Sawtimber		8277	trips	$17	/trip			$140,709
Scaling Biomass		274	trips	$3	/trip			$822
Other Costs:								
Potosi Creek; Pearson Ravine, County Rd Improvement							$100,000	
Cedar Grove Crossing							0	
CedGrve Cnty 690 improvement							0	
Deficit Engineering Deposit Reduction		26.0	miles of road X	$3,333	$/mile =		$86,658	
TOTAL HARVEST COST								**$5,457,516**
NET HARVEST VALUE								**$356,032**
					PERCENT ABOVE VALUE			**6%**
Groups:					Acre/job	Direct	Indirect	
Reforestation Costs (planting)	612	acres X	$400	/acre	110	6	8	$244,800
Grapple Pile Tractor Groups	523	acres X	$490	/acre	150	3	5	$256,148
Hand Pile Skyline/Helicopter Groups	326	acres X	$550	/acre	120	3	4	$179,300
Exams, w 1 Release	1020	acres X	$650	/acre	120	9	12	$663,000
WO/RO/SO Overhead Costs	50.5%	of above costs						$678,340
Subtotal								$2,021,587
DFPZ:								
Tractor Pile Site Preparation	0	acres X	$490	/acre	150	0	0	$0
Mastication	1075	acres X	$400	/acre	150	7	10	$430,000
Hand Cut Tractor Pile	250	acres X	$600	/acre	150	2	2	$150,000
DFPZ Hand Cut, Pile and Burn	155	acres X	$650	/acre	120	1	2	$100,750
Oak HCPB	100	acres X	$650	/acre	120	1	1	$65,000
Aspen HCPB	20	acres X	$650	/acre	120	0	0	$13,000
Hand Prune and Pile	0	acres X	$650	/acre	120	0	0	$0
Underburn	650	$200	$150	/acre	400	2	2	$97,500
Hand Line	0	$200	$65	/chain	200	0	0	$0
Dozer Line	0	$140	$15	/chain	5000	0	0	$0
Pile Burning	0	$260	$200	/acre	120	0	0	$0
Potosi Creek; Pearson Ravine, County Rd Improvement								$400,000
Road Decommissioning	5.0	$150	$5000	mile	40	0	0	$25,000
	%					219	219	
						252	266	
TOTAL NON-HARVEST COST								-$1,281,250

TOTAL PROJECT VALUE	**-$925,218**
TOTAL FULL TIME JOBS	**518**
TOTAL EMPLOYEE-RELATED INCOME	**$22,271,251**

Assumptions:
* Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh
** Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh
*** Timber Values for 9"-13.9" are $25.00/mbf
Deduction if average volume per acre under 5mbf/ac -$25
Skyline Yarding $30/mbf for 23"-29.9"(25% of Volume) $80/mbf for 14"-22.9"(75% of Volume)
Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac
Cost/ac for contract length decreases 10% every year after one year
Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and 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-around employment.

ECONOMIC ANALYSIS
Worksheet Sugarberry Alternative G -

			Total Acres =	1550	acres			
VALUE - Groups			Total Acres =	1020		Low mbf/	$0	
PP 23"-29.9" sawtimber *	4.0%	1224	mbf X (	$300	/mbf +	$0	/mbf)	$367,200
SP 23"-29.9" sawtimber *	5.0%	1530	mbf X (	$300	/mbf +	$0	/mbf)	$459,000
WF 23"-29.9" sawtimber *	28.0%	8568	mbf X (	$220	/mbf +	$0	/mbf)	$1,884,960
DF 23"-29.9" sawtimber *	2.0%	612	mbf X (	$340	/mbf +	$0	/mbf)	$208,080
IC 23"-29.9" sawtimber *	2.0%	612	mbf X (	$430	/mbf +	$0	/mbf)	$263,160
ALL 9"-22.9" sawtimber **	59.0%	18054	mbf X (	$150	/mbf +	$0	/mbf)	$2,708,100
	100.0%	30600	mbf	30.0	mbf/acre			
Biomass Value when Removed		0	acres X	13.0	tons/acre X	$15.00	/ton =	$0
VALUE - Aspen			Total Acres =	10		Low mbf/	$0	
PP 23"-29.9" sawtimber *	15.0%	42	mbf X (	$300	/mbf +	$0	/mbf)	$12,555
SP 23"-29.9" sawtimber *	10.0%	28	mbf X (	$300	/mbf +	$0	/mbf)	$8,370
WF 23"-29.9" sawtimber *	55.0%	153	mbf X (	$220	/mbf +	$0	/mbf)	$33,759
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$340	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	5.0%	14	mbf X (	$430	/mbf +	$0	/mbf)	$5,999
ALL 9"-22.9" sawtimber **	15.0%	42	mbf X (	$150	/mbf +	$0	/mbf)	$6,278
	100.0%	279	mbf	27.9	mbf/acre			
Biomass Value when Removed		0	acres X	13.0	tons/acre X	$15.00	/ton =	$0
VALUE - Thin to 40 % Canopy Cover			Total Acres =	170.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	$0	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	$0	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$220	/mbf +	$0	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$340	/mbf +	$0	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	$0	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	1020	mbf X (	$150	/mbf +	$0	/mbf)	$153,000
	100.0%	1020	mbf	6.0	mbf/acre			
Biomass Value when Removed 3-8.9"		170	acres X	13.0	tons/acre X	$15.00	/ton =	$33,150
VALUE - Thin to 50 % Canopy Cover			Total Acres =	230.0	acres	Low mbf/	$0	
PP 23"-29.9" sawtimber *	5.0%	58	mbf X (	$300	/mbf +	$0	/mbf)	$17,250
SP 23"-29.9" sawtimber *	2.0%	23	mbf X (	$300	/mbf +	$0	/mbf)	$6,900
WF 23"-29.9" sawtimber *	27.0%	311	mbf X (	$220	/mbf +	$0	/mbf)	$68,310
DF 23"-29.9" sawtimber *	2.0%	23	mbf X (	$340	/mbf +	$0	/mbf)	$7,820
IC 23"-29.9" sawtimber *	5.0%	58	mbf X (	$430	/mbf +	$0	/mbf)	$24,725
ALL 9"-22.9" sawtimber **	59.0%	679	mbf X (	$150	/mbf +	$0	/mbf)	$101,775
	100.0%	1150	mbf	5.0	mbf/acre			
Biomass Value when Removed 3-8.9"		264	acres X	13.0	tons/acre X	$15.00	/ton =	$51,480
VALUE - Plantation Thin (CWHR Size Class 3)			Total Acres =	120.0	acres	Low mbf/	($52)	
PP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	($52)	/mbf)	$0
SP 23"-29.9" sawtimber *	0.0%	0	mbf X (	$300	/mbf +	($52)	/mbf)	$0
WF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$220	/mbf +	($52)	/mbf)	$0
DF 23"-29.9" sawtimber *	0.0%	0	mbf X (	$340	/mbf +	($52)	/mbf)	$0
IC 23"-29.9" sawtimber *	0.0%	0	mbf X (	$430	/mbf +	($52)	/mbf)	$0
ALL 9"-22.9" sawtimber **	100.0%	60	mbf X (	$150	/mbf +	($52)	/mbf)	$5,880
		60	mbf	0.5	mbf/acre			
Biomass Value when Removed 6-8.9"		120	acres X	10.0	tons/acre X	$15.00	/ton =	$18,000
TOTAL HARVEST VALUE		**33109**	**mbf**					**$6,445,750**
COSTS	Acres	(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Add sawtimber skyline cost	255	7650	mbf X	$115	/mbf =			$879,750
Additional Cost - Heli	68	2040	mbf X	$250	/mbf			$510,000
Additional Cost - Long Skid	20	600	mbf X	$20	/mbf			$12,000
		Average Unit Size =		20	acres	$68	/acre	
		Contract Length =		10	years	($360)	/acre	
		Months Operation =		0	months	$40	/acre	
Acres of 6"-9.9" biomass-tractor		120	acres X (	$340	/acre +	($252)	/acre)	$10,560
Acres of 3"-9.9" biomass-tractor		434	acres X (	$400	/acre +	($252)	/acre)	$64,232
Acres of 6"-9.9" biomass-skyline		0	acres X (	$1,000	/acre +	($252)	/acre)	$0
Acres of 3"-9.9" biomass-skyline		0	acres X (	$2,000	/acre +	($252)	/acre)	$0
		554	Biomass Acres	12.4	tons/acre =	6842	tons	
# of sawtimber loads		33109	mbf /		4	mbf/truc	8277	
Additional Haul Cost (4 hr avg)		1	hours/trip X	$75	/hour X	8277	trips	$620,775

# of biomass loads	554	acres X	12.4	tons/acr	25	tons/truc	274	
Haul Cost Biomass		5.5	hours/trip X	$75	/hour X	274	trips	$113,025
Surface Replacement-sawtimber		33109	mbf X			$6.00	/mbf =	$198,654
Surface Replacement-biomass		554	acres X	12.4	tons/acre X	0.67	/ton =	$4,584
Subsoiling Costs		189	acres X	$230	/acre			$43,386
BD Costs		33109	mbf X	$7.20	/mbf			$238,385
Road Construction		26.0	miles X					$311,730
Temp Roads		21.0	miles X	$4,800	/mile			$100,800
Advertised Rate-sawtimber		33109	mbf X			$61.56	/mbf	$2,038,142
Advertised Rate-biomass		554	acres X	12.4	tons/acre X	$0.20	/ton	$1,368
Yield Tax		$6,445,750	X	2.9%				$186,927
Scaling Sawtimber		8277	trips	$17	/trip			$140,709
Scaling Biomass		274	trips	$3	/trip			$822
Other Costs:								
Potosi Creek; Pearson Ravine, County Rd Improvement							$100,000	
Cedar Grove Crossing							0	
CedGrve Cnty 690 improvement							0	
Deficit Engineering Deposit Reduction		26.0	miles of road X	$3,333	$/mile =		$86,658	
TOTAL HARVEST COST								**$5,475,849**
NET HARVEST VALUE								**$969,901**
					PERCENT ABOVE VALUE			**15%**
Groups:					Acre/job	Direct	Indirect	
Reforestation Costs (planting)	612	acres X	$400	/acre	110	6	8	$244,800
Grapple Pile Tractor Groups	523	acres X	$490	/acre	150	3	5	$256,148
Hand Pile Skyline/Helicopter Groups	326	acres X	$550	/acre	120	3	4	$179,300
Exams, w 1 Release	1020	acres X	$650	/acre	120	9	12	$663,000
WO/RO/SO Overhead Costs	50.5%	of above costs						$678,340
Subtotal								$2,021,587
DFPZ:								
Tractor Pile Site Preparation	0	acres X	$490	/acre	150	0	0	$0
Mastication	1075	acres X	$400	/acre	150	7	10	$430,000
Hand Cut Tractor Pile	250	acres X	$600	/acre	150	2	2	$150,000
DFPZ Hand Cut, Pile and Burn	155	acres X	$650	/acre	120	1	2	$100,750
Oak HCPB	100	acres X	$650	/acre	120	1	1	$65,000
Aspen HCPB	20	acres X	$650	/acre	120	0	0	$13,000
Hand Prune and Pile	0	acres X	$650	/acre	120	0	0	$0
Underburn	650	$200	$150	/acre	400	2	2	$97,500
Hand Line	0	$200	$65	/chain	200	0	0	$0
Dozer Line	0	$140	$15	/chain	5000	0	0	$0
Pile Burning	0	$260	$200	/acre	120	0	0	$0
Potosi Creek; Pearson Ravine, County Rd Improvement								$400,000
Road Decommissioning	11.5	$150	$5000	mile	40	0	0	$57,500
	%					219	219	
						253	266	
TOTAL NON-HARVEST COST								-$1,313,750

TOTAL PROJECT VALUE	**-$343,849**
TOTAL FULL TIME JOBS	**518**
TOTAL EMPLOYEE-RELATED INCOME	**$22,288,021**

Assumptions:

* Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh

** Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh

*** Timber Values for 9"-13.9" are $25.00/mbf

Deduction if average volume per acre under 5mbf/ac -$25

Skyline Yarding $30/mbf for 23"-29.9"(25% of Volume) $80/mbf for 14"-22.9"(75% of Volume)

Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac

Cost/ac for contract length decreases 10% every year after one year

Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and 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-around employment.

Appendix E

Mitigation Measures

Table E-1. Mitigation measures by unit for the Sugarberry Project.

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Botany	All units	Cleaning of equipment coming back from forest to prevent the introduction of noxious weeds.	Best Management Practices (BMPs)	Herger-Feinstein Quincy Library Group (HFQLG), FSM	B6.35, C6.343	—	All	—	All	—	Must Do
	All units	Weed free mulch to prevent the introduction of noxious weeds.	Forest Service Manual (FSM) Policy	HFQLG, FSM	C6.349	—	All	—	All	—	Must Do
	27, 37, 59, 70, 145, 150, 150b, 161, 590, 599, 608, 613, 615, 618, 638, 639, 914c	Controlled areas to prevent direct impacts to rare plants.	BMP	HFQLG, FSM	B6.24, C6.24, Sale Area Map (SAM)	—	All	—	All	—	Must Do
	140	These units are known to contain high concentrations of noxious weeds or they are adjacent to known infestations. To prevent the spread of noxious weeds to uninfested units, Off-Road Equipment operating in these units will be cleaned prior to moving to any other unit that is indicated on Sale Area Map as being free of invasive species of concern, Purchaser shall again take reasonable measures to make each such piece of equipment free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds.	BMP	HFQLG, FSM	B6.35, C6.343, SAM	—	All	—	All	—	Must Do
	140, 614, 908	These units contain Controlled Areas to prevent equipment from entering known high infestation areas and spreading weed seed within the unit.	BMP	HFQLG, FSM	B6.24, C6.24, SAM	—	All	—	All	—	Must Do
Fire and Fuels	901A, 901B, 902, 903, LP1, 15TA, 11P, 12P1, 12P2, 12P3	Hand piling with fireline construction and covering.	DF	HFQLG Land and Resource Management Plan (LRMP)	C6.7, C6.723, B6.65	—	Service Contract	—	All	—	Must Do
	All harvest units	Hand and machine fireline construction for machine piles and road side hand piles include lines and covering. Hand pile activity slash that exceeds 5 tons per acre.	DF	HFQLG LRMP	C6.7, C6.723, B6.65	—	Timber Sale & Service Contract	—	All	—	Must Do
	Underburn units	Under burning or slash disposal.	BMP S&G	FSM Forest Service Handbook (FSH) HFQLG LRMP	N/A	—	Force Account	—	All	—	Must Do
	All harvest units	Slash treatment.	DF	LRMP	C6.7	—	Timber Sale	—	All	—	Must Do
	All harvest units	Fire plan (PAL).	DF	FSM	C7.2	—	Timber Sale & Service Contract	—	All	—	Must Do
	All burn units	Prescribed Burn Plan.	DF, BMP & MM	FSM, FSH, Sierra Nevada Forest Plan Amendment (SNFPA)	N/A	Rx burn	Force Account	—	All	—	Must Do
	All burn units	Smoke Management Plan.	DF & MM	FSM, FSH, SNFPA	N/A	Rx burn	Force Account	—	All	—	Must Do
	All Harvest units	Dust Abatement Plan.	S&G	LRMP	B6.33, C5.33	—	Timber Sale	—	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	901A, 902, 903, LP1, 15T, 15TA, 11P, 12P1, 12P2, 12P3, all oak enhancement units	Slash treatment for prevention of *Ips* spp. infestation. Whenever possible do not perform thinning work between 11/1 through 6/30. If work is completed during this time period, treat slash within 4 weeks of cutting unless otherwise agreed to in writing. Treat slash within 6 weeks if slash is cut between July 1st through September 30th unless otherwise agreed to in writing. Slash may be treated by removing to agreed upon disposal sight, by piling and burning, or by chipping.	MM	HFQLG, LRMP	C6.72, C6.7, SAM	—	Service/Timber Sale	11/1-6/30	All	—	SD
Heritage Resources	Administratively confidential information	There will be no effects to Heritage Resources due to the Standard Resource Protection measures for cultural resources.	N/A	NHPA, Regional PA	C6.411,C6.24 B6.24, SAM	—	All	—	All	—	Must Do
Hydrology/ Fisheries	Treatment units where fungicide application is proposed: 7, 33, 909, 905a, 905b, 907a.	Pesticide Use Planning Process – To introduce water quality and hydrologic considerations into the pesticide use planning process.	BMP 5-7	HFQLG Final Supplemental Environmental Impact Statement (FSEIS) in compliance with the *Clean Water Act*	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do
	Treatment units where fungicide application is proposed: 7, 33, 909, 905a, 905b, 907a.	Pesticide Application According to Label Directions and Applicable Legal Requirements – To avoid water contamination by complying with all label instructions and restrictions for use.	BMP 5-8	HFQLG FSEIS in compliance with the *Clean Water Act*	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do
	Treatment units where fungicide application is proposed: 7, 33, 909, 905a, 905b, 907a.	Pesticide Application Monitoring and Evaluation – 1. To determine whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects. 2 To document and provide early warning of possible hazardous conditions resulting from possible contamination of water or other non-target areas by pesticides. 3. To determine the extent, severity and possible duration of any potential hazard that might exist.	BMP 5-9	HFQLG FSEIS in compliance with the *Clean Water Act*	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do
	Treatment units where fungicide application is proposed: 7, 33, 909, 905a, 905b, 907a.	Pesticide Spill Contingency Planning – To reduce contamination of water by accidental pesticide spills.	BMP 5-10	HFQLG FSEIS in compliance with the *Clean Water Act*	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Treatment units where fungicide application is proposed: 7, 33, 909, 905a, 905b, 907a.	Cleaning and Disposal of Pesticide Containers and Equipment – To prevent water contamination resulting from cleaning, or disposal of pesticide containers. The cleaning and disposal of pesticide containers must be done in accordance with Federal, State, and local laws, regulations, and directives. Specific procedures for the cleaning and disposal of pesticide containers are documented in the Forest Service Pesticide Use Management and Coordination Handbook (FSH 2109.114), and state and local laws.	BMP 5-11	HFQLG FSEIS in compliance with the Clean Water Act	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do
	DFPZ treatment units that are proposed for maintenance with the use of herbicides and herbicide use for control of noxious weed treatment area	Streamside Wet Area Protection During Pesticide Spraying – To minimize the risk of pesticide inadvertently entering waters, or unintentionally altering the riparian area, Stream Management Zone (SMZ), of wetland.	BMP 5-12	HFQLG FSEIS in compliance with the Clean Water Act	N/A	—	N/A	N/A	B and C	Water Quality management for Forest System Lands in California Best Management Practices	Must Do
	All treatment units	Standard resource protection measures for hydrology and fisheries resources.	S&G, BMPs 1-3, 1-6, 1-8, 1-18, 1-19, 1-20, 1-21, 2-12, 5-1, 5-2, 7-3, and 7-4	HFQLG FSEIS, Scientific Analysis Team (SAT) Guidelines, Plumas National Forest LRMP, Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.34, B6.341, B6.342, B6.5, B6.65, C6.411, C6.5, C6.6, C6.65 and C6.601	—	All	N/A	All	—	Must Do
Hydrology	All	Timber Sale Planning Process – Incorporate water quality and hydrological considerations into the timber sale planning process.	BMP 1-1	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	none	Completed by Interdisciplinary (ID) Team during the project planning process.	N/A	N/A	All	—	Must Do
	All	Timber Harvest Unit Design – Timber harvest unit design will secure favorable conditions of water quality and quantity while maintaining desirable stream channel characteristics and watershed conditions.	BMP 1-2	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	none	Completed by ID Team during the project planning process.	N/A	N/A	All	—	Must Do
	See soils resource mitigation measures for applicable units	Determination of Surface Erosion for Timber Harvest Unit Design – Identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.	BMP 1-3	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.65 C6.6 and C6.601	Completed by ID Team during the project planning process.	All	N/A	All	—	Must Do
	All	Use of Sale Area Maps and/or Project Maps for Designating Water Quality Protection Needs – Recognition and protection of areas related to water quality protection delineated on sale area maps or project map.	BMP 1-4	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	SAM	—	All	N/A	All	—	Must Do
	3, 7, 27, 29, 154, 500, 530, 533, 535, 543, 556, 584, 599, 636, 914C, LP2	Protection of Unstable lands – Provide special treatment of unstable areas to avoid triggering mass slope failure with resultant erosion and sedimentation.	BMP 1-6	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.6, C6.6, and C6.601	Completed by ID Team during the project planning process.	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Hydrology, Fisheries, and Wildlife	All	Riparian Habitat Conservation Area (RHCA) – Protect riparian areas, streams with annual scour, lakes, wetlands, and ponds: (a) 300 foot buffer on each side of fish bearing streams and lakes, and ponds with mountain yellow-legged frog habitat and (b) 150 foot buffer on each side of perennial non-fish bearing streams, intermittent and ephemeral channels with annual scour, meadows, ponds, wetlands, lakes greater than 1 acre and landslide-prone areas.	S&G, BMP 1-8, BMP 1-18, BMP 1-19, BMP 7-3	HFQLG FSEIS, Scientific Analysis Team (SAT) Guidelines, PNF LRMP, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	SAM, B6.5, B6.61, C6.5, C6.62 and C6.411	—	All	N/A	All	—	Must Do
Hydrology and Fisheries	All	Streamside Management Zone (SMZ) – Protect ephemeral stream channels without evidence of annual scour: (a) for channels with a slope less than 60—percent a 25 foot buffer on each side is applied and (b) unstable channel slopes or channel slopes greater than 60 percent a 50 foot buffer on each side is applied. In all treatment units with ground-based mechanical equipment, equipment may reach into SMZs in the identified no-tractor equipment zone. Retain trees along streambanks.	S&G, BMP 1-8	Plumas National Forest LRMP, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	SAM, B6.5, C6.5 and C6.411	—	All	N/A	All	—	Must Do
	All	TM-1: Prohibit scheduled timber harvest, including fuelwood cutting, in RHCAs.	BMP 1-8, BMP 1-18, BMP 1-19, BMP 7-4	HFQLG FSEIS	B6.5, C6.5, and C6.411	—	All	N/A	All	—	Must Do
	All	Management activities in RHCAs must contribute to improving or maintaining watershed and aquatic habitat conditions described in the Riparian Management Objectives. When activities are found to detract from meeting RMOs, those activities will be modified, rescheduled, or discontinued. Areas where riparian conditions are presently degraded, management activities must be designed to improve habitat conditions.	S&G	HFQLG FSEIS	none	Completed by ID Team during the project planning process.	N/A	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	905, 907	RHCA mechanical treatments in DFPZ units: (a) 50 foot buffer or extent of riparian vegetation, which ever is greatest, applied on each side of fish-bearing streams and (b) 25 foot buffer or extent of riparian vegetation, whichever is greatest, applied on each side of non-fish bearing streams. Limited operation has been approved in RHCAs in two DFPZ units (905, 907). Mastication will be permitted to reduce fuel loads and ladder fuels adjacent to headwater ephemeral channels as approved by the hydrologist. Retain trees along streambanks. In all other units, standard RHCA and SMZ restrictions apply.	RMO, BMP 1-8, BMP 1-19	RMOs of the HFQLG FSEIS, PNF LRMP SMZ guidelines, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	SAM, B6.5 and C6.5	—	All	N/A	All	—	Must Do
	All DFPZ units	FM-1 – Design fuel treatment to meet Resource Management Objectives (RMO), and to minimize disturbance of riparian ground cover and vegetation.	S&G, BMP 1-8, BMP 1-20	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.5 and C6.5	—	All	N/A	All	—	Must Do
	11G, 11P, 12G2, 12P1, 12P2, 12P3, 13T, 15T, 15TA, 901A, 902, 903, 909, 912, 913, A, A2, A3, B, B2, D, E, F, LP1	FM-4 – Design prescribed burn projects to protect RHCAs from burning. Where riparian ecosystems would be enhanced by prescribed burns, clearly identify the specific objectives and risks.	S&G, BMP 1-8, BMP 1-21	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	none	—	Service Contract	N/A	All	—	Must Do
Hydrology and Fisheries	Treatment units identified as natural stands	RHCA non-mechanical treatments in DFPZ units – Any DFPZ prescription and follow-up treatments within RHCAs by Fuel Specialist determination and approval. Methods include hand cutting and underburning with possible limited ignition within RHCAs. RHCA lighting will only occur if fuel objectives are not met by backing fire and low burn severities will result. All burning shall be conducted on permissive burn days, within air quality constraints. Hand line construction allowed within RHCAs only where necessary, with hydrologist approval and appropriate rehabilitation.	RMO, BMP 1-8, BMP 1-19	RMOs of the HFQLG FSEIS, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	none	—	Service Contract	N/A	All	—	Must Do
	All	Protection of Wetlands – Avoid adverse water quality impacts associated with destruction, disturbance, or modification of wetlands. The Forest Service will not permit the implementation of activities and new construction in wetlands whenever there is a practical alternative.	BMP 7-3	RMOs of the HFQLG FSEIS, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.61, B6.62	—	All	N/A	All	—	Must Do
	All	Cumulative Off-Site Watershed Effects – Protect the identified beneficial uses of water from the combined effects of multiple management activities which individually may not create unacceptable effects but collectively may result in degraded water quality conditions.	BMP 7-8	RMOs of the HFQLG FSEIS, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	N/A	—	N/A	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Temporary road locations, Haul Routes, Road Reconstruction, and Stream Crossing Upgrade or Removals	Standard resource protection measures for hydrology and fisheries resources.	S&G, BMP 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-9, 2-10, 2-11, 2-13, 2-14, 2-16, 2-17, 2-19, 2-20, 2-21, 2-22, 2-23, 2-24, 2-26	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B5.12, B5.2, B6.63, B6.631, B6.312, B6.5, B6.65, B6.66, C6.5, C6.6 and C6.65	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction.	General Guidelines for the Location and Design of Roads – Locate and design roads with minimal resource damage.	BMP 2-1	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B5.12, B5.2, B6.63, B6.631, B6.312, B6.5, B6.65, B6.66, C6.5, C6.6 and C6.65	Done During T.S. Planning	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	RF-8 – Require a Road Management Plan be developed and carried out that meets the RMOs.	S&G, BMP 2-1	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312, B6.5, C6.5	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Erosion Control Plan – Limit and mitigate erosion and sedimentation through effective planning prior to initiation of construction activities and through effective contract administration during construction.	BMP 2-2	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
Hydrology and Fisheries	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Timing of Construction Activities – Minimize erosion by conducting operations during minimal runoff periods.	BMP 2-3	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Stabilization of Road Slope Surfaces and Spoil Disposal Areas – Minimize erosion from exposed cut slopes, fill slopes, and spoil disposal areas.	BMP 2-4	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Road Slope Stabilization Construction Practices – Reduce sedimentation by minimizing erosion from road slopes and slope failure along roads.	BMP 2-5	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Dispersion of Subsurface Drainage From Cut and Fill slopes – Minimize the possibilities of cut or fill slope failure and the subsequent production of sediment.	BMP 2-6	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Control of Road Drainage – Minimize the erosive effects of water concentrated by road drainage features; disperse runoff from disturbances within the road clearing limits; to lessen the sediment yield from roaded areas; minimize erosion of the road prism by runoff from road surfaces and from uphill areas.	BMP 2-7	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects – Minimize erosion and sedimentation from disturbed ground on incomplete projects.	BMP 2-9	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312, B6.6, C6.6	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Construction of Stable Embankments (Fills) – Construct embankments with materials and methods, which minimize the possibility of failure and subsequent water quality degradation.	BMP 2-10	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Control of Sidecast Material During Construction and Maintenance – Minimize sediment production originating from sidecast material during road construction or maintenance.	BMP 2-11	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312	—	All	N/A	All	—	Must Do
	All	Servicing and Refueling of Equipment – Prevent pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels.	BMP 2-12	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.34, B6.341, and B6.342	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Control of Construction and Maintenance Activities Adjacent to SMZs – Protect water quality by controlling construction and maintenance actions within and adjacent to any streamside management zone	BMP 2-13	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312, B6.5	—	All	N/A	All	—	Must Do
Hydrology and Fisheries	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Controlling In-Channel Excavation – Minimize stream channel disturbances and related sediment production. During construction, heavy equipment is only permitted to cross, or work in and near streams or lakes during the construction, or removal of culverts and bridges and other facilities (e.g., water sources, boat ramp/launching sites, etc.) and only under specific protection requirements. The Engineering Representative is authorized to designate the location of crossings or work sites. Excavation during the installation of instream structures must follow all of the minimum water quality protection requirements listed with this BMP.	BMP 2-14	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and **Clean Water Act**	B6.312	—	All	N/A	All	—	Must Do
	Temporary road locations	Stream Crossings on Temporary Roads – Ensure that temporary roads do not unduly damage stream channels and to ensure that fish passage is unimpeded by stream crossing structures. Contact Hydrologist for verification and recommendations. List of road location recommendations is in the Sugarberry project file.	BMP 2-16	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B5.1, B6.312, B6.63, B6.5, C6.5, C6.6	—	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Bridge and Culvert Installation – Minimize sedimentation and turbidity resulting from excavation for in-channel structures.	BMP 2-17	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	B6.312, B6.5	—	All	N/A	All	—	Must Do
	Haul Routes, Road Reconstruction, and Stream Crossing Upgrades	RF-4 – Require improvement of culverts and stream crossings found to pose a substantial risk to riparian conditions to accommodate at least a 100-year flood, including associated bedload and debris. Base priorities for upgrading on the potential impact and ecological value of the riparian resources affected. Design and construct new stream crossings to accommodate at least a 100-year flood, including associated bedload and debris.	BMP 2-17	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	SAM, B6.5	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Disposal of Right-of-Way and Roadside Debris – (a) ensure that organic debris generated during road construction is kept out of streams so that channels and downstream facilities are not obstructed. (b) ensure debris dams are not formed which obstruct fish passage, or which could result in downstream damage from high water flow surges after dam failure.	BMP 2-19	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and *Clean Water Act*	—	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Specifying Riprap Composition - minimize sediment production associated with the installation and utilization of riprap material.	BMP 2-20	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	—	—	All	N/A	All	—	Must Do
Hydrology and Fisheries	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Water Source Development Consistent with Water Quality Protection – Supply water for roads and fire protection while maintaining existing water quality.	BMP 2-21	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	C5.36	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, and Road Reconstruction	Maintenance of Roads – Maintain roads in a manner which provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities all of which can cause erosion and sedimentation, and deteriorating watershed conditions.	BMP 2-22	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B5.12	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Road Surface Treatment to Prevent Loss of Materials – Minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production from those areas.	BMP 2-23	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	—	—	All	N/A	All	—	Must Do
	Temporary road locations, Haul Routes, Road Reconstruction, Road Decommissioning, and Stream Crossing Upgrade or Removals	Traffic Control During Wet Periods – (a) reduce road surface disturbance and rutting of roads. (b) minimize sediment washing from disturbed road surfaces.	BMP 2-24	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	—	—	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Meadow Restoration, Streambank Stabilization, Fish Barrier Removals, Road Decommissioning (see Fig A-1.e. and Fig A-3.a for roads)	Standard resource protection measures for hydrology, fisheries and soil resources	MM, BMP 2-26, BMP 7-1	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000) and Clean Water Act	N/A	—	N/A	N/A	All	—	Must Do
	Road Decommissioning, temporary roads	Obliteration or Decommissioning of Roads – reduce sediment generated from temporary roads or unneeded system roads by obliterating or decommissioning them at the completion of their intended use.	BMP 2-26	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.63	—	N/A	N/A	All	—	Must Do
	Road Decommissioning	Unclassified Road Decommissioning and Egregious Resource Damage – The following roads have been determined by the ID Team to be unnecessary unclassified roads and/or roads that are the cause of egregious resource damage: U1433, U1431, U1420, U1390, U1333, U1329, U1220, U1219, U1169, U1153, U1140, U1133, U1124, U1119, U1082, U1076, U1068. Portions of these roads are designated for immediate closure and rehabilitation, as allowed under the terms of the OHV Route Designation Process.	MM and BMP 2-26	HFQLG FSEIS, Route designation memo J. Pena 5/31/2005	N/A	—	N/A	N/A	All	—	Must Do
	Meadow Restoration, Streambank Stabilization, Fish Barrier Removals, Road Decommissioning	Watershed Restoration – repair degraded watershed conditions and improve water quality and soil stability.	BMP 7-1	HFQLG FSEIS in compliance with the Clean Water Act	N/A	—	N/A	N/A	All	—	Must Do
Hydrology and Fisheries	Aspen Enhancement	Protection of Wetlands – avoid adverse water quality impacts associated with destruction, disturbance, or modification of wetlands. The Forest Service will not permit the implementation of activities and new construction in wetlands whenever there is a practical alternative. Employ directional felling and/or endlining where necessary to protect wetlands, meadows and other riparian resources.	BMP 7-3	Riparian Management Objectives (RMO) objectives of the HFQLG FSEIS, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.61, B6.62, B6.5, C6.62, C6.411, C6.422, SAM	—	Timber Sale	—	—	—	Must Do
Hydrology and Soils	Harvest, Group Selection, and Individual Tree Selection (ITS) Treatment Units	Standard resource protection measures for hydrology and soil resources.	BMPs 1-9, 1-10, 1-11, 1-12, 1-13, 1-15, 1-16, 1-17, 1-21	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.422, B6.65, B 6.67, C6.36, C6.425, C6.427, C6.5, C6.601, and C6.65	—	Timber Sale	N/A	All	—	Must Do
	All treatment units	Standard resource protection measures for hydrology and soil resources.	BMP 1-18, 1-20, 5-3, 5-4, 5-6, 7-3	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.61, B6.67, C6.62, C6.313, C6.411, C6.601, C6.62, SAM	—	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	All	Determining Tractor Loggable Ground – Minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.	BMP 1-9	Riparian Management Objectives (RMO) objectives of the HFQLG FSEIS, and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	B6.65, B 6.67, C6.5, C6.601, and C6.65	—	All	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Tractor Skidding Design – Design skidding patterns to best fit the terrain, the volume, velocity, concentration, and to control direction of runoff water in a manner that will minimize erosion and sedimentation.	BMP 1-10	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.422 and C6.422	—	Timber Sale	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Suspended Log Yarding in Timber Harvest – (a) protect the soil mantle from excessive disturbance (b) maintain the integrity of the SMZ and other sensitive watershed areas (c) control erosion on cable corridors.	BMP 1-11	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.422, B6.65, C6.422, C6.425, C6.427, and C6.601	—	Timber Sale	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Log Landing Location – Locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.	BMP 1-12	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	SAM, B6.422	—	Timber Sale	N/A	All	—	Must Do
	All	Erosion Prevention and Control Measures During Timber Sale Operations – Ensure that the purchasers' operations will be conducted reasonably to minimize soil erosion.	BMP 1-13	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.5, C6.5	—	All	N/A	All	—	Must Do
Hydrology and Soils	Group Selection Treatments located in Unit DFPZ Treatment unit 5: 33g, 34g, 35g, 36g, and 37g	Special Erosion Prevention Measures on Disturbed Land – Provide appropriate erosion and sedimentation protection for disturbed areas. The purchaser will give adequate treatment by spreading slash, mulch or wood chips (or, by agreement, some other treatment) on portions of tractor roads, skid trails, landings, cable corridors or temporary road fills.	S&G, MM, and BMP 1-14	PNF LRMP, HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	C6.601	—	All	N/A	All	—	Must Do
	All SMZs and RHCAs where temp roads or landings are present and will be used/re-used	Do not sub-soil landings or temp roads in RHCAs or SMZs; seed and mulch and allow natural regeneration.	MM, BMP 1-14, and BMP 1-16	HFQLG FSEIS	C6.601	—	Timber Sale	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Harvest, Group Selection, and ITS Treatment Units	Revegetation of Areas Disturbed by Harvest Activities – Where soil has been severely disturbed by the purchaser's operations, and the establishment of vegetation is needed to control accelerated erosion, the purchaser will be required to take appropriate measures normally used to establish an adequate ground cover of grass or other vegetative stabilization measures acceptable to the Forest Service. The type and intensity of treatment to establish ground cover is prescribed by the Timber Sale Administrator, with assistance from soil scientist and botanist as needed.	BMP 1-15	PNF LRMP, HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	C6.601	—	Timber Sale	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Log Landing Erosion Control – Reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.	BMP 1-16	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.64 and C6.601	—	Timber Sale	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Erosion Control on Skid Trails – Protect water quality by minimizing erosion and sedimentation derived from skid trails.	BMP 1-17	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.65 and C6.601	—	Timber Sale	N/A	All	—	Must Do
	All	Erosion Control Structure Maintenance – Ensure that constructed erosion control structures are stabilized and working.	BMP 1-20	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.67	—	All	N/A	All	—	Must Do
	All	Acceptance of Timber Sale Erosion Control measures Before Sale Closure – Ensure the adequacy of required erosion control work on timber sales. The effectiveness of soil erosion prevention and control measures is determined by the conditions found after sale areas have been exposed for one, or more years to the elements as determined by the sale administrator.	BMP 1-21	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.36	Purchaser responsible for up to one calendar year after sale.	T.S.	N/A	All	—	Must Do
Hydrology and Soils	All	Soil Disturbing Treatments on the Contour – decrease sediment production and stream turbidity while mechanically treating slopes. This is a preventive measure that limits surface disturbance activities to preclude water from concentrating by providing means of adequate infiltration and by decreasing the velocity of surface runoff so that infiltration is enhanced.	BMP 5-1	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	—	—	All	N/A	All	—	Must Do
	All	Slope Limitations for Mechanical Equipment Operation – reduce gully and sheet erosion and associated sediment production by limiting tractor use.	BMP 5-2	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.42, SAM	Sale Prep	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	All	Tractor Operation Limitation in Wetlands and Meadows – Limit turbidity and sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion by excluding the use of mechanical equipment in wetland and meadows except for the purpose of restoring wetland and meadow function.	BMP 5-3	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	B6.61, B6.62, C6.62, SAM	—	All	N/A	All	—	Must Do
	All	Revegetation of Surface Disturbed Areas – Protect water quality by minimizing soil erosion through the stabilizing influence of vegetation foliage and root network. This is a corrective practice to stabilize an otherwise unstable soil surface during vegetation manipulation projects. The plant species selected will be a mix best suited for site conditions and attainment of multiple management objectives for the area.	BMP 5-4	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	C6.601	—	All	N/A	All	—	Must Do
	All	Soil Moisture Limitations for Mechanical Equipment Operations – Use to prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.	BMP 5-6	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	C6.313, SAM	Need Limited Operating Period (LOP) for soils - condition-based, rather than dates - see soils mitigations	All	N/A	All	—	Must Do
	Units with underburn or pile burn treatments	Standard resource protection measures for hydrology and soil resources for prescribed burning treatments.	BMP 6-1, 6-2, 6-3, 6-4, 6-5	HFQLG FSEIS and Water Quality Management for National Forest System Lands in CA, BMPs (2000)	N/A	—	Service Contract	N/A	All	—	Must Do
	Units with underburn or pile burn treatments	Fire and Fuel Management Activities – Reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity and extent of wildfire.	BMP 6-1	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	N/A	—	All	N/A	All	—	Must Do
	Units with underburn or pile burn treatments	Consideration of Water Quality in Formulating Fire Prescriptions – Provide for water quality protection while achieving the management objectives through the use of prescribed fire.	BMP 6-2	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	N/A	—	Service Contract or Force Account	N/A	All	—	Must Do
Hydrology and Soils	Units with underburn or pile burn treatments	Protection of Water Quality from Prescribed Burning Effects – Maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.	BMP 6-3	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	N/A	—	Service Contract or Force Account	N/A	All	—	Must Do
	Units with underburn or pile burn treatments	Minimizing Watershed Damage from Fire Suppression Efforts – Avoid watershed damage in excess of that already caused by the wild fire. Avoid heavy equipment operation on fragile soils and steep slopes whenever possible.	BMP 6-4	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	N/A	—	Service Contract or Force Account	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
	Units with underburn or pile burn treatments	Repair or Stabilization of Fire Suppression Related Watershed Damage – Stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression related activities. Treatments for fire-suppression damages include, but are not limited to, installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas; seeding, planting and fertilizing to provide vegetative cover; spreading slash, or mulch to protect bare soil; repairing damaged road drainage facilities; clearing stream channels or structures and removing debris deposited by suppression activities which can have adverse life, property and environmental impacts.	BMP 6-5	HFQLG FSEIS, Water Quality Management for National Forest System Lands in CA, BMPs (2000), and Clean Water Act	N/A	—	Service Contract or Force Account	N/A	All	—	Must Do
Rec/Lands/ Minerals	Units along Oroville/La Porte highway (Diamond Springs to La Porte) - power & phone lines, and overhead and underground power line from highway to Lexington Hill; Unit 14A (La Porte Pines CC Access Road); Unit 15A (Communication Site on Lexington Hill); Unit 910 (Table Rock Trailhead); Unit 55 (American House OHV Camp)	Protection of Improvements (Forest Service and non-Forest Service) and Land Survey Monuments	S&G, MM	LRMP, FSM, FSH	B6.22, B6.221, B6.23, C6.223, C6.411, SAM	—	All	—	All	—	Must Do
Soils	All	Prevent significant or permanent impairment of soil productivity.	S&G	PNF LRMP	N/A	—	All	N/A	All	—	Must Do
	All	During project activities, minimize excessive loss of organic matter and limit soil disturbance according to the Erosion Hazard Rating (EHR) as follows: (a) EHR 4-8: Conduct normal activities, (b) EHR 9-10: Minimize or modify use of soil-disturbing activities, and (c) EHR 11-13: Severely limit soil-disturbing activities.	S&G	PNF LRMP	N/A	—	All	N/A	All	—	Must Do
	All	For all proposed treatment types, EHRs are below a numerical value of 8.	S&G	PNF LRMP	N/A	—	All	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Soils	All	Determine adequate ground cover for disturbed site outside of streamside management zones during project planning on a case-by-case basis, based on specialist evaluation, using the following as a guide: (a) Low EHR (4-5): 40 percent minimum effective ground cover (b) Mod. EHR (6-8): 50 percent minimum effective ground cover (c) High EHR (9-10): 60 percent minimum effective ground cover (d) Very high EHR (11-13): 70 percent minimum effective ground cover.	S&G	PNF LRMP	N/A	—	All	N/A	All	—	Must Do
	908	Reduce increased soil erosion from proposed treatments, seed and mulch disturbed bare ground.	S&G, MM and BMP 1-14	PNF LRMP	C6.601	—	Timber Sale	N/A	All	—	Must Do
	All	Use existing temporary roads, landings, and skid trails to minimize additional detrimental soil compaction and limit skid trails and landings to no more than 15 percent of the treatment unit. Where conditions unfavorable for implementation of this mitigation measure COR/SA (in consultation with soil scientist) to prescribe alternative treatment consistent with standard resource protection measures.	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	B6.422	—	All	N/A	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Subsoil all landings, 200 feet of the main skid trail approach to the landing, and all temporary roads. On skid trails, limit subsoiling to a maximum slope of 25 percent. Areas to be subsoiled must be approved by the COR/SA upon recommendation by silviculturists and soil scientist. Apply treatment slash, debris and mulch, wood chips, or straw to disturb sites after subsoiling to reduce soil erosion potential (COR/SA determination in consultation with soil scientist).	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	B6.63, C6.349, C6.601, C6.606, C6.607, C6.608	—	Timber Sale	N/A	All	—	Must Do
	All	Operate ground based mechanical equipment only when the upper 8 inches of the soil is essentially dry, the ground is frozen to a depth of 5 inches, or snow depth is at least 18 inches or "machine compacted" to 8 inches. Soil is defined as "dry" when the upper 8 inches is not sufficiently moist to allow a soil sample to be squeezed and hold its shape, or crumbles when the hand is tapped. Dryness would be determined by the sale administrator upon the recommendation of a soil scientist.	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	C6.313	—	All	Dry Upper 8 inches	All	—	Must Do
	Harvest, Group Selection, and ITS Treatment Units	Restrict ground based logging operations on slopes greater than 35 percent.	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	N/A	—	Timber Sale	N/A	All	—	Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Soils	DFPZ Mastication Treatment Units	1. Prime power unit - tracked unit with maximum ground pressure that shall not exceed 5–8 psi; 2. Machine shall be equipped with a masticating or mulching head with an articulating boom that can reach 20 feet or greater from center of machine; 3. Capable of working on slopes continuously on 0 to 45 percent slopes; 4. Limit the number of passes the machine makes for soil compaction concerns. Soil compaction should not exceed 15 percent; and 5. Limit traveling along the sideslope to reduce soil displacement. Soil displacement should not exceed 15 percent.	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	N/A	—	Service Contract	N/A	All	—	Must Do
	All	Maintain fine organic to occur in at least 50 percent of the area. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter.	MM	R5 Soil Management Handbook FSH 2509.18-95-1	N/A	—	All	N/A	All	—	Must Do
	All	Large woody material is at least 5 well distributed logs/acre representing the range of decomposition classes. Desired logs are at least 20 inches in diameter and 10 ft long, but need to be at least 12 inches in diameter. Protect logs in decomposition classes 3–5 from mechanical disturbance.	MM	R5 Soil Management Handbook FSH 2509.18-95-1	C6.705	Leave 5 logs per acre that are 12 (prefer 20) inches or greater in small end diameter and 10 feet or longer.	All	N/A	All	—	Must Do
	912 and 913	To prevent a medium to high intensity fire burning would occur during cool conditions to prevent loss of effective soil cover below standards and guides.	MM	PNF LRMP, R5 Soil Management Handbook FSH 2509.18-95-1	N/A	N/A	Burn Plan and Burn Contract	Cool burn conditions	All	—	—
Vegetation	7, 33, 905A, 905B, 909	Treatment of stumps with borate compound for control of *Heterobasidion annosum*. Treat all freshly cut stumps 14 inches diameter and greater (including wet dead stumps) at a rate of one pound per 50 square feet of stump surface. This is equivalent to one pound of borax on 60 twelve-inch stumps.	MM	FSM	C6.412, SAM	Treat stumps >14" dbh	Timber Sale	—	All	FSM 2150; Project File FS 2100-2, Spill Plan, and Sugarberry Project Human and Ecological Risk Evaluation.	Must Do
Visuals	Units along Oroville/La Porte highway (Diamond Springs to La Porte), 909, 43, 908, 906, 33, 32, 905A, 905B, 907A, 907B, 21, 14A, 14B, 3, 573, 542, 500	Slash treatment in visual quality corridor along La Porte-Quincy Highway and Lexington Hill for Visual Quality Objective (VQO) - Retention (People's activities are not to be evident to the casual Forest visitor).	S&G, MM	LRMP, FSM, FSM	C6.77 and SAM	Remove activity generated slash from visual corridor roads to 100 feet. Activities include vegetation treatments as well as associated roads and skid trails. Slash may be removed, piled, or chipped. If piled, associated brush disposal costs would be incurred for pile burning.	All		All		Must Do

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Wildlife - California Spotted Owl	Unit 523 affects Activity Center for PAC SI069 T22N R10E Sec. 32 and Road 21N78Y segment going through Activity Center for PAC PL359 T21N R9E Sec. 16 and Unit 12G affects Activity Center for PAC YU021 and segment of Road 20N06 going through T20N R9E Sec. 24 Unit 909 affects Activity Center for PAC PL185 and a portion of road 21N01Y T21N R9E Sec. 25 & 36 and Unit 100 & 11G and road 20N03 affects Activity Center PAC SI097 T20N R9E Sec. 18	Apply Standard and Guidelines HFQLG FEIS p.—2-7 and 2-8	BMP 1.5 FSM 2670.32 LRMP [p.4-33, 4-4, 430-35 4-79 - 182]	SNFPA FSEIS/ROD 2004, HFQLGFRA FEIS/ROD 2004	C6.24 B6.24 C6.313	HFQLG ACT states: A new Protected Activity Center (PAC) and Home Range Core Area (HRCA) will be created if a new territory is discovered. Then a LOP may be added or modified for this project by the district biologist. Stand prescriptions may be adjusted as well.	All	March 1 through August 15	All	—	Must Do
	Segment of road 21N10Y affects Activity Center for PAC SI103 T21N R10E Sec. 6 & 7	—	—	—	C6.24 B6.24 C6.313	—	—	—	—	—	
Wildlife- Northern Goshawk	Unit 15T affects Activity Center PAC T44, & road 20N16 T20N R8E Sec. 34 and Unit 904 affect Activity Center of PAC T60, T21N R9E Sec. 18	Apply Standard and Guidelines HFQLG FEIS p. 2-7 and 2-8	BMP 1.5 FSM 2670.32 LRMP [p.4-33, 4-4, 430-35 4-79 - 182]	SNFPA FSEIS/ROD 2004, HFQLGFRA FEIS/ROD 2003	C6.24 B6.24 C6.313	HFQLG ACT states: A new PAC and HRCA will be created if a new territory is discovered. Then a LOP maybe added or modified for this project by the district biologist. Stand prescriptions may be adjusted as well.	All	March 1 through September 15	All	—	Must Do
	Unit 21 affects Activity Center PAC T12 and a segment of Road 20N18 and 21N18A T21N R9E Sec. 21 and Unit 504 affects Activity Center PAC T58 and a segment of Road SC900 T22N R10E Sec. 30 and Road 21N66Y all affects Activity Center PAC T07 T21N R9E Sec. 31 & 6 and Road 21N66 segment affect Activity Center PAC T61 T20N R9E Sec. 8 & 7 and Road SC690 segment affects Activity Center PAC T57 T21N R10E Sec. 24	—	—	—	C6.24 B6.24 C6.313	—	All	March 1 through September 15	—	—	
Wildlife- Pacific Fisher	Appropriate LOPs would apply if species is detected	N/A	N/A	N/A	N/A	N/A	N/A	Appropriate LOPs if needed	N/A	—	
Wildlife - American Martin	Appropriate LOPs would apply if species is detected	N/A	N/A	N/A	N/A	N/A	N/A	Appropriate LOPs if needed	N/A	—	

Table E-1. Mitigation measures by unit for the Sugarberry Project (continued).

Resource	Applicable Units	Brief Description	Type of Direction (BMP, S&G, MM, DF)	Source of Direction (LRMP, SNFPA, HFQLG, FSM, FSH, NHPA,	Applicable Timber Sale Provisions Alternatives B,C and G	Provision Specifications from Specialist	Contract Type (Timber Sale, Service, Construction)	Limited Operating Periods	Applicable Action Alternatives	Applicable Reference	Must Do / Should Do
Wildlife - Bats	Appropriate LOPs would apply if species is detected	N/A	N/A	N/A	N/A	N/A	N/A	Appropriate LOPs if needed	N/A	—	
Wildlife/ Fisheries	LP1	Controlled Areas to prevent injury to Mountain yellow-legged frogs that may shelter in burn poles, No pole burning within 75 feet of stream edge.	MM	USDA-FWS	N/A	N/A	Service	N/A	All	Wengert et al. 2006	Must Do
Wildlife - California Spotted Owl and Northern Goshawk	Unit 65 & 98 Landing in Unit 65 affect PAC YU019 and Unit 647,510,513,508,504,507,479,524,506,479,524, 506,526, & 505 Landing in 500 affect SI069 Unit 649 affect PAC T43 Landing 556 Unit	Controlled Areas to prevent harassment to nesting birds and their nestlings. Appropriate LOPs will apply if a helicopter flight path flies over an Activity Center of a California spotted owl and/or northern goshawk.	BMP 1.5 FSM 2670.32 LRMP [p.4-33, 4-4, 430-35 4-79 - 182]	SNFPA FSEIS/ROD 2004, HFQLGFRA FEIS/ROD 2003	C6.24 B6.24 C6.313	HFQLG ACT states: A new PAC and HRCA will be created if a new territory is discovered. Then a LOP may be added or modified for this project by the district biologist. Stand prescriptions maybe adjusted as well.	All	March 1 through August 15 for the California spotted owl or March 1 through September 15 for the northern goshawk	All	—	Must Do

Table E-2. Timber sale provisions related to mitigation measures.

Timber Sale Provision & Title	FS 2400-6	April/2004
SAM	Sale Area Map	
A2	Volume Estimate and Utilization Standards	
B5.12	Use of Roads by Purchaser	
B6.22	Protection of Improvements	
B6.221	Protection of Improvements Not Owned by Forest Service	
B6.23	Protection of Land Survey Monuments	
B6.24	Protection Measures Needed for Plants, Animal, Cultural Resources, and Cave Resources	
B6.312	Plan of Operations for Road Construction	
B6.33	Safety	
B6.35	Equipment Cleaning	
B6.42	Skidding and Yarding	
B6.422	Landings and Skid Trails	
B6.63	Temporary Roads	
B6.65	Skid Trails and Fire Lines	
B6.67	Erosion Control Structure Maintenance	
C1.3	Requirements of Temporary Land Use Agreement	
C5.11	Requirements of Right-of-Way	
C5.124	Existing Temporary Roads	
C5.33	Dust Abatement for Temporary Roads	
C5.36	Water Supply Development	
C6.223	Protection of Improvements	
C6.24	Site Specific Special Protection Measures	
C6.313	Limited Operating Period	
C6.343	Cleaning of Equipment to Prevent Root Rot	
C6.349	Use of State of California Certified Weed Free Hay, Straw, and Mulch Used in This Contract	
C6.411	Directional Felling	
C6.416	Mechanized Harvesting	
C6.417	Whole Tree Yarding	
C6.421	Rigging	
C6.422	Tractor Skidding Requirements	
C6.427	Skyline Yarding	
C6.428	Landings	
C6.65	Backblading	
C6.6	Erosion Prevention and Control	
C6.601	Vegetative Soil Stabilization	
C6.606	Tillage of Landings	
C6.608	Tillage of Temporary Roads	
C6.65	Backblading	
C6.7	Slash Treatment	
C6.72	Timing of Slash Treatment to Control Slash Breeding Insects	
C6.705	Treatment of Substandard Material	
C6.77	View Areas	
C6.723	Covering Piles	
C7.2	Specified Fire Precautions	

Appendix F

Past, Present, and Foreseeable Future Action in the Sugarberry Project Area

Appendix F-1. USFS Past, Present, and Future Foreseeable Actions Within the Sugarberry Project Area.

Project Year	NEPA Document Name	Activity	Within Project N	Within Project Y	Total Acres	Within Project N	Within Project Y	Annual Total Acres
1984	Illinois T.S.	Clearcut/Tractor Pile and Burn	—	23	23	0	23	23
1985	American T.S.	Clearcut/Tractor Pile and Burn	—	18	18	—	—	—
	American T.S.	Piles	—	50	50	—	—	—
	Bellevue Yg	Seed Tree Removal (Cable Yarded)	—	20	20	—	—	—
	Frosty Hollow T.S.	Clearcut/Tractor Pile and Burn	—	4	4	—	—	—
	Unknown	Clearcut (Cable Yarded)	—	43	43	—	—	—
	Unknown	Commercial Thinning	—	22	22	0	156	156
1986	Frosty Hollow T.S.	Clearcut/Tractor Pile and Burn	0	84	84	—	—	—
	Frosty Hollow T.S.	Clearcut/Broadcast Burn	6	12	18	—	—	—
	Unknown	Clearcut	—	24	24	6	120	126
1987	Bellevue Yg	Overstory Removal/Tractor Pile and Burn	—	39	39	0	39	39
1988	Illinois T.S.	Clearcut(Cable Yarded)/Broadcast Burn	—	30	30	—	—	—
	Illinois T.S.	Clearcut/Tractor Pile and Burn	—	10	10	—	—	—
	Illinois T.S.	Clearcut (Cable Yarded)	—	3	3	—	—	—
	Illinois T.S.	Precommercial thinning	—	16	16	—	—	—
	Poverty Hill	Clearcut (Cable Yarded)	—	25	25	—	—	—
	Scales Timber Sale	Clearcut	—	34	34	0	119	119
1989	Bunker Hill T.S.	Seed Tree Removal/Tractor Pile and Burn	14		14	—	—	—
	Illinois T.S.	Clearcut/Broadcast Burn	—	32	32	—	—	—
	Illinois T.S.	Clearcut/Tractor Pile and Burn	—	25	25	—	—	—
	Lexington	Clearcut	6	3	9	—	—	—
	Lexington	Clearcut (Cable Yarded)	2	1	3	—	—	—
	Portwine	Clearcut	—	15	15	—	—	—
	Portwine	Clearcut (Cable Yarded)	—	12	12	—	—	—
	Poverty Hill	Clearcut/Tractor Pile and Burn	—	61	61	—	—	—
	Scales Timber Sale	Clearcut (Cable Yarded)	—	8	8	22	156	178
1990	Harrison Buyout Sba	Clearcut/Tractor Pile and Burn	—	2	2	—	—	—
	Illinois T.S.	Clearcut/Broadcast Burn	—	19	19	—	—	—
	Lexington	Clearcut/Tractor Pile and Burn	40	11	51	—	—	—
	Mountain Boy	Seed Tree Seed	—	36	36	—	—	—
	Mountain Boy	Clearcut/Tractor Pile and Burn	—	89	89	—	—	—
	Mountain Boy	Seed Tree Removal/Tractor Pile and Burn	—	22	22	—	—	—
	Portwine	Clearcut	—	21	21	—	—	—
	Portwine	Clearcut/Tractor Pile and Burn	—	58	58	—	—	—

Table F-1. USFS Past, Present, and Future Foreseeable Actions Within the Sugarberry Project Area (continued).

Project Year	NEPA Document Name	Activity	Within Project		Total Acres	Within Project		Annual Total Acres
			N	Y		N	Y	
	Portwine	Clearcut (Cable Yarded)	—	19	19	—	—	—
	Stowman	Clearcut/Tractor Pile and Burn	—	77	77	—	—	—
	Stowman	Clearcut (Cable Yarded)	—	20	20	40	374	414
1991	Lexington	Clearcut	10	5	15	—	—	—
	Lexington	Clearcut (Cable Yarded)	68	56	124	—	—	—
	Mountain Boy	Clearcut/Tractor Pile and Burn	—	2	2	—	—	—
	Portwine	Clearcut (Cable Yarded)	—	32	32	—	—	—
	Poverty Hill	Clearcut/Tractor Pile and Burn	—	17	17	—	—	—
	Rose Ranch	Clearcut/Tractor Pile and Burn	—	23	23	—	—	—
	Scales Timber Sale	Clearcut/Tractor Pile and Burn	—	130	130	—	—	—
	Scales Timber Sale	Clearcut/Broadcast Burn	—	22	22	—	—	—
	Scales Timber Sale	Clearcut(Cable Yarded)/Broadcast Burn	—	110	110	—	—	—
	Unknown	Clearcut	4	—	4	82	397	479
1992	Bellevue Yg	Commercial Thinning	—	307	307	—	—	—
	Bellevue Yg	Single-tree selection	—	76	76	—	—	—
	Gibsonville	Clearcut/Broadcast Burn	4	—	4	—	—	—
	Peterson T.S.	Clearcut	68	7	75	72	391	463
1993	Brushy Creek	Clearcut/Tractor Pile and Burn	—	55	55	—	—	—
	Peterson T.S.	Clearcut (Cable Yarded)	17	—	17	—	—	—
	Scales Timber Sale	Clearcut(Cable Yarded)/Broadcast Burn	—	26	26	—	—	—
	Unknown	Clearcut/Tractor Pile and Burn	—	28	28	17	109	125
1994	Brushy Creek	Clearcut/Tractor Pile and Burn	—	29	29	—	—	—
	Peterson T.S.	Clearcut(Cable Yarded)/Broadcast Burn	7	—	7	—	—	—
	Rose Ranch	Clearcut/Broadcast Burn	—	74	74	7	103	110
1995	Big Hill T.S.	Clearcut(Cable Yarded)/Broadcast Burn	26	—	26	—	—	—
	Brushy Creek	Clearcut/Broadcast Burn	—	74	74	26	74	100
1997	Howland Flat Thinning	Commercial Thinning	—	77	77	—	—	—
	Pc Snow Damage Ssts	Seed Tree Seed	—	4	4	0	81	81
1998	Howland Flat Thinning	Seed Tree Seed	—	6	6	—	—	—
	Howland Flat Thinning	Commercial Thinning	—	129	129	0	135	135
1999	Portwine	Clearcut(Cable Yarded)/Broadcast Burn	—	37	37	—	—	—

Table F-1. USFS Past, Present, and Future Foreseeable Actions Within the Sugarberry Project Area (continued).

Project Year	NEPA Document Name	Activity	Within Project N	Within Project Y	Total Acres	Within Project N	Within Project Y	Annual Total Acres
	Portwine	Seed Tree Removal (Cable Yarded)	—	31	31	0	68	68
2003	Bellevue Yg	Precommercial thinning	—	70	70	—	—	—
	Bellevue Yg	Seed Tree Removal	—	11	11	—	—	—
	Portwine	Precommercial thinning	—	111	111	—	—	—
	Poverty Hill	Precommercial thinning	—	87	87	—	—	—
	South Fork DFPZ	Mastication	101	—	101	101	279	380
2004	Lower Slate	Hand Cut Pile Burn	—	188	188	—	—	—
	Lower Slate	Hand Thin	—	41	41	—	—	—
	Lower Slate	Mastication	—	591	591	—	—	
	Upper Slate	Mastication	—	225	225	0	1044	1044
2005	Bellevue Yg	Mastication	—	32	32	—	—	—
	Upper Slate	Hand Cut Pile Burn	—	556	556	—	—	
	Upper Slate	Hand Cut Pile Burn/Underburn	—	46	46	—	—	—
	Upper Slate	Hand Cut/Underburn	—	89	89	—	—	—
	Upper Slate	Underburn	—	18	18	0	740	741
2006	South Fork DFPZ	Commercial Thinning	13	—	13	13	0	13
2007	American House Ssts	Sanitation Salvage	—	79	79	—	—	—
	La Porte Pines	Mastication	—	59	59	—	—	—
	La Porte Pines	Mastication/Hand Cut Pile Burn	—	4	4	—	—	—
	Portwine CYFA Prescribed Fire Study	Prescribed Fire	—	6	6	0	148	148
2008	Portwine CYFA Prescribed Fire Study	Hand Thin	—	25	25	—	—	—
	South Fork DFPZ Unit 30	Commercial Thinning/Underburn	100	11	111	100	36	136
		Grand Total	**486**	**4,591**	**5,078**	**486**	**4,591**	**5,078**

Table F-2. Past, present, and future foreseeable actions on private land in the Sugarberry Project area.

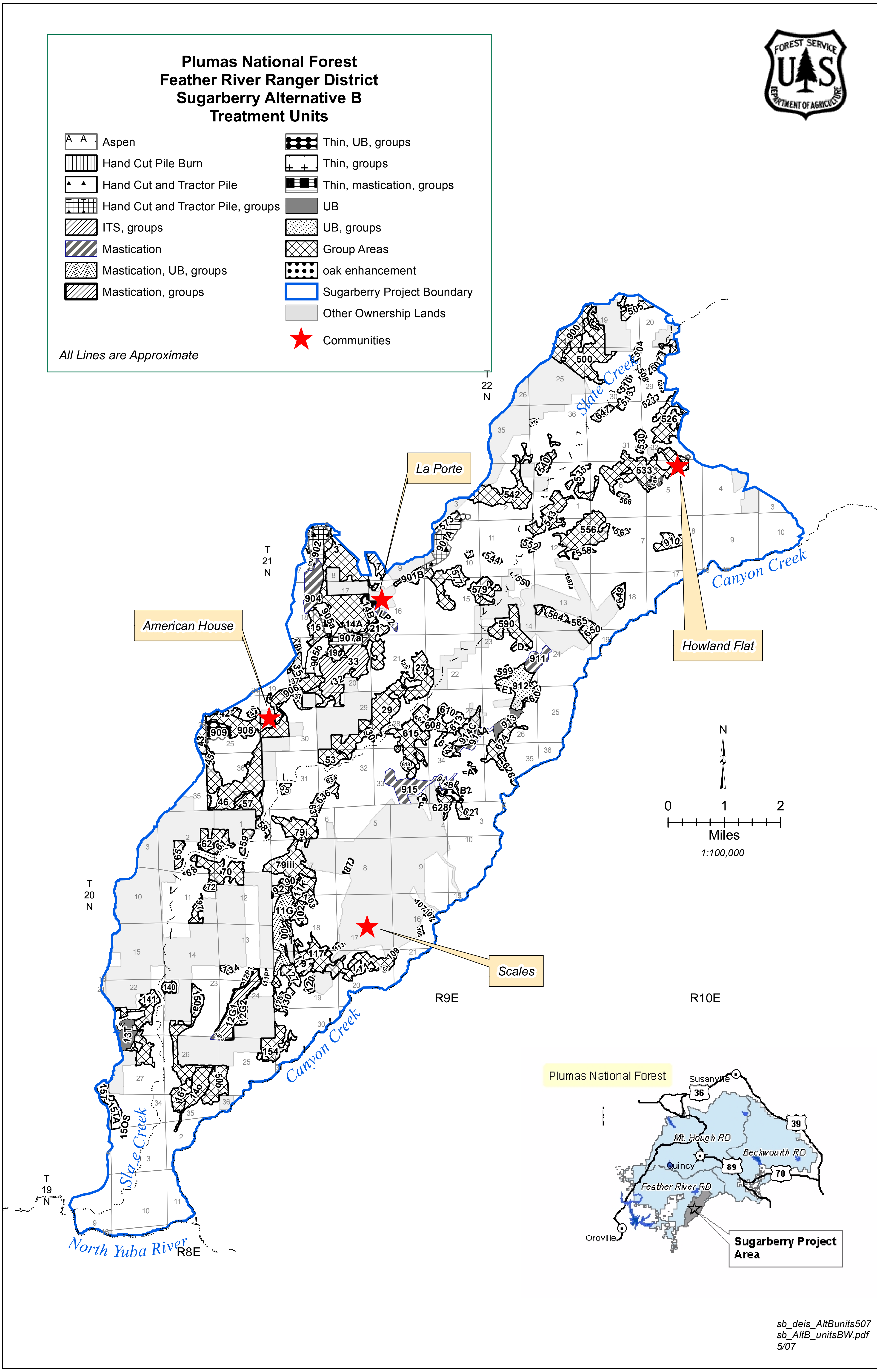
Project Year	Activity	Within Project		Total Acres	Within Project		Annual Total Acres
		N	Y		N	Y	
1985	Clearcut	17	388	405	—	—	—
	Selection	177	508	685	194	896	1,090
1995	Clearcut	104	451	554	—	—	—
	Selection	745	2,367	3112	849	2,818	3,666
1997	Seed Tree Removal	—	25	25	—	—	—
	Selection	—	16	16	—	—	—
	Shelterwood Removal	—	15	15	0	56	56
2000	Clearcut	—	19	19	—	—	—
	Group Selection	26	73	99	—	—	—
	Selection	—	88	88	—	—	—
	Shelterwood Removal	81	85	166	107	265	371
2001	Selection	459	21	480	—	—	—
	Shelterwood Removal	—	71	71	459	92	551
2003	Group Selection	—	576	576	—	—	—
	Shelterwood Removal	—	12	12	0	588	588
2004	Clearcut	5	17	22	—	—	—
	Group Selection	—	190	190	—	—	—
	Shelterwood Removal	293	453	747	298	660	958
2005	Clearcut	0	1	1	—	—	—
	Commercial Thin	—	63	63	—	—	—
	Group Selection	0	430	430	—	—	—
	Sanitation Salvage	—	15	15	—	—	—
	Selection	1	59	60	—	—	—
	Shelterwood Removal	0	11	11	2	579	580
2006	Group Selection	7	723	730	7	723	730
2008	Clearcut	—	73	73	—	—	—
	Group Selection	72	634	707	—	—	—
	Rehabilitation	—	76	76	—	—	—
	Sanitation Salvage	—	68	68	—	—	—
	Seed Tree Removal	—	14	14	—	—	—
	Selection	64	51	115	—	—	—
	Shelterwood Removal	55	107	161	190	1,023	1,213
Grand Total		**2,106**	**7,699**	**9,805**	**2,106**	**7,699**	**9,805**

Appendix G

Sugarberry Project Maps

Appendix G
Sugarberry Project Maps

- Sugarberry Project Alternative B Treatment Units Map
- Sugarberry Project Alternative C and G Treatment Units Map
- Sugarberry Roads Treatment, Aquatic and Riparian Ecosystem Restoration Map 1 of 2
- Sugarberry Roads Treatment, Aquatic and Riparian Ecosystem Restoration Map 2 of 2
- Sugarberry Project Flame Length by Alternatives Map
- Sugarberry Project Fire Type by Alternatives Map
- Planned and Proposed Projects on the Feather River Ranger District Map
- Sugarberry Project Vegatation, Fire and Fuels Analysis Boundary Map
- Sugarberry Project Alternative G Units and DFPZ Boundaries
- Sugarberrry Project Alternative G Roads


Plumas National Forest
Feather River Ranger District
Sugarberry Alternative B
Treatment Units
Aspen
Hand Cut Pile Burn
Hand Cut and Tractor Pile
Hand Cut and Tractor Pile, groups
ITS, groups
Mastication
Mastication, UB, groups
Mastication, groups
Thin, UB, groups
Thin, groups
Thin, mastication, groups
UB
UB, groups
Group Areas
oak enhancement
Sugarberry Project Boundary
Other Ownership Lands
Communities
All Lines are Approximate
La Porte
American House
Howland Flat
Scales
Slate Creek
Canyon Creek
North Yuba River
T 22 N
T 21 N
T 20 N
T 19 N
R8E
R9E
R10E
N
0 1 2
Miles
1:100,000
Plumas National Forest
Susanville
Mt. Hough RD
Beckwourth RD
Quincy
Feather River RD
Oroville
Sugarberry Project Area
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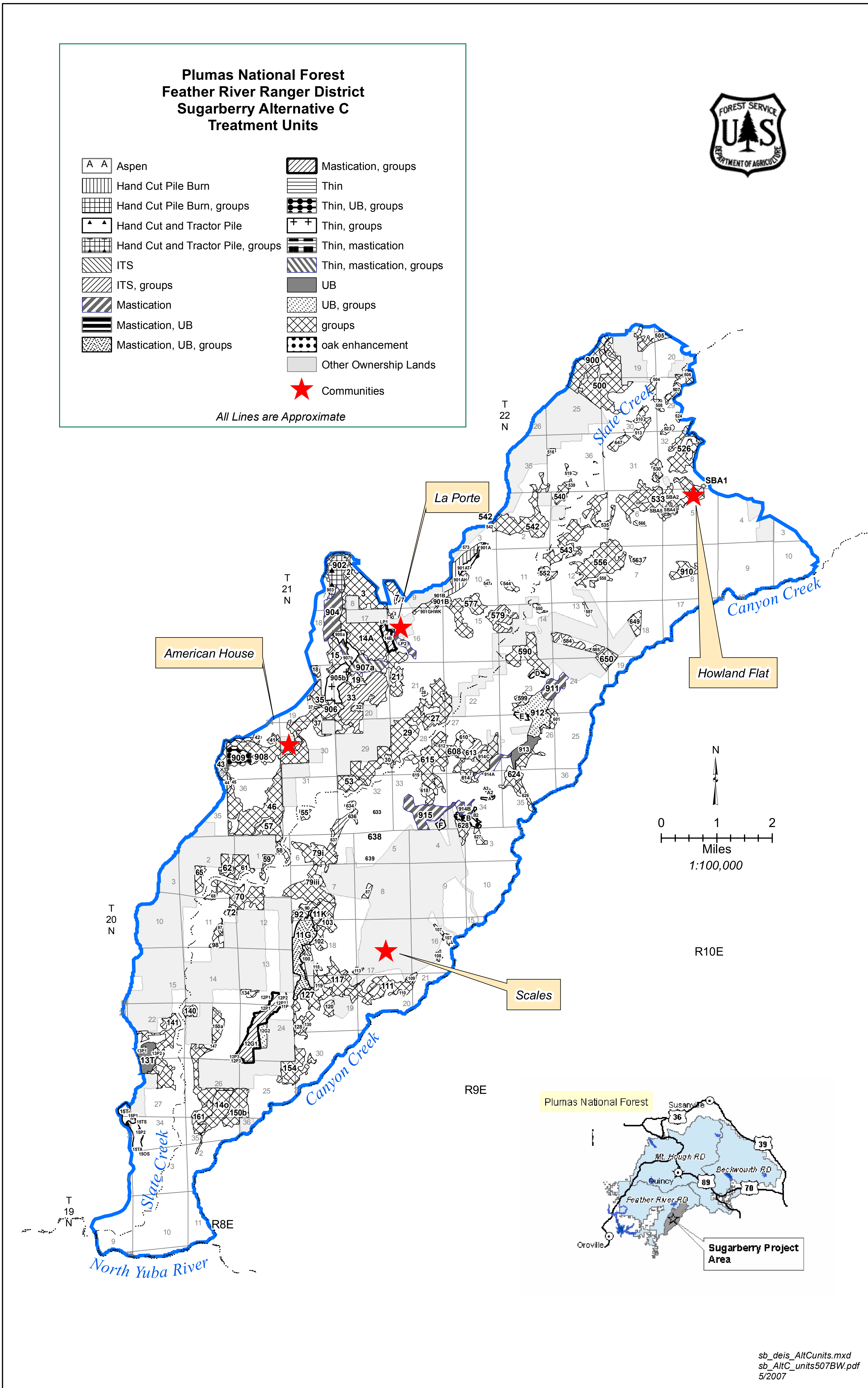
Plumas National Forest
Feather River Ranger District
Sugarberry Alternative C
Treatment Units
Aspen
Hand Cut Pile Burn
Hand Cut Pile Burn, groups
Hand Cut and Tractor Pile
Hand Cut and Tractor Pile, groups
ITS
ITS, groups
Mastication
Mastication, UB
Mastication, UB, groups
Mastication, groups
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UB
UB, groups
groups
oak enhancement
Other Ownership Lands
Communities
All Lines are Approximate
La Porte
American House
Howland Flat
Scales
Slate Creek
Canyon Creek
North Yuba River
T 22 N
T 21 N
T 20 N
T 19 N
R8E
R9E
R10E
N
0 1 2
Miles
1:100,000
Plumas National Forest
Susanville
Quincy
Oroville
Mt. Hough RD
Beckwourth RD
Feather River RD
Sugarberry Project Area
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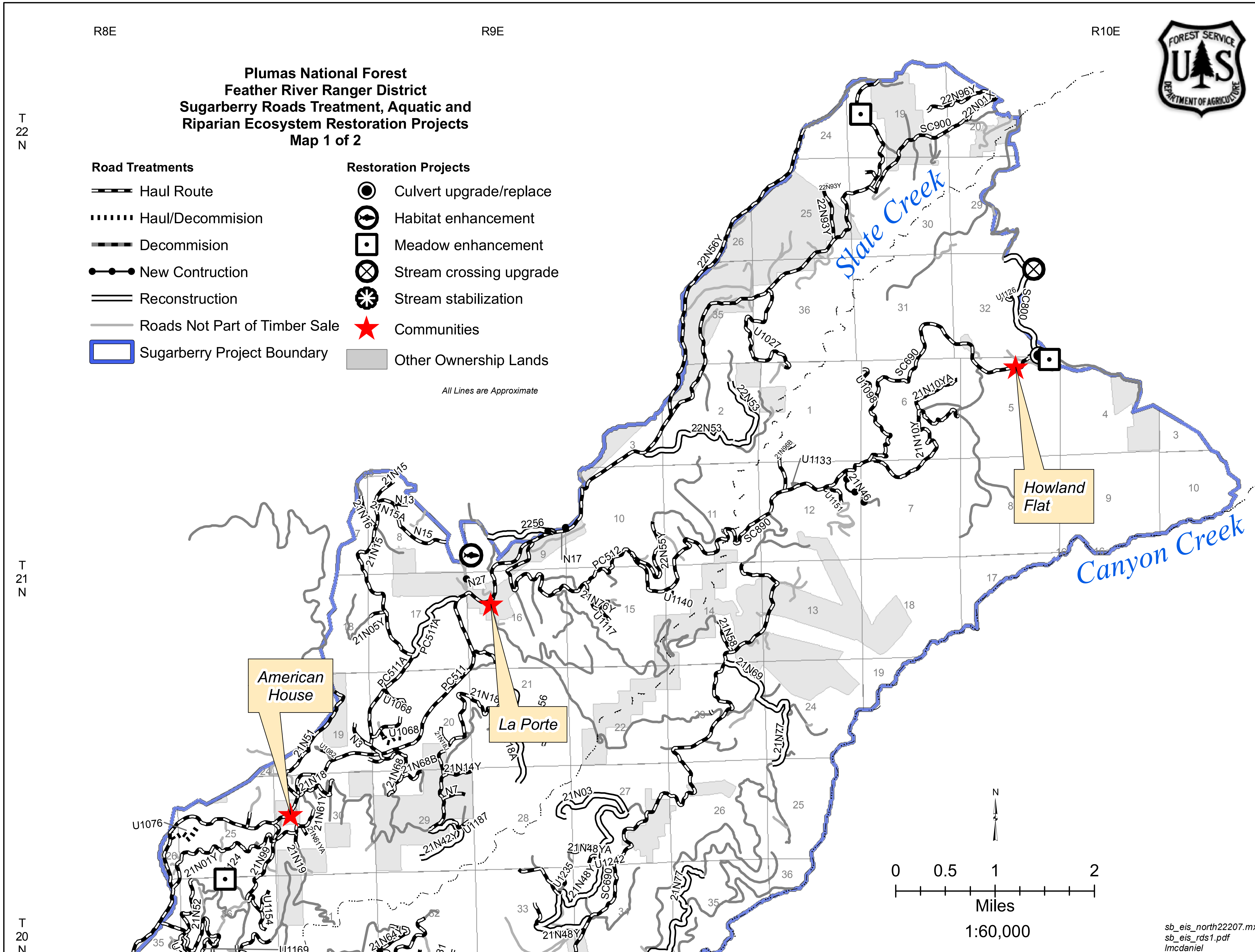
5/2007



Plumas National Forest
Feather River Ranger District
Sugarberry Roads Treatment, Aquatic and
Riparian Ecosystem Restoration Projects
Map 1 of 2
Road Treatments
Haul Route
Haul/Decommision
Decommision
New Contruction
Reconstruction
Roads Not Part of Timber Sale
Sugarberry Project Boundary
Restoration Projects
Culvert upgrade/replace
Habitat enhancement
Meadow enhancement
Stream crossing upgrade
Stream stabilization
Communities
Other Ownership Lands
All Lines are Approximate
R8E
R9E
R10E
T 22 N
T 21 N
T 20 N
American House
La Porte
Howland Flat
Slate Creek
Canyon Creek
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sb_eis_north22207.mxd
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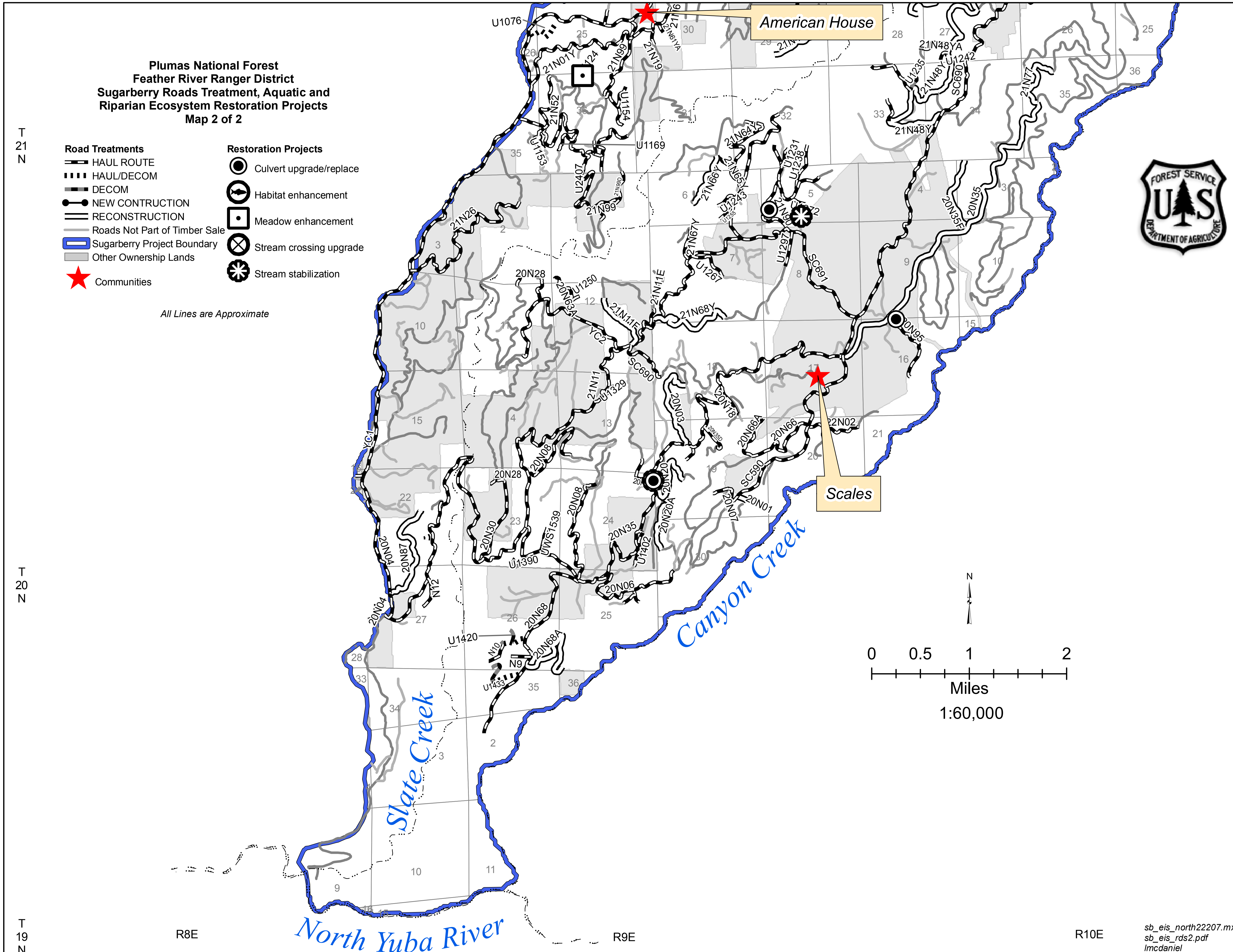
lmcdaniel


Plumas National Forest
Feather River Ranger District
Sugarberry Roads Treatment, Aquatic and
Riparian Ecosystem Restoration Projects
Map 2 of 2
Road Treatments
HAUL ROUTE
HAUL/DECOM
DECOM
NEW CONTRUCTION
RECONSTRUCTION
Roads Not Part of Timber Sale
Sugarberry Project Boundary
Other Ownership Lands
Communities
Restoration Projects
Culvert upgrade/replace
Habitat enhancement
Meadow enhancement
Stream crossing upgrade
Stream stabilization
All Lines are Approximate
American House
Scales
Canyon Creek
Slate Creek
North Yuba River
T 21 N
T 20 N
T 19 N
R8E
R9E
R10E
0 0.5 1 2
Miles
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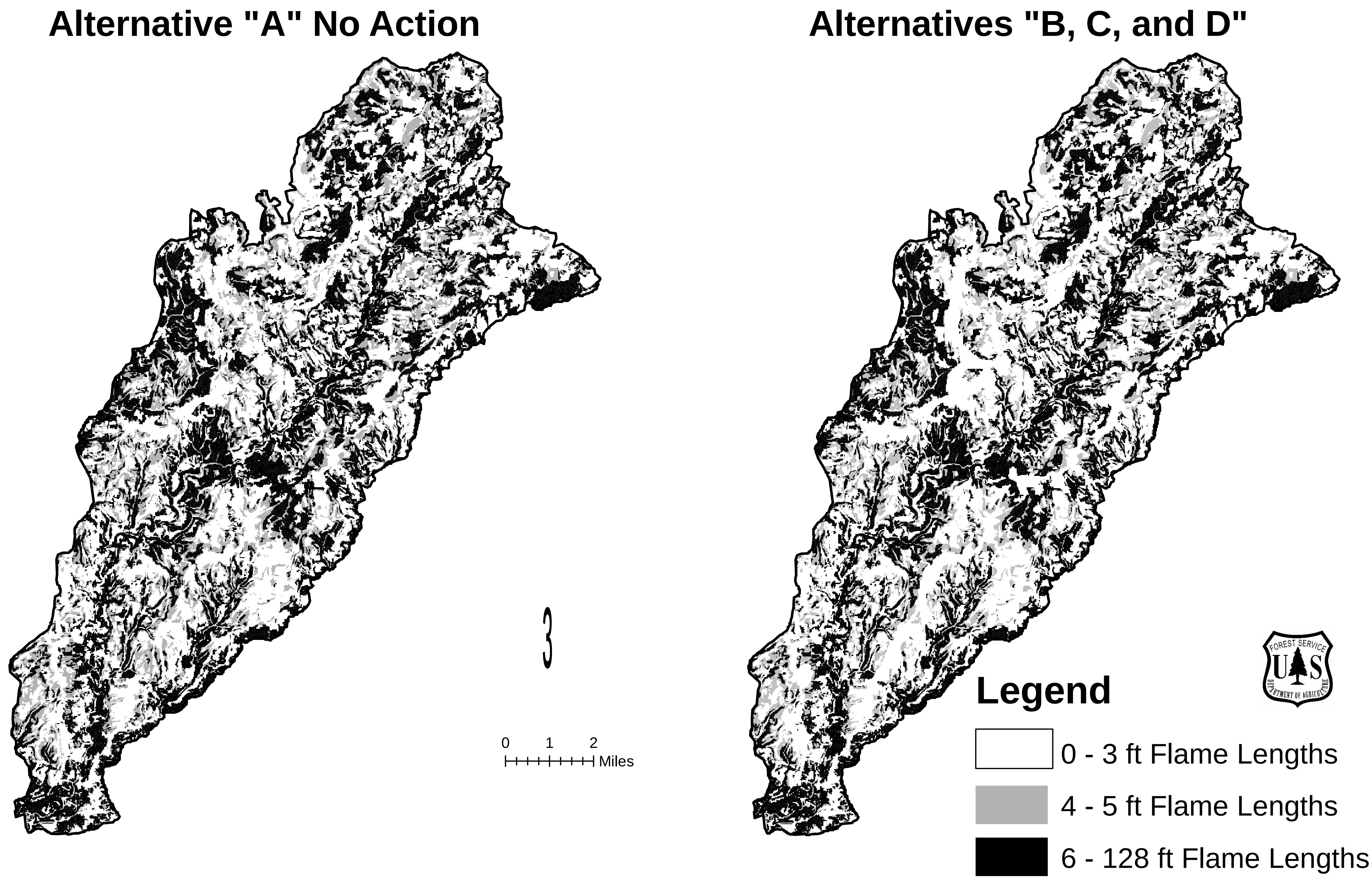
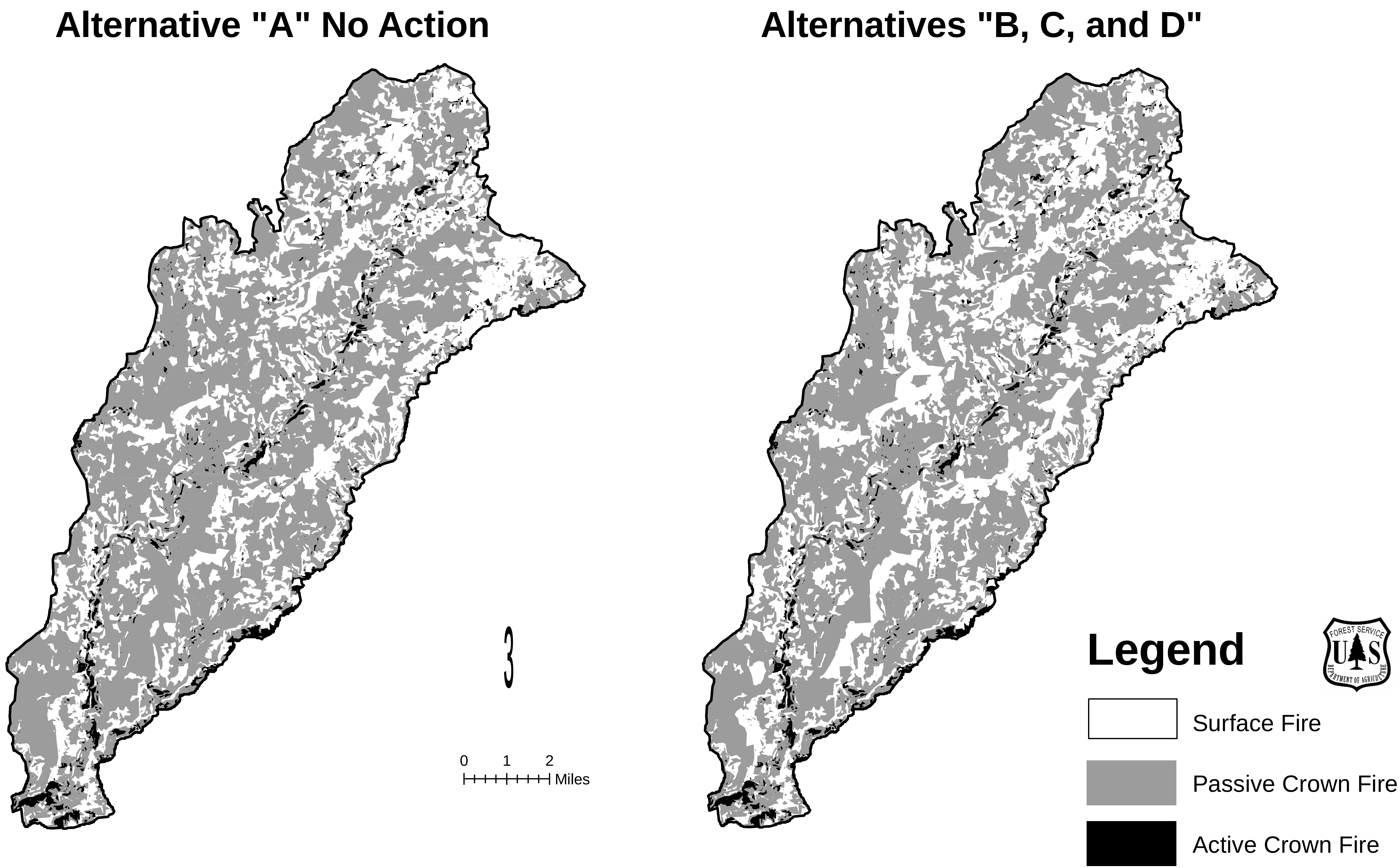
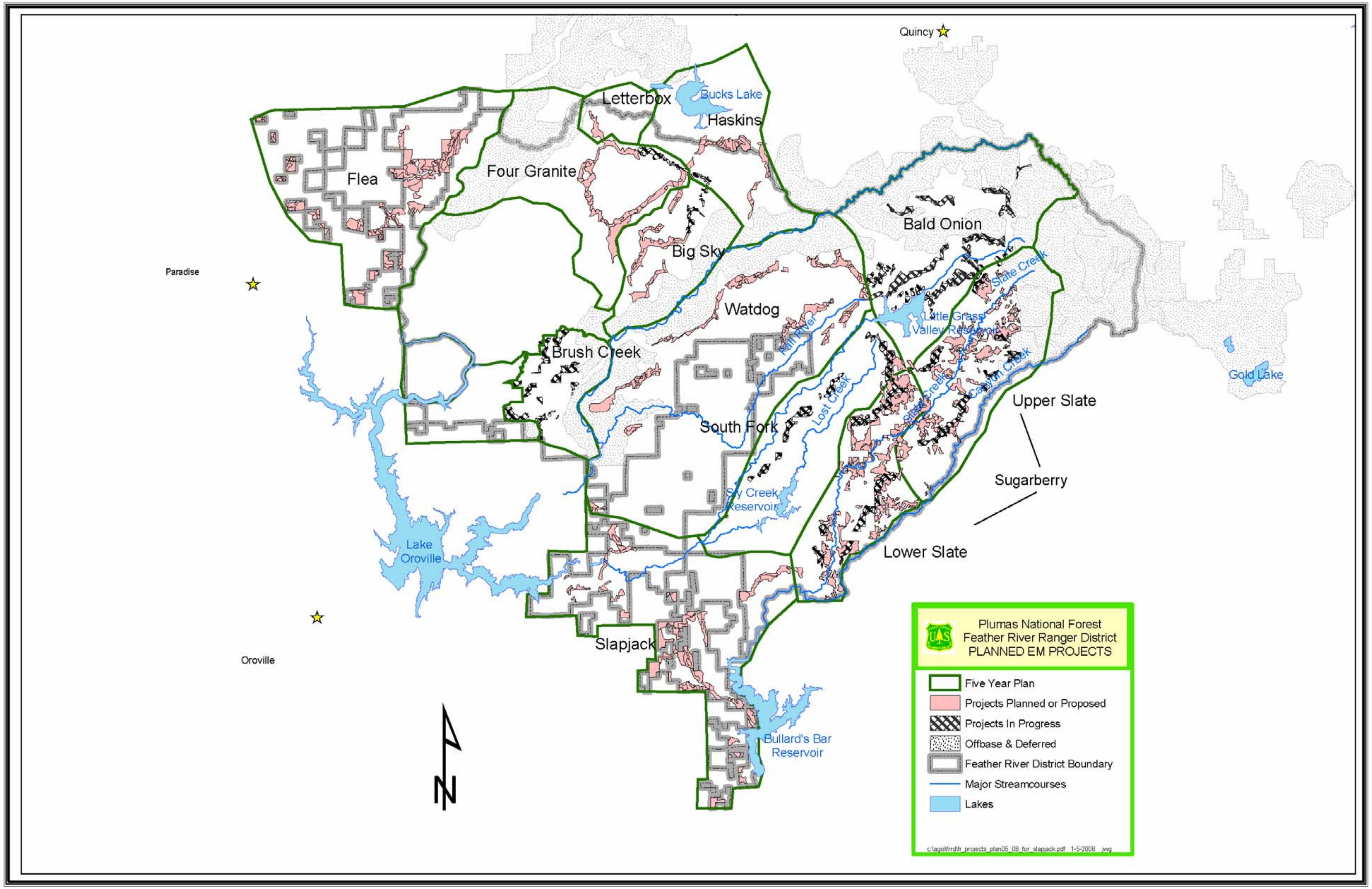
sb_eis_rds2.pdf
lmcdaniel

Flame Lengths by Alternatives

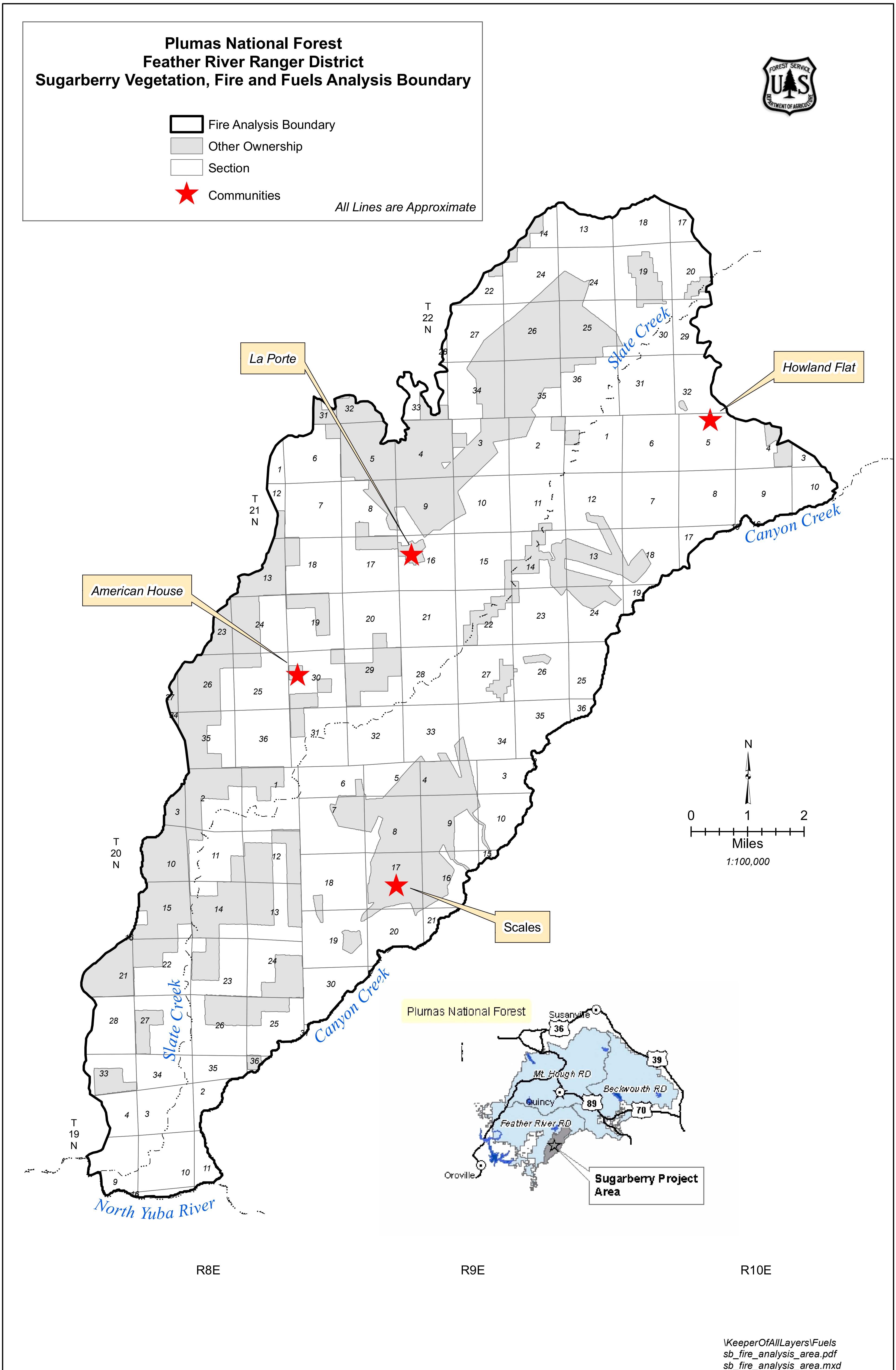


Fire Type by Alternatives





Appendix G-6. Planned and proposed projects on the Feather River Ranger District.



Plumas National Forest
Feather River Ranger District
Sugarberry Vegetation, Fire and Fuels Analysis Boundary
Fire Analysis Boundary
Other Ownership
Section
Communities
All Lines are Approximate
La Porte
Howland Flat
American House
Scales
Slate Creek
Canyon Creek
North Yuba River
T 22 N
T 21 N
T 20 N
T 19 N
R8E
R9E
R10E
N
0 1 2
Miles
1:100,000
Plumas National Forest
Susanville
Mt. Hough RD
Beckwourth RD
Quincy
Feather River RD
Oroville
Sugarberry Project Area
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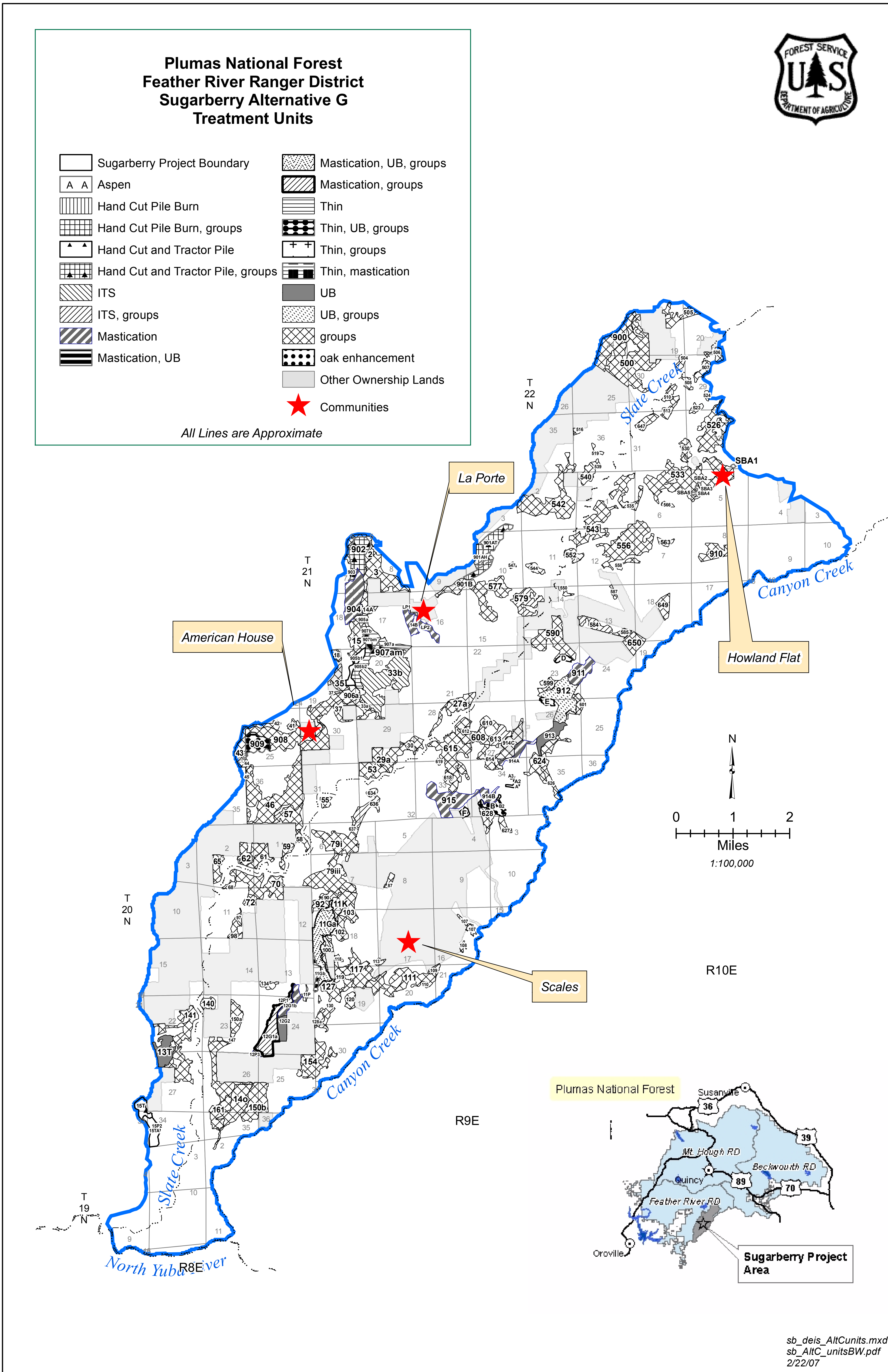

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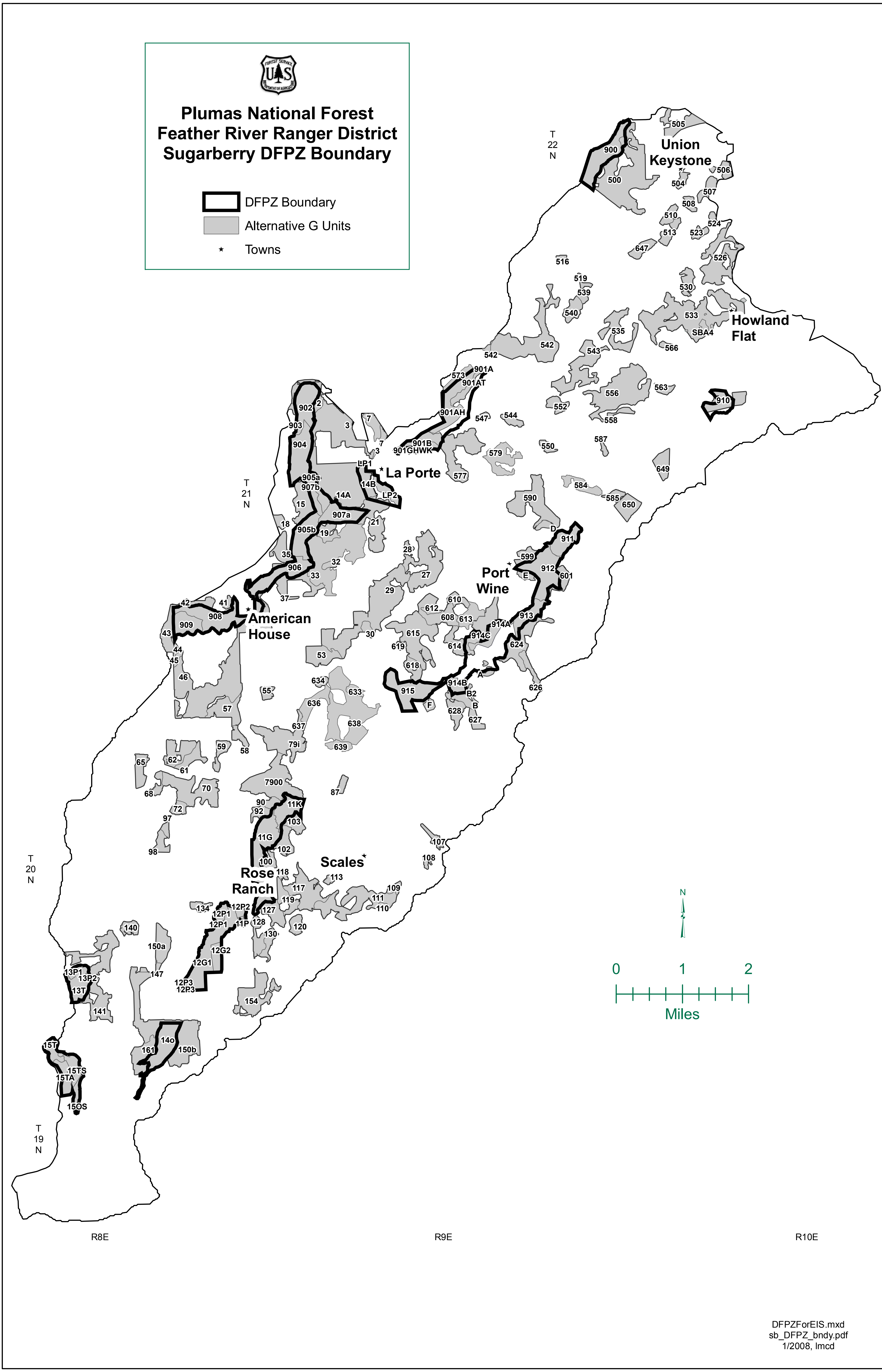
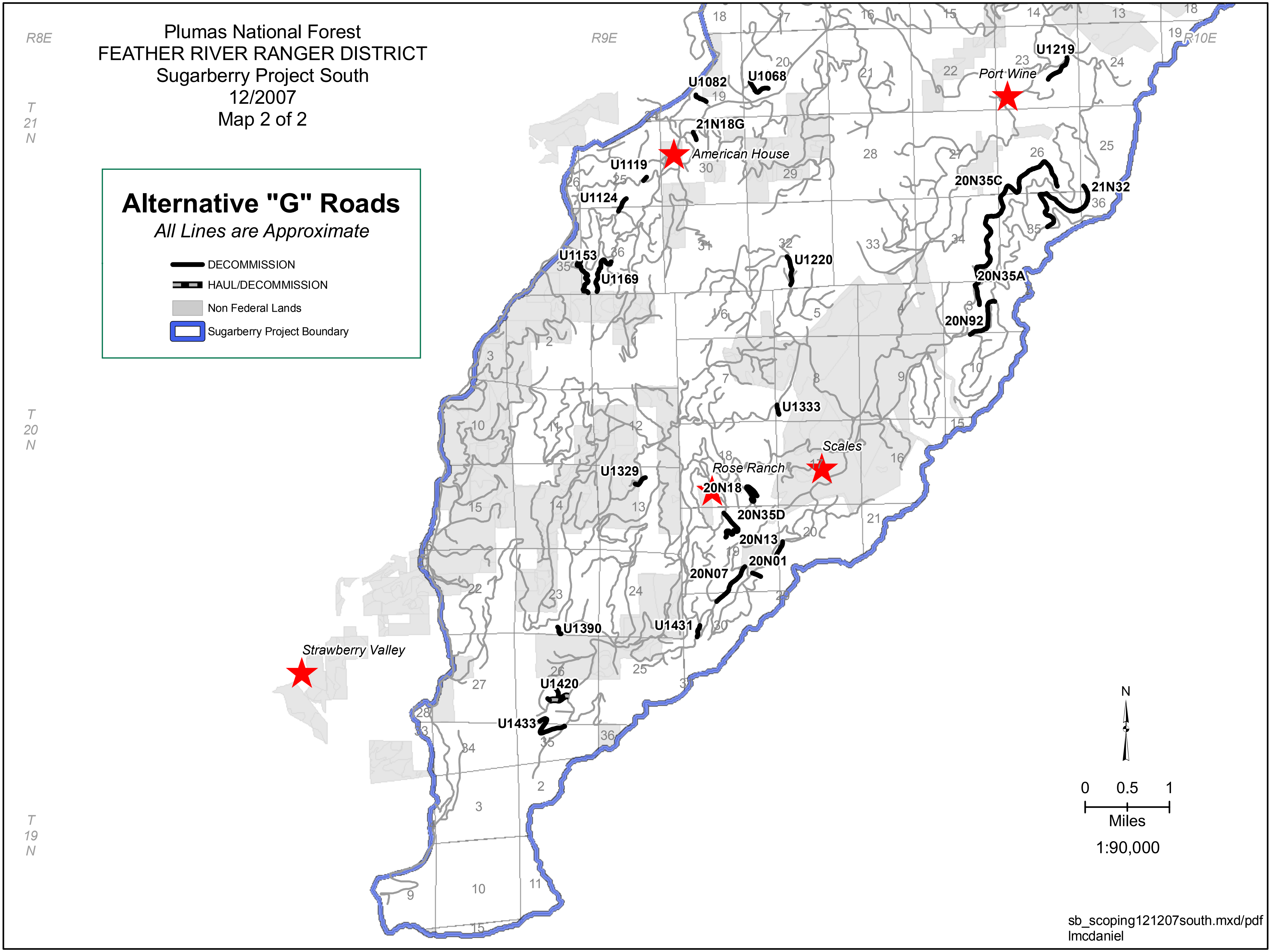


Plumas National Forest
Feather River Ranger District
Sugarberry DFPZ Boundary
DFPZ Boundary
Alternative G Units
Towns
Union Keystone
Howland Flat
La Porte
Port Wine
American House
Scales
Rose Ranch
T 22 N
T 21 N
T 20 N
T 19 N
R8E
R9E
R10E
N
0
1
2
Miles
DFPZForEIS.mxd
sb_DFPZ_bndy.pdf
1/2008, lmcd

Plumas National Forest
FEATHER RIVER RANGER DISTRICT
Sugarberry Project South
12/2007
Map 2 of 2



Appendix H

Response to Comments

On the Draft EIS

Appendix H

Response to Comments on the Sugarberry Project Draft Environmental Impact Statement

The Council on Environmental Quality (CEQ) regulation 40 CFR 1503.4 states that an agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively. The agency shall respond by one or more of the following means:

1. Modify alternatives
2. Develop and evaluate alternatives not previously given serious consideration
3. Supplement, improve, or modify its analyses
4. Make factual corrections
5. Explain why the comments do not warrant further agency response.

All substantive comments received on the draft should be attached to the final statement.

Comment Coding Structure

As the comment letters were received, each was assigned a number for tracking purposes:

Letter Number	Commenter
1, 3, 4, 5, 6, 7	Sierra Forest Legacy
8	Chad Hanson, John Muir Project
9	Ken Wilde, Sierra Pacific Industries
10	Laura Fujii, Environmental Protection Agency
11	Frank Stewart, Counties' QLG Forester

Comments from each letter were then sorted by **subject** (or resource area, e.g., Fuels) and then by **category** (e.g., DFPZs).

Master code list:

Subject	Subject Code	Category	Category Code	Definition
Wildlife	WILD	General	100	General comment
		TES	101	Specific to TES
		Forest carnivores	102	Specific to forest carnivores
		MIS/Neotropical	103	Specific to MIS/Neotropical
Hydrology	HYDRO	General	200	General comment
		RHCA- Riparian areas	201	Specific to RHCAs – riparian areas
Cultural	CULT	General	300	General comment
		Treaty rights	301	Specific to treaty rights
Botany	BOT	General	400	General comment
		Noxious weeds	401	Specific to noxious weeds
		TES	402	Specific to TES
Planning	PLAN	General	500	General comment
		NFMA/Forest Plan	501	Specific to Forest Plan
		NEPA	502	Specific to NEPA process
		HFQLG	503	Specific to HFQLG Act
Timber	TM	General	600	General comment
		Canopy cover	601	Specific to canopy cover
		Group selection	602	Specific to group selection
Fire/Fuels	FUEL	General	700	General comment
		DFPZ	701	Specific to DFPZs
		Air quality	702	Specific to air quality
Scenery	VIEW	General	800	General comment
Other	OTHER	General	900	General comment
		Transportation	901	Specific to transportation
		Social/economic	902	Specific to economics/social
		Recreation	903	Specific to recreation
		Soils	904	Specific to soils

The comments were numbered sequentially from the beginning of the letter. Each code has the following format:

subject code - category code - letter # - comment #

EXAMPLE:

Comment: EPA recommends that the cumulative impact [of all action alternatives to noxious weed invasion], which the DEIS identified as moderate, be mitigated by reducing the acreage of group selection units, where these species will likely become established.

Code: BOT-401-5 -68

Comments were taken from the letters verbatim.

Coded comment letters are available upon request.

Responding to Comments

Comments that expressed similar concerns were grouped together as follows:

Subject Code corresponds to the main resource area that the comment refers to.

Category Code is more specific, sorting the comment based on different categories within the resource area.

Summary of Concern: Comments were grouped together whenever possible.

Response: Responses are listed in table 1. Comment letters follow the table.

Table 1. Comments and Responses.

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL	700	There is, however, no discussion in the soils report or the DEIS that identifies the need to maintain low levels of large down logs to achieve the fuel objectives.	1-62	See response to comment letter number 1-60 (OTHER, 904).
FUEL	700	The analysis of fire and fuels issues in the DEIS is fundamentally flawed by its failure to consider a wider range of logging prescriptions that could achieve the project's fuels reduction goals.	1-109	The DEIS considered two less intensive logging alternatives D and E including several variations of E but eliminated them from detailed study as they did not meet the purpose and need of the Sugarberry project. (DEIS Sections 2.5.2.1 and 2.5.2.2)
FUEL	700	The DEIS fails to acknowledge, discuss, and respond to a broad array of scientific information and opinion indicating that the agency's fuels reduction goals can be met while maintaining higher canopy cover (e.g., 50 percent) and utilizing a lower logging diameter limit (e.g., 20 inches). Instead, the EIS only considers one set of logging prescriptions, which are embedded in the two action alternatives. In this way, the EIS establishes a false dichotomy of "doing the project" or "doing nothing."	1-110	Many studies examining empirical information from past fires indicate that crown fire propagation is dependent on the abundance and horizontal continuity of canopy fuels. Omi and Martinson (2002) concluded that "a reduction in crown fuels outweighs any increase in surface fire hazard." Graham and others (2004) highlight that "the continuity and density of tree canopies in combination with wind and physical setting provide the conditions required for rapidly moving fires that typically consume the crowns of large forest areas." The Sugarberry project has identified the need to decrease the number of trees per acre, thereby increasing the crown spacing and canopy base height of residual trees to decrease the probability of crown fire activity (DEIS 1-4). The DEIS fire and fuels analysis for the Sugarberry project shows that decreasing surface fuel loading, increasing crown base height by removing ladder fuels, and reducing canopy cover result in decreased intensity of fire behavior. Although scientific literature states that more research is needed to fully understand the long-term impacts of thinning in the Sierra Nevada and that not one treatment across the landscape is an appropriate fix to high fuel loading and dense conifer stands, there is agreement that thinning from below of small diameter trees and reduction of

Subject Code	Category Code	Comment	Comment Letter Number	Response
				surface fuels could help reduce the fire hazard in the Sierra Nevada (Christensen 2002 and Weatherspoon 1996).
FUEL	700		1-110	Action alternatives meet the direction of the SNFPA ROD, including full implementation of HFQLG FEIS. The canopy cover across Sugarberry is comprised primarily of CWHR 4M (40-59 % canopy cover) and 4D (60-80% canopy cover), with varying degrees of overlapping in canopy layers. Thinning involves the cutting of some dominant and co-dominant conifers remove both large tree structure and canopy cover. Under Alternatives B and C, post-thinning canopy cover is 40 to 50 percent. Note* The CWHR percentages reported do not reflect the canopy cover in protected areas, such as for the California spotted owl or Northern goshawk, which is typically above 70 percent canopy.
FUEL	700	There is substantial evidence indicating that it is not necessary to reduce canopy cover to 40 percent or to remove trees up to 30” dbh, as proposed in the Sugarberry project, to reduce the risk of catastrophic wildfire.	1-112	See response to comment letter 8-3. The limit of 30 inches is the maximum diameter of tree which can be removed as specified on page 68, Table 2 Standards and guidelines applicable to the HFQLG Pilot Project Area for the life of the pilot project, of the 2004 SNFPA ROD. The upper diameter limit is not a prescription and all trees up to 30 inches dbh will not be removed. There are multiple reasons for removing trees up to 30 inches in diameter such as forest health, fire suppression and fire fighter safety. Section 3.3.6.1, p. 3-32 explains, trees greater than 20 inches in diameter may be removed in Alternative B and C when diseased, suppressed, and competing with larger trees or when contributing to undesirable canopy fuels. Section 3.3.6.2, p 3-41 discusses the benefits of reduced canopy cover for both ground and aerial suppression resources. Page 3-42 of section 3.3.6.2 states that the removal of trees will allow for safer locations to establish control and safety zones for firefighters. Stephens and Moghaddas, (2005a) indicate that removing crown fuels, without removing biomass and excessive surface fuels will not substantially modify potential fire severity. Within all active

Subject Code	Category Code	Comment	Comment Letter Number	Response
				un-even age methods in Stephens and Moghaddas, (2005a), all live and dead biomass (trees <10 inch DBH) was left standing and all limbs and tops were lopped, scattered, and left on site with no follow up fuels treatment (J. Moghaddas, personal communication, 11/7/2005). In contrast, the Sugarberry project proposes to thin stands from below, remove biomass, and implement prescribed burning for fuel treatments while retaining the "healthiest, largest, and tallest conifers" to make up the residual canopy. This mechanical plus fire approach was documented to be the most effective treatment to modify potential fire behavior and severity in the Stephen and Moghaddas, (2005b) cited by the commenter. In addition, this treatment incorporates three principles of fire resistance (reduce surface fuels, increase height to live crown, decrease crown density, while retaining the largest trees in the stand) described by Agee et al (1999).
FUEL	700	The DEIS asserts that intensive mechanical thinning up to 30" dbh is necessary to reduce potential for severe fire. However, recent scientific studies have found that precommercial thinning of sapling and pole-sized trees only (up to 8-10 inches in diameter) effectively reduces fire severity.	8-3	See response to comment letter 1-112. The DEIS states on pg. 3-32 that trees up to 30 inches may be removed for operability, however most trees removed will be less than 20 inches in diameter. The DEIS further states that trees greater than 20 inches in diameter may be removed in Alternatives B and C when diseased, suppressed, competing with larger trees or when contributing to undesirable canopy fuels. The Sugarberry project is designed and developed to meet multiple objectives that include fuel reduction and forest health, as well as to provide better access to and a safe area for firefighters to take action against wildfires. Treatments within the project are designed to address reduction of surface fuels, increasing the height to live crown, decreasing crown density and to retain the largest fire resistant trees (DEIS 1-4, 1-5, 2-4, 2-5, 3-41).
FUEL	700	Why is it necessary to remove trees up to 30" dbh, as you propose?	8-4	See response to comment letters 1-112, and 8-3.

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL TM	700 600	The DEIS assumes that mechanical thinning, as you propose, will reduce, rather than increase, potential for severe fire. There is ample evidence to contradict this.	8-5	The potential changes in microclimate as a result of thinning are discussed in the DEIS on page 3-40. The DEIS states that information from various authors indicates that when all potential fuel treatments are considered together, the effects of changes to microclimate condition are mitigated. While generalization of the effects of thinning on fire severity are difficult to apply on a broad scale due to variability in weather, physical settings and forest fuels, thinning followed by prescribed fire, piling and burning, or other treatments significantly reduced fire intensity and/ severity (Alexander and Yancik 1977, Hirsh and Pengelly 1999, Graham, and others 1999). Treatment efficacy may also vary depending on the degree of treatment and follow-up surface fuel manipulation. Many studies examining empirical information from past fires indicate that the use of prescribed burning, hand piling or tractor piling following thinning are effective in reducing crown fire ignition and fire severity (Omi and Martinson, 2002, Graham and others, 2004). The fire and fuels analysis shows that decreasing surface fuel loading, increasing crown base height by removing ladder fuels, and reducing canopy cover result in decreased intensity of fire behavior. Although scientific literature states that more research is needed to fully understand the long-term impacts of thinning in the Sierra Nevada and that not one treatment across the landscape is an appropriate fix to high fuel loading and dense conifer stands, there is agreement that thinning from below of small diameter trees and reduction of surface fuels could help reduce the fire hazard in the Sierra Nevada (Christensen 2002 and Weatherspoon 1996). The difference in thinning treatments planned for the Sugarberry project and those referred to in the Biscuit Fire by the commenter is the handling of activity fuels. The activity fuels were minimally treated on two of three plots analyzed in the Biscuit fire by Raymond and Peterson, 2005. Raymond and Peterson

Subject Code	Category Code	Comment	Comment Letter Number	Response
				suggest removal of post thinning slash just as the Sugarberry project prescribes. In the Hanson and Odion, 2006 reference it doesn't appear that the activity fuels were removed as is proposed in the Sugarberry project. The Sugarberry project also prescribes follow-up understory burns on treatment units that do not meet the fuel loading desired condition of 0-3 inch diameter material less than 5 tons per acre (see Section2.2.2.1 p. 2-5). Negative effects on fire behavior that can result from opening canopy cover are discussed on page 3-40 and 3-46 of the Vegetation and Fire and Fuels section of the Sugarberry DEIS.
FUEL TM	700 600	You have not analyzed, or adequately analyzed, this type of evidence from actual wildland fires burning through areas mechanically thinned. Instead, your documents make assumptions or rely upon modeling results, which are based upon assumptions that may not reflect actual real-world fire behavior. Increased fire severity could result from: a) increased mid-flame windspeeds due to a reduction in the buffering effect of mature tree boles; b) slash debris (even if you make efforts to reduce slash, this is never totally effective, and much slash remains—enough to perhaps increase overall surface fuels relative to current levels, which the current analysis does not adequately discuss); c) accelerated brush growth due to increased sun exposure; and d) desiccation of surface fuels due to increased sun and wind exposure.	8-6	See response to comment letter 8-5

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL TM	700 600	Any increase in fire severity resulting from mechanical thinning will be particularly problematic near human communities or structures—a potential outcome which the current analysis does not adequately discuss or analyze. Such an increase in fire hazard post-thinning could come immediately, due to slash debris and increased mid-flame windspeeds, or it could come shortly after slash removal, due to accelerated brush regrowth. Please describe in detail in the final document when exactly slash debris would be piled and burned following thinning, and what will be the potential adverse impacts on human health and safety if a fire occurs after thinning but prior to piling/burning or broadcast burning?	8-7	The effects of mechanical thinning are discussed on pages 3-32 through 3-42 in the DEIS. Page 3-40 of the DEIS specifically addresses the effects of fuel treatments on the microclimate. The DEIS states that information from various authors indicates that when all potential fuel treatments are considered together, the effects of changes to microclimate condition are mitigated. In addition, mechanized thinning may utilize whole tree yarding which effectively reduces the need for post-project slash pile fuels treatment (DEIS, 2-5). Where necessary pile burning would be used to treat residual slash, pre-existing fuels and shrubs. See DEIS, Appendix E for any mitigation measures for slash debris piling. It is impossible to give exact times and dates when slash debris would be piled and burned on a multi-year project such as Sugarberry. In accordance with C provision 6.7, slash must be treated (piled, chipped or masticated) within six weeks of cutting during the period between July 1 through September 30, and within eight weeks during the remainder of each year, unless otherwise agreed in writing. Pile burning on the Feather River District usually begins after the first fire season ending storm. Piles are typically burnt the following fall after they are constructed. Impacts on human health and safety if a fire occurs after thinning but prior to piling/burning or prescribed burning should be minimal during the Sugarberry project because of the project design. See appendix E for fire mitigation in harvest units. All contractors are required to have a fire plan in place during operations to minimize the risk of equipment caused fires. The Sugarberry project requires whole tree yarding in some of the thinning and biomass removal units (see Section 2.2.2.1 p. 2-4). Whole tree yarding removes most of the limbs and tree tops from the stand, effectively reducing the need for post-project slash pile fuels treatments. The material from the whole tree yarding would be piled in vegetation cleared landings. Fire activity in the thinning units would decrease between the time of timber operations and pile or understory burning for the following reasons: 1) Removal of activity fuels to landings: 2) The decrease in ladder fuels: 3) The breaking up of horizontal continuity in the surface fuels by skid trails: 4) The increase in crown base height.

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL	700	Fully analyze the potential increased danger to public safety even after slash treatment due to the other effects discussed above which can result in increased fire severity from mechanical thinning (e.g., accelerated brush growth after slash treatment due to canopy reduction, increased midflame windspeeds, desiccation of surface fuels).	8-8	See response to comment letters 8-5, and 8-7.
FUEL TM	700 601	Please explain your proposal of a 30” dbh limit for mechanical thinning, in the context of a fire/fuels management proposal, when no peer-reviewed, published scientific literature recommends such a prescription as being necessary or effective in the context of fire/fuels management?	8-9	See response to comment letters 8-3, and 1-112. During mechanical harvesting and other fuel treatments, it may be necessary to remove trees up to 30 inches dbh for operability. Page 3-32 in the DEIS states that “throughout all treatment units regardless of thinning prescription, trees in the 20 to 30 inch and greater than 30 inch diameter classes would generally be favored for retention.”
FUEL	700	You must fully consider a reasonable range of alternatives, including an alternative with no group selection, a 12” dbh limit in mechanical thinning units (retaining in both cases at least 60% canopy cover in dominant and codominant trees to protect spotted owl populations and other wildlife, and at least 50% canopy cover where existing canopy is between 50% and 60%, and at least 40% where canopy cover is 40-50%).	8-10	Section 2.5 in the DEIS discusses alternatives and variations of alternatives considered.

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL	700	The final analysis and decision documents must include a full comparison of all fire/fuel modeling output results for all of the final alternatives that are fully considered (including the 12” limit alternative described above).	8-11	Need a statement to the effect that all modeling runs are in the project records.
FUEL	701	It is not necessary to remove medium to large diameter trees or alter canopy cover in order to prevent crown fire and other extreme fire behaviors.	1-113	See response to comment letters 1-110, 1-112, and 8-3.
FUEL	701	The goal of reducing catastrophic wildfire and promoting fire resilient forests can be met without logging trees up to 30” diameter or reducing canopy cover to 40 percent or below, as proposed in the Sugarberry project.	1-114	See response to comment letters 1-110, 1-112, and 8-3.
FUEL	702	Provide a description of existing air quality conditions. The DEIS provides a short description of the number of acres of the project in each county and Air Quality Management District. There appears to be little information on existing air quality conditions.	10-20	See the FEIS for additional information on existing air quality conditions in the Sugarberry project area.

Subject Code	Category Code	Comment	Comment Letter Number	Response
FUEL	702	We recommend the FEIS include additional information on existing air quality conditions in the description of Existing Conditions. For instance the FEIS should include information on the nearest monitoring stations, data from these stations, general wind direction, seasonal weather and air quality variations, attainment/non-attainment status with the National Ambient Air Quality Standards, presence of Class I or II sites (e.g., National Parks, wilderness), history of air quality violations, presence of sensitive receptors (schools, hospitals, nursing homes), de minimus levels for general conformity thresholds, and the need for a conformity determination.	10-21	See the FEIS for additional information on existing air quality conditions in the Sugarberry project area.
HYDRO	200	We commend the Forest Service for the proposed road and restoration projects, especially the closure and decommissioning of roads and restoration projects that will reduce sediment sources and benefit fish and aquatic systems.	10-1	Thank you for your comment.
HYDRO	200	We support selection of Alternative C, which would reduce disturbance in sub-watersheds that are over or approaching the Threshold of Concern for Cumulative Watershed Effects.	10-2	Thank you for your comment.

Subject Code	Category Code	Comment	Comment Letter Number	Response
HYDRO	200	We are concerned with the cumulative effects of the project, especially within the context of the Herger-Feinstein Quincy Library Group Forest Recovery Act Pilot Project, the need to address adverse effects of the high-density road system, and potential impacts to late-successional forest species. Based on our review, we have rated the Sugarberry Project as Environmental Concerns – Insufficient Information (EC-2).	10-3	Cumulative effects presented in HFQLG Pilot Project and the SNFPA finial supplemental EIS concluded that habitat changes would not result in the loss of viable California Spotted Owl habitat or other species of concern. In response to this recommendation, we have included Alternative G in the FEIS that proposes to decommission up to 11.5 miles of system roads, in addition to the unclassified roads analyzed for decommissioning in the DEIS.
HYDRO	200	For the Final EIS (FEIS), we urge inclusion of a more detailed cumulative impact analysis; closure and decommissioning of roads with identified resource issues, and evaluation of a modified alternative which would maintain canopy cover and reduce habitat fragmentation. These additional design features would more aggressively address adverse water quality effects of the high-density road system and reduce cumulative impacts to late-successional forest species.	10-4	See response to comment letters 10-3, 10-15, 1-107 (PLAN, 500), and 1-75 (PLAN, 500).

Subject Code	Category Code	Comment	Comment Letter Number	Response
HYDRO	200	Redesign treatments to avoid unstable ground associated with legacy mining to avoid cumulative watershed effects. The DEIS states there are areas of unstable ground associated with legacy mining, such as in the Howland Flat, St. Louis and Pioneer Pit areas, which could be further destabilized by mechanical activity (p. 3-121). Project activities could increase the risk of cumulative watershed effects even with the implementation of Best Management Practices.	10-8	In the project planning phase, we have determined the extent of unstable areas within the Sugarberry project area and the risk of operating on them, and we have minimized that risk by avoiding these areas or by designing project mitigations to prevent destabilizing them (Appendix E of the DEIS). Planning considerations and mitigations, including Best Management Practices, as described in the Sugarberry Hydrology Report.
HYDRO	200	We recommend the Forest Service redesign treatment units to avoid the highly unstable ground associated with legacy mining.	10-9	See response to comment letters 10-8.
HYDRO	200	Close and decommission problem roads as soon as possible.	10-12	See response to comment letters 10-3, and 10-15.
HYDRO	200	We commend the Forest Service for decommissioning 4.7 miles of road and proposing watershed improvement projects (replacement of culverts, meadow restoration) to improve fish passage and stream and meadow conditions.	10-13	Thank you for your comment.

Subject Code	Category Code	Comment	Comment Letter Number	Response
HYDRO	200	Given the high road density and disturbed watersheds, we urge closure and decommissioning of roads with identified resource issues as soon as possible, instead of waiting until completion of the Off-Highway Vehicle (OHV) route designation process. At a minimum, we recommend rapid closure and decommissioning of roads that are unlikely to be designated in the OHV network or are causing significant impacts. The FEIS should describe and commit to a specific schedule for road closure and decommissioning.	10-15	In response to this recommendation, we have included Alternative G in the FEIS that proposes to decommission up to 11.5 miles of system roads, in addition to the unclassified roads analyzed for decommissioning in the DEIS. (See Chapter 2 of the FEIS for alternative descriptions, and for description of the how the Travel Management and OHV route designation process may affect road decommissioning proposals).
HYDRO	200	The FEIS should provide information on road and restoration work being done by local communities and on private land within or adjacent to the Sugarberry Project area. Describe how these projects are integrated into, or complement, the Sugarberry Project objectives.	10-16	Future restoration projects are listed in Appendix F (Future Foreseeable Actions) of the FEIS and Appendix F of the Sugarberry Hydrology Report. The La Porte Pines fuels reduction project is being conducted on National Forest System and private lands adjacent to the Sugarberry Project area, with the cooperation and participation of the Forest Service. Two watershed restoration projects described in the Chapter 2 of the Sugarberry FEIS (Upper Dutch Diggings and Gold Run Dam) may extend onto adjacent private lands, in partnership with the landowners. Also, there is a large mine complex (Gardner's Point/Pioneer Pit) that is located on private land within the Sugarberry project area and is scheduled for cleanup/abatement under Superfund authority.

Subject Code	Category Code	Comment	Comment Letter Number	Response
HYDRO	200	The DEIS states that most of the watershed improvement projects would be accomplished after completion of the timber harvest activities (p. 1-12). We recommend the FEIS provide assurances and enforcement measures to ensure the identified watershed improvements occur.	10-17	The Feather River Ranger District has a documented record of accomplishing watershed restoration and improvement projects. Fiscal year accomplishment reports from 1983 through 2007, and the 2008 Program of Work are available upon request. We have employed a variety of funding sources including appropriated program dollars (HFQLG and national budget allocations), K-V collections and grant funding to accomplish restoration projects, including stand-alone projects and projects associated with comprehensive HFQLG NEPA documents such as the Sugarberry project. The Sugarberry FEIS is a planning document that provides the legal framework for project implementation, and does not guarantee funding availability. Once the project is approved, we will seek funding to complete the watershed restoration projects described in proposed action.
HYDRO	201	Aquatic and Riparian Ecosystem Restoration: What are the individual project costs for each of the restoration activities listed on the two pages?	11-7	The cost estimates have been added to the economic analysis in Appendix D of the FEIS.
OTHER	904	Project induced impacts on another 19 units could increase detrimental compaction up to as much as 29.5% on 1,301 acres. As a result, significant detrimental compaction that exceeds 15% of a unit could be experienced on as many as 1,956 acres (21 units).	1-53	The Forest Plan does not establish a threshold standard for detrimental soil compaction (See section 3.10.2.2 and Section 3.10.6.2 of the DEIS).).
OTHER	904		1-53	The Appendix lists multiple mitigation measures used to reduce the potential increase in detrimental compaction within proposed treatment units. Mitigations include subsoiling, a Limited Operating Period (LOP) for soil moisture content, re-using legacy skid trail, landings, and temporary roads when possible in accordance with Forest Service Handbook (FSH) 2409.15, and limit the quantity of skid trails and landings.

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				Areas to be subsoiled include all landings used, 200 feet of the main skid trail approach to the landing, and all temporary roads. These areas are the most likely to be detrimentally compacted due to proposed mechanical treatments. Additional subsoiling was not proposed because; subsoiling creates loose soil material that is susceptible to erosion (especially on steeper slopes) and risk of root damage to plants. Legacy skid trails that are not used in the Sugarberry Project are not going to be subsoiled. Updates on recent research have been included in the FEIS and Soils Report in regards to the effects of detrimental soil compaction on soil productivity. The current Long Term Soil Productivity study suggests that soil compaction does not affect soil productivity, except in areas with poorly drained or perennially wet soils (unusual occurrence for general forest soils). For more information on cumulative effects to soil porosity, refer Sugarberry Soils Report. An alterative to address the concern of detrimental compaction exceeding a 15 percent threshold has been developed.
OTHER	904	The presumption in the DEIS that subsoiling will be effective in achieving the forest plan standards can not be supported by recent monitoring.	1-54	The HFQLG pilot project studies across the Plumas, Lassen, and Tahoe National Forest have not included monitoring the effectiveness of subsoiling. There is no documentation supporting the statement in the soil analysis form the Freeman Project, which states “monitoring on the Plumas, Lassen and Tahoe has shown this subsoiling to be only 66 percent effective." Review of subsoiling practices has occurred on the Plumas National Forest. It has been determined that the success of subsoiling depends upon factors such as the operator, soil type, soil condition, and slope (Subsoiling Review letter dated June 29, 2006). There is documentation supporting subsoiling is an effective tool for mitigation for increased levels of detrimental soil compaction resulting from timber harvesting activities. For more information refer to the Sugarberry Soils Report.

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OTHER	904	Subsoiling only a portion of the skid trail and landing system leaves skid trails farther than 200 feet from the landing intact and does nothing to remediate legacy skid trails that may not be used in the project.	1-55	See response to comment letter 1-54 and 1-56.
OTHER	904	Subsoiling skid trails and landings as a mitigation measure also does not clearly address the issue that detrimental compaction (i.e. the loss of soil porosity exceeding 10%) presently exists on many of the stands. Since there is no discussion of the location of existing detrimental compaction within a stand, there is nothing to suggest that the areas that might be subsoiled after project implementation are coincident with the same areas suffering from detrimental compaction prior to treatment. Thus, it is not possible to assess if the proposed subsoiling is capable of returning each unit to a state where the applicable standards can be met.	1-56	The Forest Service Region 5 (R5) Soil Management Handbook establishes regional soil quality analysis guidelines and provides threshold values that indicate when changes in soil properties and soil conditions would likely result in a significant change or impairment of the soil productivity potential, hydrologic function, or buffering capacity of the soil. The R5 Soil Management Handbook threshold is a ten percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction. This analysis threshold is for site specific measurements and does define an aerial extent threshold for detrimental compaction of activity areas. For more information see Section 3.10.3.2 of the DEIS and Section 3.2 of the Sugarberry Soils Report). The Plumas National Forest does not have a standard for “loss of soil porosity exceeding 10%” (see Section 3.10.2.2 of the DEIS and Section 2.2 of the Sugarberry Soils Report). The Forest Plan does not establish a threshold standard for detrimental soil compaction (See section 3.10.2.2 and Section 3.10.6.2 of the DEIS). Reviewed as a whole, published studies do not indicate the existence of a general threshold for detrimental compaction that would result in significant impairment of forest soil productivity across a broad spectrum of soil types and geographic locations. Updates on recent research have been included in the FEIS and Soils Report in regards to the effects of detrimental soil compaction on soil productivity. The current Long Term Soil Productivity study suggests that soil compaction does not affect

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				soil productivity, except in areas with poorly drained or perennially wet soils (unusual occurrence for general forest soils). Fore more information on cumulative effects to soil porosity, refer to section 3.10.7.2 of the FEIS and Section 7.2.1.2 of the Sugarberry Soils Report. Project designed mitigation measures were designed to achieve Forest Plan standards for Soil Productivity (Appendix E of the DEIS and Appendix A of the Sugarberry Soils Report). The Appendix lists multiple mitigation measures used to reduce the potential increase in detrimental compaction within proposed treatment units. Mitigations include subsoiling, a Limited Operating Period (LOP) for soil moisture content, re-using legacy skid trail, landings, and temporary roads when possible in accordance with Forest Service Handbook (FSH) 2409.15, and limit the quantity of skid trails and landings. Areas to be subsoiled include all landings used, 200 feet of the main skid trail approach to the landing, and all temporary roads. These areas are the most likely to be detrimentally compacted due to proposed mechanical treatments. Additional subsoiling was not proposed because; subsoiling creates loose soil material that is susceptible to erosion (especially on steeper slopes) and risk of root damage to plants. Legacy skid trails that are not used in the Sugarberry Project are not going to be subsoiled.
OTHER	904	Subsoiling as a mitigation measure to reduce detrimental compaction has a questionable degree of effectiveness, an alternative that limits the post project proportion of detrimental compaction that affects each unit to 15% or less should be developed. Furthermore, significant and avoidable impacts to resources are likely and the extent of this impact has not been adequately disclosed.	1-57	An additional alternative that limits detrimental compaction to 15% in each unit was not developed because Forest Plan Standards and Guides do not establish a detrimental compaction threshold (see response to comment 1-56). Published studies do not indicate the existence of a general threshold for detrimental compaction (such as 15%) that would result in significant impairment of the forest soil productivity across a broad spectrum of soil types and geographic locations. Soil compaction was assessed and mitigation measures were proposed to limit the effects of timber harvesting activities to the soil properties (see response to comments 1-53 through 1-55).

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OTHER	904	The soil compaction impacts for the Sugarberry project when added to the increasing detrimental soil compaction documented for the QLG planning area in three recent Status Reports to Congress (USDA Forest Service 2005, 2006a, and 2007) demonstrates the ongoing and increasing impact to the health of these forests. This also represents a significant violation of regional soil quality standards and could well result in the permanent impairment of the productivity of the land in violation of NFMA 36 CFR § 219.27 (a) (1).	1-59	See response to comment 1-57.
OTHER	904	The report fails to estimate that likely decrease in large wood for all units in the treated area. By applying a decrease of 5 logs per acre to the monitoring data in Table 8 (Ibid., pp. 57-61), it is estimated that an additional 36 units listed in the table may have levels of large logs post treatment that are below the standard.	1-60	The Forest Service Region 5 (R5) Soil Management Handbook establishes regional soil quality analysis guidelines and provides threshold values that indicate when changes in soil properties and soil conditions would likely result in a significant change or impairment of the soil productivity potential, hydrologic function, or buffering capacity of the soil. The R5 Soil Management Handbook recommends large woody material is at least 5 well-distributed logs per acre representing the range of decomposition classes and the amount recommended should consider the fuel management objectives for the area (See Section 3.2 of the Sugarberry Soils Report). The Plumas National Forest does not have a standard of “six logs per acre” in regards to Soil Productivity (see Section 3.10.2.2 of the DEIS and Section 2.2 of the Sugarberry Soils Report). The Forest Plan does not establish a threshold standard and guide for large woody debris in regards to Soil Productivity. (See sections 3.10.2.2 and 3.10.6.2 of the DEIS). The soils analysis disclosed the effects of proposed activities to large woody material. (See section 3.10.7 of the DEIS and Section 7.2.1.3 of the Sugarberry Soils Report). Recently there

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				have been new research presentations by PSW on the importance of large woody material to soil nutrients. The study concludes large woody material is not considered important for nutrient storage or cycling with respect to soils (see Section 7.2.1.3 of the Sugarberry Soils Report). Down wood standards and guides HFQLG projects are listed in Table 2 in the Record of Decision for the 2004 Sierra Nevada Forest Plan Amendment. The standard and guide states "Determine retention levels of down woody material on an individual basis. Within Westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large down wood per acre." Recent research demonstrates that organic carbon and nitrogen concentrations are much higher in decaying wood material than mineral soil and cocludes that large woody material is not considered important for nutrient cycling with respect to soils (personal communication with Robert Powers). However large woody material plays a large role for wildlife habitat (refer to pages 49-50 in Section V Existing Environment of the Sugarberry "Wildlife Biological Evaluation/Biological Assessment for more information).
OTHER	904		1-60	Appendix E of the DEIS includes mitigations for the retention of large down logs from a wildlife perspective.
OTHER	904	Monitoring data was not taken for all of the units in Sugarberry. More than 40 additional units likely will suffer from the same low levels of large logs post treatment since they have similar conditions. The soils analysis does not disclose this or consider the effect that this condition might have on soil quality and productivity.	1-61	See response to comment letter 1-60.

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OTHER	904	Most of the units in the project are group selection units that target the removal of trees 20-29.9" in diameter – the very trees that could provide recruitment for low large down wood levels.	1-63	See response to comment letter 1-60.
OTHER	904	Contrary to the notion that large log levels "need" to be adjusted downward to achieve the fuel objectives, the soils report identifies mitigation measures that attempt to reduce the loss of large wood.	1-64	See response to comment letter 1-60.
OTHER	904	The regional standards allow for changes in the thresholds when such physical characteristics do not allow achievement of the fuels treatments. They do not allow for waiving of the standards due to the operational challenges of protecting large logs. The DEIS should correct the analysis to reflect this difference.	1-65	See response to comment letter 1-60.
OTHER	904	Mitigation measures that assure the conservation of existing large down wood should be adopted for the project.	1-66	See response to comment letter 1-60.
OTHER	904	The DEIS should also develop an alternative that reduce the impacts to large wood by either avoiding areas where levels are already low or felling and leaving in place large wood to meet the standard.	1-67	See response to comment letter 1-60.
PLAN	500	As demonstrated in our appeal of the 2004 ROD and FSEIS (SNFPC et al. 2004), both the 2004 plan and the FSEIS fail to comply with the National Forest Management Act, the National	1-1	Sugarberry Project analysis was designed to comply with the Record of Decision (ROD) for the 2004 SNFPA Final Supplemental Environmental Impact Statement (FSEIS) and the 1988 Plumas National Forest Land and Resource Management Plan as amended by HFQLG 1999 FEIS and ROD, and 2003

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		Environmental Policy Act, and other environmental laws. Therefore, for the programmatic reasons set forth in our appeal of the 2004 ROD and FSEIS, the Sugarberry project is also contrary to law.		FSEIS and ROD. Decisions were made to meet the legal requirements of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project (1998).
PLAN	500	To comply with NEPA, an EIS must discuss the environmental impacts of past, present, and proposed logging; a mere listing of projects and acreage, in the absence of specific analysis of the environmental impacts of the projects, is inadequate.	1-69	Past, present, and foreseeable actions within the Sugarberry analysis area are listed in Appendix F of the Sugarberry DEIS. The size of the analysis area incorporating past, present and foreseeable actions as well as analysis of the effects of time, type, place, and scale of the actions varies by resource. Analysis of the environmental effects of these actions on resources is documented in Chapter 3 of the DEIS.
PLAN	500	The EIS must include “discussion of the connection between individual harvests and the prior environmental harms from those harvests.”	1-70	See response to comment letters 1-69, and 1-75.
PLAN	500	The EIS also needs to provide “adequate data of the time, type, place, and scale of past timber harvests.”	1-71	See response to comment letters 1-69, and 1-75.
PLAN	500	It is essential that the cumulative effects analysis provide “quantified or detailed information; …general statements about possible effects and some risk do not constitute a hard look.”	1-72	See response to comment letter 1-69.
PLAN	500	The DEIS fails adequately to consider the cumulative impacts of the Sugarberry project together with other past, present, and reasonably foreseeable projects in the area.	1-74	See response to comment letters 1-69, and 1-75.
PLAN	500	The DEIS fails to consider the cumulative impacts of several hazard tree projects	1-75	A list of future foreseeable activities in the Sugarberry cumulative watershed effects analysis area appears in Appendix F

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		that the Forest Service has approved and is considering within and adjacent to the Sugarberry project area, including Tamarack Flat, Mule, American House, Lost Creek, Fowler Peak, and Devil's Gap.		of the FEIS and Appendix F of the Sugarberry Hydrology Report. The Lexington Hill and Devil's Gap hazard tree sales overlap the Sugarberry cumulative watershed effects (CWE) analysis area, and have been added to the CWE analysis for the FEIS as well as these appendices. A number of timber harvest plans on privately owned timberlands within the CWE analysis area, which have been filed since the original analysis for the DEIS, have also been added. Results of the CWE analysis are included in the Sugarberry Hydrology Report.
PLAN	500	At least two of the projects –American House and Devil's Gap – appear to be within unit boundaries for the Sugarberry project. Therefore, the possibility of cumulative effects is substantial.	1-77	See response to comment letter 1-75. Cumulative effects of these projects and others, particularly those mentioned in comment letter 1-75, have been analyzed for the final EIS.
PLAN	500	Of the six projects, only American House is mentioned in the cumulative effects list (BE, p. 102), and the only information provided is that the project involves 79 acres of "sanitation salvage."	1-80	See response to comment letters 1-75, and 1-77. Further analysis will be completed for the final EIS.
PLAN	500	Merely listing the project name and acreage does not constitute an adequate cumulative effects analysis. Moreover, most of the projects are not even listed.	1-81	See response to comment letters 1-69, 1-75, and 1-77. Further analysis will be completed for the final EIS.
PLAN	500	These cumulative effects were also not addressed in the planning files for the approved hazard tree projects.	1-84	Proposed actions such as the hazard tree removal projects discussed by the commenter may be categorically excluded from further analysis and documentation in an EIS or environmental assessment (EA) only if there are no extraordinary circumstances related to the proposed action and if the proposed action is within a category listed in section 31.12 or 31.2 of the FSH.
PLAN	500	We urge that the Sugarberry project and any approved or proposed hazard tree projects in the analysis area be	1-85	See response to comment letters 1-75, 1-77, and 1-84.

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		reconsidered based upon an adequate analysis of cumulative impacts.		
PLAN	500	The BE and DEIS, however, do not consider the site specific effect of the proposed harvest in relation to these private lands and in combination with past logging on national forest land.	1-86	Further analysis will be completed for the final EIS where necessary.
PLAN	500	The DEIS eliminated from detailed study two alternatives that addressed the significant issues that we raised. One of the alternatives also addressed significant issues about risk to spotted owl from the location of groups selection units that was raised in the BE (pp. 172-173). The DEIS's dismissal of these alternatives from detailed consideration is arbitrary.	1-101	See response to comment letter 1-107.
PLAN	500	A project that simply does not produce the amount of timber that the Forest Service seeks is not an adequate reason for dismissing the alternative from detailed consideration.	1-104	See response to comment letter number 1-107.
PLAN	500	In the Sugarberry project, the Forest Service appears committed to avoid evaluating in detail the feasibility of alternatives with less intensive treatments and greater benefit to wildlife. The DEIS should be revised to include Alternatives D and E.	1-107	Alternative D was developed in response to scoping comments, and it is an alternative that would fully implement the 2001 SNFPA ROD. The Sugarberry IDT recommended that this alternative be eliminated from detailed consideration because it would not fully meet the purpose or resolve the need for the project. The basis for the recommendation is in Section 2.5.2.1 of the DEIS. Several modifications of Alternative E were analyzed, specifically to look at how the treatments proposed would affect habitat suitability for the spotted owl, northern goshawk, and carnivores (Section 2.5.2.2 in the DEIS). Three variations of

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				Alternative E were analyzed. All tree variations would have retained 50% canopy across treatment units in the project where existing. The variations of Alternative E were considered, but eliminated from further analysis because it would not fully meet or resolve the need for the project as well as the conclusion of cumulative effects presented in the HFQLG pilot project and assessed in SNFPA final supplemental EIS (this concluded that habitat changes would not result in the loss of viable California spotted owl habitat or other species of concern).
PLAN	500	By failing to acknowledge extensive evidence that fuels reduction goals can be achieved with less intensive logging, and by failing to consider in detail alternatives utilizing less intensive logging, the DEIS falls short of NEPA's requirements.	1-111	See response to comment letters 1-109, 1-110, 1-112, and 8-3 in Subject Code FUEL, Category 700. CEQ regulations for implementing NEPA require the Forest Service 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 Code of Federal Regulations [CFR] 1502.14).
PLAN	500	By failing to address this research and incorporate lower diameter limits into specific alternatives, the Sugarberry DEIS fails to comply with NEPA.	1-115	See response to comment letters 1-111 above and 1-109, 1-110, 1-112, and 8-3 within Subject Code FUEL, Category 700.
PLAN	500	We have identified a number of significant issues for which alternatives to the proposed action should be developed. The issues include: • Degradation of spotted owl habitat from group selection harvest and the high risk posed by these treatments • Existing high road density and the contribution that project activities will make to increasing or maintaining this road density • High levels of detrimental compaction, in violation of the Soil Quality Standards,	1-116	Several variations of Alternative E were developed in response to concerns proposed treatments would alter habitat components for the spotted owl and other sensitive wildlife species. Alternative D was developed to meet fuels objectives and reduce impacts to species such as the spotted owl and marten. Both of these alternatives were eliminated from detailed study. (DEIS section 2.5.2.1 and 2.5.2.2) Alternative H was developed in the FEIS to address the concern of detrimental compaction exceeding a 15 % threshold. See Chapter 2 of the DEIS for alternative descriptions.

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		resulting from group selection harvest • Low levels of large down wood, in violation of the Soil Quality Standards, further reduced by group selection harvest • Reduction of black oak in conflict with the stated purpose and need to enhance this component of the forest • Creation of early seral forest through group selection in a landscape that already has significant early seral and open vegetative conditions. For the reasons stated in our comments, these issues result in significant environmental impacts and in many cases result in violations of NFMA.		The Purpose and Need section (DEIS 1-8) clearly states there is a need to release black oak from competing vegetation in mixed conifer forests and where it exists in pure stands. The competing vegetation consists of both brush and conifers that are crowding young oaks and older more mature oaks. The proposed action addresses this need. Within the Sugarberry Project oak retention will *exceed* current management direction (to retain an average of 25 to 35 square feet basal area per acre of oaks greater than 15 inches dbh (Herger-Feinstien QLG Forest Recovery Act FEIS 2-10)). The DEIS page 3-207 clearly states that oaks greater than 12 inches in diameter will be retained in DFPZ and ITS units, which gives additional protection to oaks in the project area. In addition, black oak has been designated as for retention in both DFPZ and ITS thinning prescriptions, second only to ponderosa pine (DEIS page 3-32). Placement of group selection units have been designed to avoid black oak areas during layout where possible (DEIS 3-16), and oak >12” dbh will be retained in group selection units, where they exist.
PLAN	500		1-116	The Slate Creek Landscape Analysis (1999) indicates that early seral stages (DEIS 1-6) are lacking according to the desired condition. The project area is currently dominated by mid-seral stage stands. Creation of early seral stage stands through group selection will consist of an addition of less than 2 % of the acres within the entire vegetation analysis area.
PLAN	500	The Sugarberry DEIS fails to comply with the National Forest Management Act, the National Environmental Policy Act, and other federal laws. The DEIS should be revised to comply with NEPA, and the revised DEIS should be circulated for additional public comment.	1-117	See response to comment letter 1-1. A revision to a DEIS is required: “If a draft statement is so inadequate as to preclude meaningful analysis, the agency shall prepare and circulate a revised draft of the appropriate portion” (40 CFR 1502.9(a)). The comments on the DEIS will allow us to make the necessary changes to our analysis in the FEIS. The comments received do not warrant a revised DEIS and another comment period.

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PLAN	500	We support the selection of Alternative C as the Preferred Alternative. We would prefer to see Alternative B chosen but the reasons given for developing Alternative C due to sub watershed threshold concerns make sense. Alternative C will reduce hazardous fuels and the risk of high intensity wildfires, improve the overall health of the forest, and contribute to the stability and economic health of the local communities by providing employment and timber into the marketplace.	9-1	Thank you for your comment.
PLAN	500	Provide specific information on the fuel reduction and timber management activities on adjacent private and community lands. Incorporate these projects into the cumulative impacts analysis.	10-10	Thank you for your recommendation.
PLAN	500	The FEIS should provide specific information on fuel reduction and timber management activities on adjacent private and community lands. For example, describe and evaluate the fuel reduction projects being designed by the Fire Safe Councils, community efforts to make their communities fire safe, and fuel management projects on adjacent private timberlands. This evaluation should describe how these separate fuel reduction projects, in conjunction with HFQLG projects, are being integrated on a landscape-scale to ensure an effective regional system of DFPZ and move the	10-11	Thank you for your recommendation. An evaluation of adjacent private lands will be incorporated into the FEIS.

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		forest towards a more fire-resilient heterogeneous forest. This evaluation should also be incorporated into the cumulative impacts analysis.		
PLAN	500	The reference of how the Sugarberry project ties into adjoining DFPZ projects is confusing and the maps in Appendix G do not clearly show the ties and or relationships. The scale of the maps are small, hard to read and lack specificity regarding the boundaries of the "at-risk" communities and there associated WUI's, location and separation of the DFPZ's and the Group Selection units.	11-2	Thank you for your recommendation. Two maps have been added to the FEIS appendix. One map illustrates adjoining DFPZ projects and the other shows the communities at risk and their associated WUI boundaries.
PLAN	500	Page 2-8, 1st bullet under Black Oak Enhancement: Can't find locations on map B in Appendix G.	11-4	This has been improved in the FEIS.
PLAN	500	Need to show the location of Strawberry Valley and Clipper Mills on maps in Appendix G. Again, the outer boundaries of the communities must be designated on the maps in order to establish the associated start and end of the WUI's.	11-9	Thank you for your recommendation.
PLAN	500	Regulatory Framework: I suggest you include the Healthy Forest Restoration Act in this listing.	11-10	Thank you for your recommendation.
PLAN	500	It is important to declare that this project falls within the "Municipal Watershed" of the state water system for southern California.	11-11	Thank you for your recommendation.

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PLAN TM	500 601	You need to clearly show the location of the DFPZ network in relation to the communities and their WUI's.	11-14	Thank you for your recommendation. We have included a map in the FEIS that shows the DFPZ network as well as a map illustrating communities at risk and associated WUI boundaries. See response to 11-3. The remainder of treatment units within the DFPZ designation are either stand alone group selection or plantation units (which are not subject to a canopy cover requirement), or mastication, hand cut and pile, or underburn units.
PLAN TM	500 600	The snag standards in Table-2 of the SNFramework-2 for Westside mix conifer stands is 4 snags per acre and not "2 to 6 snags per acre."	11-16	Snag retention guidelines vary by vegetation type and may be lower in number in treatment areas within the WUI and DFPZ. These guidelines are clearly stated in the Sierra Nevada Forest Plan Amendment Record of Decision, Table 2. The statement on 3-34, 2nd paragraph of the Sugarberry DEIS attempts to reflect these guidelines over a span of vegetation types. Page 3-20 of the DEIS states that the dominant vegetation types are mixed conifer and white fir dominated stands, which have a snag retention guideline of four snags per acre. A minor vegetation type in the project area is red fir, which has a 6 snag per acre retention guideline.
PLAN	500	Page 3-103, 3rd and 4th paragraph: Here is where you make the case for the utilization of the Healthy Forest Restoration Act NEPA protection authorities. You clearly demonstrate how the watersheds within the project area feed into the state water system for the 23 municipal water districts that have a contract with the state for water deliveries that come out of this area. I urge you to utilize the protections of the HFRA and instructions to the courts.	11-20	Thank you for your recommendation.

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PLAN	500	Pages 3-197 and 3-213: Change “1884” to “1984”	11-23	The Sugarberry FEIS will reflect this information.
PLAN	500	What is a “—“zone listed in the tables?	11-26	Acres by treatment unit are displayed in Appendix A for each treatment type. Units listed in Appendix A that have a dash (-) are not designated as WUI or DFPZ. The asterisk * is used to indicate units within the HFQLG network that have been treated in other projects.
PLAN	500	A clear and legible map is needed to show how this project ties into the Upper and Lower Slate and which units are being reworked.	11-27	See response to comment letter 11-26.
PLAN	500	Since the majority of volume is coming from group selection units, it is imperative that you have a clear and concise listing of units with subsequent treatments, acres and volumes that are clearly represented on the project maps.	11-28	Thank you for your recommendation.
PLAN	500	This project is going to court and you must make clear, concise and legible unit tables and maps for this project.	11-29	Thank you for your recommendation.
PLAN	500	How many acres of the Upper and Lower Slate are being reworked under this project?	11-30	Some DFPZ acres within Sugarberry were originally part of the Upper and Lower Slate projects that were completed under the 2001 Framework. High harvest costs made the project uneconomical, and much of the work proposed was not completed (DEIS 2-22). Some Slate units are being proposed for rework under the Sugarberry project. Upper and Lower Slate units that were completed included service contract hand cutting and mastication of small material. Approximately 79 acres in Lower Slate and 388 acres in Upper Slate will be *re-entered* in the Sugarberry Project.

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				In Lower Slate, 35 acres will be *reworked* with hand treatment or mastication in the Sugarberry project. The remainder of the area within Lower Slate is proposed for group selection. In Upper Slate area, under the Sugarberry project, 216 acres are proposed for underburning, 148 acres for mastication and 24 acres of group selection.
PLAN	500	Have these acres been reported as “accomplished” under previous Program of Worked “Accomplished” and reported to congress in the annual report?	11-31	See response to comment letter 11-26. Re-entry into the Upper and Lower Slate units will consist of group selection harvest, mastication and underburning as opposed to the initial hand cut and mastication treatment under the 2001 Framework. For Upper Slate, 754 acres were reported as accomplished in the Oracle database. For Lower Slate, 835 acres were reported. Only 35 acres of the Slate Projects will be *reworked* with the same prescription under the Sugarberry project. The remainder of the overlap area between Sugarberry and the Slate projects has been planned under the 2004 Framework.
PLAN	500	Page C-1: Mileage totals need to be corrected in top two tables.	11-32	Corrections will be made in the FEIS, thank you.
PLAN	500	Although I support the implementation of this project through a Stewardship Contract, what is the status of resolving the collection of Forest Reserve Revenues for the counties?	11-36	There has been no national or regional direction to date.
PLAN	500	Please clarify the collection of FRR’s before this project is awarded under a SC.	11-37	It is unknown until direction is provided.
PLAN	502	The DEIS fails to include sufficient information and analysis to adequately disclose the project’s likely environmental impacts and to allow a	1-2	See response to comment letters 1-1, 1-69, 1-75, 1-84, 1-107, 1-111, and 1-116.

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		reasoned choice about whether or not to implement the project. Some of the key deficiencies include failure to adequately disclose the current habitat conditions and the project's likely impacts on California spotted owl and marten, failure to monitor wildlife as required by the forest plan or adequately to assess the project's impacts on these species, failure to disclose and mitigate detrimental effects to soils, and failure to analyze an adequate range of alternatives or to develop alternatives that address the significant issues identified during project scoping and as a result of the environmental analysis. Lastly, the analysis of cumulative effects fails to consider the effects of salvage logging on public lands and underestimates the impacts of past logging on habitat for species dependent on late seral forests. These deficiencies are important enough that they should be remedied in a revised environmental analysis so that the public has an opportunity to comment on the additional information and analysis, as required by NEPA. We therefore urge the Forest Service to prepare a revised environmental analysis, rather than proceeding directly to a final document and decision on this project.		
PLAN	502	The Sugarberry DEIS falls short of the requirements of NEPA.	1-99	See response to comment letters 1-1, 1-69, 1-75, 1-84, 1-107, 1-111, and 1-116.

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PLAN	502	NEPA requires that the Forest Service consider a range of reasonable alternatives. In Sierra Nevada Forest Protection Campaign v. Tippin, 2006 WL 2583036 (E.D. Cal. 2006), the court held that the Creeks EIS failed to consider a range of alternatives as required by NEPA. Like the Sugarberry DEIS, the action alternatives in the Creeks EIS were "nearly identical, as is evidenced by the fact that the Forest Service analyzes them [together] throughout most of the FEIS." Id. at *6. Like the Sugarberry, all the action alternatives in the Creeks EIS "contain identical quantities of DFPZs ..." Id. In the Creeks case, the court held that "the Forest Service arbitrarily and capriciously failed to analyze an adequate range of alternatives." Id. at *9. Because the Sugarberry DEIS is virtually identical to the Creeks EIS in its consideration of alternatives, the same conclusion applies to the Sugarberry DEIS.	1-100	Six alternatives were considered in the DEIS (pages 2-1–2-23, DEIS). Three additional alternatives have been considered as a result of public comments received on the DEIS (Section 2.7, FEIS). *Forest Service Handbook* 1909.05.15 Chapter 10, 12.33 and the *40 most asked questions* memo from Council on Environmental Quality (CEQ) only require a full range of reasonable alternatives be considered. Reasonable alternatives must meet the purpose and need for action.
PLAN	502	With respect to economics, the stated purpose and need is to "contribute to the stability and economic health of rural communities by providing and adequate timber supply." (Ibid.) Alternative D would clearly provide timber to rural communities, but there is no objective definition of "adequate" in the DEIS. The Forest Service is simply rejecting this alternative based on the idea that one alternative goes farther in achieving a particular purpose than another.	1-102	See response to comment letter 1-107. . Alternative D was developed in response to scoping comments, and it is an alternative that would fully implement the 2001 SNFPA ROD. The Sugarberry IDT recommended that this alternative be eliminated from detailed consideration because it would not fully meet the purpose or resolve the need for the project. The basis for the recommendation is in Section 2.5.2.1 of the DEIS.

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		This is not the standard for assessing alternatives under NEPA.		
PLAN	502	There are no objective reasons given for dismissing Alternative D from detailed consideration.	1-103	See response to comment 1-102.
PLAN	503	Provide a more detailed cumulative impact analysis of the Sugarberry Project within the context of the HFQLG Pilot Project.	10-5	The analysis of cumulative effects is consistent with the direction provided by the Council on Environmental Quality's (CEQ) June 24, 2005, memorandum titled, "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis." In the memorandum, the CEQ provides guidance on the extent to which federal agencies are required to analyze the environmental effects of past actions when they describe the cumulative environmental effects of a proposed action in accordance with Section 102 of the National Environmental Protection Act (NEPA) and the CEQ regulations for implementing procedural provisions of NEPA, 40 CFR parts 1500-1508. The CEQ memorandum is hereby incorporated by reference. The HFQLG FEIS (1999) provides cumulative effects consideration of implementing DFPZs, group selection harvests and individual tree selection (ITS). At the HFQLG Pilot Project scale, cumulative effects on species and/or their habitats were displayed/discussed on pages 3-60 to 3-85 to 3-116 of the DEIS and pages 13-183 of the BA/BE.
PLAN	503	We recommend the FEIS provide a summary of HFQLG projects and the status and results of effectiveness monitoring. We recommend this summary include a list of HFQLG projects approved and implemented; the number of acres logged by specific prescriptions; and current data on the effectiveness of DFPZ and fuel	10-6	Thank you for your recommendation. Providing a summary of all HFQLG projects and the status of monitoring is beyond the scope of the Sugarberry Project. The Forest Service is required to conduct post-project monitoring for Water Quality, Best Management Practices, and Implementation Monitoring one year after completion of timber sales.

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		management prescriptions in reducing fire intensity, increasing community and fire fighter safety, providing significant economic benefits for local communities, and moving the forest towards a more fire-resilient heterogeneous forest.		Past, present, and foreseeable actions within the Sugarberry analysis area are listed in Appendix F of the Sugarberry DEIS. The size of the analysis area incorporating past, present and foreseeable actions as well as analysis of the effects of time, type, place, and scale of the actions varies by resource. Analysis of the environmental effects of these actions is documented in Chapter 3 of the DEIS by resource.
PLAN	503	The FEIS should include a more detailed evaluation of the cumulative impacts of DFPZ construction and maintenance, road construction, and timber harvests over the entire HFQLG Pilot Project area. Of specific interest are potential cumulative impacts to water quality, cumulative watershed effects, habitat fragmentation, and noxious weed proliferation. We recommend that the Forest Service refer to the Cumulative Impact Guidance jointly prepared by the California Department of Transportation (Caltrans), the Federal Highway Administration (California Division) and EPA Region 9 in the preparation of the cumulative impacts analysis for this project.	10-7	Thank you for your recommendation. The HFQLG FEIS (1999) provides cumulative effects consideration of implementing DFPZs, group selection harvests and individual tree selection (ITS). The cumulative effects of fully implementing the HFQLG pilot project was modeled, analyzed, and displayed in the 2004 SNFPA FSEIS. This documented the cumulative effects to habitat across the entire Sierra Nevada range, including the HFQLG pilot project area. At the SNFPA scale, cumulative effects on species.
TM	600	In the FEIS, please describe in detail each of the following for all of the final alternatives (including figures): a) the existing density of trees, both live and dead, in each size class (e.g., 0-4”, 4-8”, 8-12”, 12-16” dbh, etc.) in each unit; b) the existing species composition of trees in each size class in each unit; c) the existing range of variability in density	8-1	The project record contains voluminous information in the form of Forest Inventory and Analysis (FIA) and Forest Vegetation Simulator (FVS) runs that provide the information the commenter requests with regard to the density and species composition of trees within each unit. This information is available in the project files (DEIS 3-14, 3-15). The breakdown of diameter classes utilized within various tables within the DEIS are designed to facilitate analysis and discussion of California wildlife habitat relationships (CWHR) and aid in summarizing

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		and species composition across the project area; d) your expected post-logging density of trees in each size class; e) your expected post-logging composition of trees in each size class; your post-logging expected range of variability in density and composition; f) the historic data that you rely upon for your assertion that you are restoring historic conditions; and g) the current and expected post-logging canopy cover in each unit. Without this information, it is impossible to evaluate the scientific accuracy and integrity of the analysis, or to understand the extent and intensity of canopy reduction and the resulting impacts to the habitat of spotted owls and MIS and SAR species.		utilization of material in biomass, thinning and sawlog harvests. The information from FIA and FVS programs has been summarized and incorporated into tables found within the DEIS and are provided in the Vegetation Report, Appendices C-1, C-2, and C-4 of the DEIS. The information in Appendix C includes a summary of pre and post treatment estimates of species composition, density, and canopy cover by unit. The existing and desired range of variability in density and species composition across the project area is illustrated in the Slate Creek Landscape Analysis, 1999, and in the Sugarberry DEIS, figure 1-4 pg.1-6. The historic “reference” condition for vegetation was derived from the Slate Creek Landscape Analysis, 1999 (See pgs. 3-19 and 3-22 in DEIS). Some historical reference conditions within the Slate Creek Analysis were derived from the writings of John Leiberg, Forest Conditions in the Northern Sierra Nevada, 1902 and timber types maps complied by J.S. Noel in 1908.
TM	600	The VTM data set from the late 1920’s and early 1930’s is a direct historical data set which establishes plots throughout the central and northern Sierra Nevada. It shows that, in the mixed conifer type, there were approximately 60 trees per acre over 12 inches dbh including 18 trees per acre for trees 24-36” dbh, on the average (See Bouldin 1999, Fig 89).	8-1.5	Thank you for your comment. See the response to 8-1 above. The Sugarberry treatments initiate a return to reference conditions within the project area. As the DEIS states within the DEIS summary on page xi, Alternatives B and C would remove most of the understory trees within DFPZ and ITS treatment units (less than 10 inches dbh) and leave approximately 60 to 100 trees per acre. In many of the CWHR Size class 4 and 5 M and D stands there are averages of 10-13 trees per acre greater than 30 inches dbh that will be retained. Page 3-32 in the DEIS states that “throughout all treatment units regardless of thinning prescription, trees in the 20 to 30 inch and greater than 30 inch diameter classes would generally be favored for retention”. Leaving 60-100 trees per acre will allow for future tree recruitment into the larger size classes.

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TM	600	Please include a cost estimate for a 30"-limit mechanical thin, including, at a minimum, the following: a) administrative costs pertaining to analysis and appeals; b) costs of sale preparation and administration; c) PER ACRE costs of slash piling and burning; d) PER ACRE costs of brush maintenance following the mechanical thinning as a result of canopy reduction (this cost must be included, regardless of whether brush maintenance is required only 3-5 years after mechanical thinning or 10-15 years after mechanical thinning; and no similar cost would be applied to non-commercial thinning since essentially no measurable canopy reduction would occur); and e) the administrative costs pertaining to analysis and planning for the slash clean-up and brush maintenance projects following the mechanical thinning. Please include citations to actual projects for all estimates.	8-2	The per acre costs for slash piling and burning may be found in Appendix D pgs. D-2 and D-3. DFPZ maintenance is not proposed in the Sugarberry project but is included in the cumulative effects analysis as a foreseeable future event (DEIS 3-52) and as such, costs are not included in this analysis. Cost estimates for analysis and appeals, and sale preparation and administration are outside the scope of this document.
TM	600	Another issue is potential timing restrictions on when logging can occur because of possible damage to the vegetation during logging (pg 2-15). Proper oversight and communication between the sale administrator and the contractor will minimize impacts to the residual vegetation during operations.	9-3	Recommendations for mitigation are utilized in order to limit damage to trees from logging or insect activity. These mitigation measures will be utilized as needed by sale administrators. Ground conditions determine when and if sale administrators need to enforce particular C provisions in the sale contract.

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TM	600	The existing 8” of dry soil requirement already restricts when ground base logging operations can occur, making this additional mitigation is unnecessary. With existing LOP’s, PAL restrictions and all the rest, we feel the window of operability is narrow enough it is.	9-3	
TM	600	What is the upper diameter limit on the 150-180 trees greater than 30” dbh to be removed in the 12 acres of Aspen projects?	11-5	There is no upper diameter limit on the estimated 150-180 trees greater than 30 inches to be removed. Note that the area surrounding Howland Flat was nearly completely denuded during the mining period of 1850 to the late 1890s. Most trees became established during the 120 year period following that disturbance. Tree species to be removed are mostly white fir and a minor amount of lodgepole pine and red fir. Some trees greater than 30 inches dbh will be retained for hydrological concerns and bank stability, reducing the number of total trees removed greater than 30 inches. The analysis and rationale for removal of trees greater than 30 inches dbh from aspen units is found on pages 1-7, 1-8, 3-22, and 3-47 of the DEIS.
TM	600	What is the species of trees to be removed?	11-6	See response to comment letter number 11-5.
TM	600	The 50% canopy closure and 20” diameter limit discussion for segments of the DFPZ are the political objectives of the Sierra Nevada Forest Protection Campaign and are not appropriate for this project.	11-13	The Sugarberry Project is being proposed under the guidelines set forth under the 2004 Framework.

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TM	600	Table 3-22: Table should be expanded to show the associated crown closure percentage that relates to the displayed CB heights. As stated canopy base heights would prevent surface fires from developing into crown fires within the DFPZ. However, the main objective of the DFPZ network is to bring crown fires that burn into the DFPZ to the ground and it is a direct function of the crown closure within the DFPZ.	11-17	Thank you for your comment. There are two units within the DFPZ that will be reduced to 40 percent canopy cover and one unit to 50 percent canopy cover. The remaining units in Table 3-22 are proposed to be treated with underburning, hand cut and tractor pile, mastication, or they are plantations that have no canopy cover requirements.
TM	600	Table 3-35: Forest Reserve Revenues are based on 25% of the gross timber receipts and not 25% of the "Net Harvest Value". As such the FRR would be closer to $500,000 instead of the $100,000 shown in the table.	11-18	Thank you for your comment. Table 3-35 will be revised in the FEIS.
TM	600	Table 3-38: Table needs clarification. 1) 8% and 88% contributions should be labeled sawlog volume percentages 2) 40% and 3% should be 94% and 6%. Same error in both alternatives.	11-19	Table 3-38 on page 3-80 in the DEIS correctly calculates the Sugarberry contribution to the HFQLG Pilot Project Area.
TM	600	Appendix A: Difficult to understand what acres are being treated. Should clearly show how many acres under each unit number are being treated by DFPZ, ITS, GS, Aspen and Black Oak.	11-24	See response to comment letter number 11-26.
TM	600	Why aren't you reducing hazardous fuels in the WUI and "—" zones?	11-25	See response to comment letter number 11-26.
TM	600	Why are there no sawlog volumes greater than 23" dbh shown in DFPZ thinnings?	11-33	On page D-1 Appendix D, the sawlog values used in the economic analysis were estimated from the Forest Vegetation Simulator (FVS) model, without the benefit of preliminary cruise

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				data, which was unavailable. When the FVS model thins a stand, it removes trees under a thinning prescription sequentially, removing the smallest trees first until canopy cover, basal area or tree size requirements are met. Thus the table on page D-1only shows volume removal for trees from 9 to 22.9 inches in diameter. The FEIS will provide recent comprehensive data in the economic analysis.
TM	600	The current Program of Work for 2008 shows this project to produce 35,000,000 bdft of merchantable sawlog volume but yet Alternative B only shows 25,000,000 bdft of sawlogs. Why is there a difference of 10,000,000 bdft between the two?	11-35	Recent cruise data collected indicates the volume is closer to what is indicated in the Program of Work, approximately 35 MMBF. The economic analysis in the FEIS will reflect the latest volume estimates.
TM	601	Why are you establishing two canopy closure targets for the DFPZ? Standards and Guidelines for SNF-2 call for 40% within the DFPZ in CWHR 5 stands and allows 40% canopy closure as the target in CWHR 4m and 4d stands. Crown closure targets within the DFPZ should be held at 40% to achieve fuel reduction and fire protection objectives, meet foraging requirements of the CSO while enhancing the cost efficiencies of the project.	11-3	On page 3-32 of the DEIS it states that canopy cover in the DFPZ units (2 units, 905a and 905b) in the WUI and high recreational use area will reduced to 40 percent under Alternatives B and C. The other DFPZ unit (1unit, 909) would be reduced to 50 percent canopy cover. The retention of canopy cover to 50 percent in the DFPZ unit 909 is due to the number of large residual trees in this individual unit. Other units that are in the DFPZ are either in plantations which have no canopy cover requirements, are of open or sparse canopy cover (S or P), or mastication or hand treatment along with underburning was thought to be sufficient to treat fuel reduction needs. All treatments are designed to meet the standards and guidelines for DFPZs as outlined in Table2 of the Sierra Nevada Forest Plan Amendment 2004.
TM	601	Clarification is needed as to where the 40% and 50% canopy closure targets will be applied. 40% needs to be the target for	11-8	Thank you for your comment. See response to 11-3 for discussion of DFPZ canopy cover. There are six ITS units in the Sugarberry project. Five of the six ITS units will have a post-

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		DFPZ's and 40% can be used in ITS units if 50% crown closure is not achievable.		treatment canopy cover of 50 percent. One ITS unit will have post treatment canopy cover of 43 percent. Prescriptions and pre and post treatment canopy cover may be found in Appendix C-2. Due to the number of large trees in the Sugarberry area, canopy cover retention may exceed the minimum requirements given under the standards and guidelines in the SNFPA, 2004 for DFPZ and ITS treatments. All treatments are designed to meet the standards and guidelines in the Sierra Nevada Forest Plan Amendment (SNFPA) 2004.
TM	601	Rather than just the "two units" within the WUI being treated to 40% crown closure, all of the DFPZ units must be treated to a 40% crown closure in order to meet the fire protection objectives of the DFPZ, the foraging habitat needs of the CSO and the social and economic concerns of the citizens, businesses and local governments.	11-15	See response to comment letter number 11-14.
TM	601	Can you achieve 40% crown closure in the DFPZ's without cutting trees over 23" dbh.	11-34	See response to comment letter number 11-33.
TM	602	Placing a Group Selection unit within CWHR 5 and 6 stands within a DFPZ does not impact the basal area or canopy cover requirements of that stand. Canopy cover & basal area do not apply to GS units and the accountability of the various resource management activities are kept separate from one another.	11-12	The statement on page 3-16 of the DEIS indicates that basal area retention and canopy cover guidelines from Table 2 of the SNFPA 2004 ROD would have an effect on the number of groups and group layout or design within CWHR 5M, 5D, and 6 Size Class stands in DFPZs and ITS treatment units. In these CWHR size classes, where thinning and group selection prescriptions are combined, guidelines for ITS stands are to retain greater than 50 percent canopy cover after treatment averaged within the treatment unit (SNFPA 2005). In addition, because of the number of large trees in the Sugarberry area, canopy cover and basal area retention may exceed the minimum guidelines given under the standards and guidelines in the

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				SNFPA 2004 for DFPZ and ITS treatments. A supplemental guideline in group layout is to avoid placing groups in areas that contain more than 20 trees per acre of trees greater than 30 inch dbh (DEIS 3-16), in order for establishment of shade intolerant seedlings to be effective. Silvicultural prescriptions for DFPZs in the Sugarberry project were developed following the direction provided in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment FEIS, and following direction provided in April of 2005 letter titled "Application of Canopy Cover Guidelines for HFQLG, SNFPA" which states that group selection acreage and canopy cover is *not* calculated in order to meet DFPZ canopy cover requirements. Within ITS units, canopy cover requirements *include* the impact on canopy cover made by group selection treatments.
TM	602	The placement of Group Selection units do not have an impact on the canopy cover of stands they are placed in. The stand acreage is reduced by the sum acres of groups placed in it and the new stand designation for the group acres is CWHR 1 stands.	11-21	
WILD	100	The wildlife reports do not disclose the existing snag levels on the project area nor do they present the results of the snag monitoring required by the forest plan. The DEIS (p. 3-169) states that based on stand data, there are on average 4 to 6 snags greater that 15" in diameter per acre, but no data are provided to support this claim. The DEIS relies on the statement that a certain number of snags will be retained, but neglects to evaluate the cumulative impact of vegetation	1-41	Snag data is collected using the Forest Inventory and Analysis (FIA) plots (see Sugarberry Project – Vegetation, Fire and Fuels Report, 2006). The SNFPA FSEIS (HFQLG Land Allocation) standard and guideline for snags would be followed for the Sugarberry Project: four of the largest snag per acre using snags larger than 15 inches dbh, clumped and distributed irregularly. The average snags > 15 inch dbh within the Sugarberry Project, based on stand data consists on average of 4-6 snags per acre. The potential loss of some snags due hazard removal or use of prescribed fire should be considered during project planning to achieve desired snag

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		management including logging on private land and salvage logging on national forest land, and to discuss the future likely amount and distribution of snags in the assessment area.		retention levels. These levels were evaluated under the HFQLG FEIS and SNFPA FSEIS for TES species. Due to operability and safety, it is anticipated that most snags within group selections would be felled and the standard target level of snags would not be retained within all of the groups but would exist on the periphery of the groups. However, depending on each stands density and tree sizes, tree growth could be affected at varying rates due to competition for nutrients and space. While maintaining the minimum snag requirements in the short-term, reducing the tree competition could increase the recruitment of large trees and future snags, and LWM, for the long-term. However large woody debris material meets or exceeds the remanded threshold in the majority of the proposed treatments. Large woody debris material meets or exceeds the recommended threshold in the majority of the proposed treatment units surveyed under the existing condition (Be/BA Page 173).
WILD	100	Despite the recognized importance of snags to wildlife and the likely negative effect of the project on snags, the DEIS fails to report any monitoring data on the current distribution and quality of snags in the project area or provide any analysis of the likely effect of the project on snag abundance and distribution.	1-42	See response to comment letter number 1-41.
WILD	100	The failure to gather and report information on snag densities is a violation of the forest plan. The failure to consider this information in the environmental analysis is also a violation of NEPA since in its absence, the quality	1-43	See response to comment letter number 1-41.

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		of the available habitat can not be known nor can mitigation measures that might improve poor conditions be identified.		
WILD	100	There are several species at risk that were addressed in the project level environmental documents for which the monitoring requirements of Appendix E have not been met. The BE reports for the three bats listed above survey results from 1991, 1992, 2001, 2002, and 2006. Annuals surveys are required by the LRMP as amended in 2001 and 2004. Despite this requirement, surveys were only completed in 3 out of the six years since adoption of Appendix E. Despite the lack of population information for these bats, the BE (p. 202) concludes that effects to these bat species would be “low.”	1-45	The SNFPA ROD contains no specific direction regarding bat species. However, under HFQLG FEIS there are Directions such as surveys and LOPs and hardwood protection that apply to bat habitat. In addition, bat foraging habitat is protected by HFQLG FEIS and SNFPA ROD standards and guidelines protecting aquatic and riparian zones (page 81). See page 81 BE/BA for surveys. See responses to comment letters 1-17 and 1-21.
WILD	100	There are additional SAR that may occur in the project area, based on their geographic range and the association of habitat types affected, for which the required monitoring has not been reported. The potential impacts of the Sugarberry project on these at risk species have not been evaluated in the environmental analysis. Such evaluation is warranted since elsewhere the Forest Service has determined that, for a majority of these species, a full viability analysis was required to satisfy NEPA and NFMA.	1-46	The SNFPA ROD contains no specific direction regarding bat species. However, under HFQLG FEIS there are Directions such as surveys and LOPs and hardwood protection that apply to bat habitat. In addition, bat foraging habitat is protected by HFQLG FEIS and SNFPA ROD standards and guidelines protecting aquatic and riparian zones (page 81). See page 81 BE/BA for surveys. See responses to comment letters 1-17 and 1-21.

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WILD	100	Despite having no information about population trends on pallid bats in the project area and no baseline data on habitat quality (including snag abundance and distribution in the project area), the BE concludes that the effects to pallid and other bats are “expected to be low.” (Ibid., p. 205). In the absence of information about population trend and existing habitat quality, the conclusion that effects will be low can not be supported.	1-48	The implementation of Management Area direction and habitat prescriptions and allocations (PNF LRMP 1988; as amended by HFQLG FEIS 1999 and SNFPA FSEIS 2004) for California spotted owl (CSO), northern goshawk (NOGO), forest carnivores, little willow flycatcher (WIFL), and amphibians would provide for many acres of untreated mature or old forest and riparian habitat. Management Requirements, include the retention of large trees (30” dbh or greater), snags (4 per acre of 15” dbh or greater), and DWM (10-15 tons per acre of the largest diameter equivalent to 8-12 logs per acre ≥ 20 inch dbh and 10 foot in length or longer). According to the HFQLG FEIS BA/BE (p. 162), “ The retention of decadent hardwoods will need to be addressed at the site specific project level, but this habitat component should be recognized for its importance to pallid bats and its contribution to snag densities”. Where California black oak is present in DFPZs, an average basal area of 25 to 35 square feet per acre would be retained for oaks over 12 inches dbh. Smaller oaks may be retained if determined necessary for future recruitment. Black oak encompasses 4.7 percent of the project area, while tanoak is 0.4 percent of the project area. The treated acres could provide many of the habitats attributes necessary to support the sensitive bat species by employing BMP and SAT guidelines and maintaining aquatic/riparian ecosystem processes in the RHCAs. Limited Operating Periods for the California spotted owl and northern goshawk overlap the spring and summer seasons, when bats are rearing their young. Where these LOPs are implemented, further minimization of disturbance to bat species is likely. The above Standard Management Requirements and/or Resource Protection Measures and Mitigations would reduce or eliminate possible direct and indirect affects for these three bat species.

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WILD	100		1-48	Western red bats are more dependent on riparian habitat for roosting and foraging and Townsend’s big-eared bats are more closely associated with structures (caves, bridges, buildings, etc.) for roosting and riparian habitat for foraging. It is expected that disturbances due to activities versus habitat modification would affect the later two species. Bat foraging habitat is protected by HFQLG FEIS and SNFPA ROD standards and guidelines protecting aquatic and riparian zones (page 204). It is expected that pallid bats could potentially be impacted, of the three bat species, due to their general use of the forest for roosting and foraging (page 205). This would have a greater impact on pallid bats since they also forage on shrubs and on the ground (page 204). Because the three sensitive bats are insectivores, the felling of snags and removal of logs may reduce the amount of microhabitat available for wood boring beetles and other insect species that may be utilized as prey). For snag retention see recommended Standards and Guidelines from Table 2 (page 69) of the SNFPA ROD will be followed for this project (page 205).
WILD TM	100 600	The group selection practices proposed conflict with the stated purpose and need and undermine the enhancement of oak in the treatment area. An alternative should be developed to more fully address the need to enhance oak.	1-50	Current management direction is to retain an average of 25 to 35 square feet basal area per acre of oaks greater than 15 inches dbh (Herger-Feinstien QLG Forest Recovery Act FEIS 2-10). Smaller oaks may be retained where necessary for future recruitment needs. The DEIS page 3-207 clearly states that oaks greater than 12 inches in diameter will be retained in DFPZ and ITS units, which gives additional protection to oaks in the project area. In addition, black oak has been designated as for retention in both DFPZ and ITS thinning prescriptions, second only to ponderosa pine (DEIS page 3-32). Placement of group selection units have been designed to avoid black oak areas during layout where possible (DEIS 3-16). Group selection units will retain oak trees greater than 12 inches dbh where they exist.

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				Within the Sugarberry project, approximately 100 acres of oak enhancement will take place, thinning out conifers from oak stands. Some oaks will be removed along with the conifers to enhance diameter growth on the remaining larger older oaks and to reduce fuels (DEIS 3-207).
WILD	100	The BE (p. 199) recognizes that oaks will be lost, but the extent or intensity of the loss is not estimated. Further, the existing abundance and distribution of black oak across the landscape is not disclosed. Despite this lack of information, the BE concludes that the indirect effects to habitat will be insignificant. There is no data or analysis provided to support this claim.	1-51	See response to comment letter number 1-50.
WILD	100	The analysis of project induced impacts on oak resources should be evaluated in a revised DEIS.	1-52	See response to comment letter number 1-50.
WILD	100	Not only does the cumulative effects analysis need to provide quantified data with respect to factors such as the amount of spotted owl habitat that will be affected, id. at 994 n.1, but “the effect of this loss on the spotted owl” and other species throughout the planning area also needs to be analyzed.	1-73	See response to comment letter number 1-50.
WILD	100	Four of these – American House, Brush Creek, Devil’s Gap, and Tamarack – appear to be located within the wildlife analysis area for the Sugarberry project.	1-76	Further analysis will be done in the FEIS.
WILD	100	The existence of six hazard tree projects in close proximity to the Sugarberry	1-78	Further analysis will be done in the FEIS.

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		project raises the possibility of cumulative impacts, particular to species associated with large trees, large snags, and large down wood, including the pileated woodpecker, spotted owl, goshawk, marten, and fisher.		
WILD	100	Based on our field review of Tamarack Flat and Mule, many large trees (some in excess of 30” dbh) are marked for removal, which will affect not only the number of remaining large trees but also the current and future number of large snags and the recruitment of large down logs. Yet the Sugarberry DEIS does not address these cumulative impacts.	1-79	Further analysis will be done in the FEIS.
WILD	100	The distribution and abundance of snags on private land, which the BE notes is scattered throughout the analysis area, has not been considered.	1-82	Further analysis will be done in the FEIS.
WILD	100	The loss of trees greater than 30” dbh as a result of implementing the logging system on 135 acres (BE, p. 125) must be evaluated in light of the loss of large trees as a result of salvage logging.	1-83	Further analysis will be done in the FEIS.
WILD	100	Group selection units are surrounded by vegetation that is very open and that contains little or no canopy cover. Low levels of canopy cover and small sized stands are rated as unsuitable habitat and contribute to fragmentation across the landscape. This type of fragmentation can also create a barrier to movement for species such as marten that avoid open	1-87	Currently there are no known American Martin or Pacific Fisher in the Sugarberry Project area. Protocol-level surveys completed in autumn of 2002 and winter of 2003 found no sign of the target species in the Sugarberry area. Surveys follow the “American Marten, Fisher, Lynx, and Wolverine: Survey Methods for their Detection”; Zielinski/Kucera; PSW-GTR-157; August 1995. The habitat for carnivores such as Marten travel and forage primarily along rivers, streams and den and rest in mature/old

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		areas.		forest habitat. The forest carnivore network in the Sugarberry Project area includes a riparian or movement corridor along Slate Creek and Canyon Creek to the east. This habitat is within dense riparian corridors and saddles between major drainages, which could be used as trail ways. Moderate to high foraging habitat exists throughout the project area. However, high denning habitat and the best foraging habitat are located only in the southwestern half of the landscape, with only a few scattered patches in the northeastern half. Therefore, distribution of quality denning habitat within the project area is considered poor. The design features of DFPZs would retain habitat elements within the range of those used by fisher or the marten for foraging and dispersal, such that the DFPZs would likely not create large barriers to further expansion and connectivity to fisher habitat (BA/BE for the HFQLG FEIS, page 243). In addition the majority of DFPZ construction will take place on ridge tops. The Pacific fisher and American marten use ridge-top saddles to cross from one watershed to another but do not typically use ridge-tops for den or rest sites. In DFPZ units, treatment in RHCAs would be limited to underburning, hand piling, and hand thinning except in some plantation where mechanical treatment (mastication) is prescribed. The cumulative effects of this project on wildlife species include past, present, and reasonably foreseeable projects occurring in and adjacent to the 49,768 acre Sugarberry terrestrial wildlife analysis area, which includes 38,545 acres of public and 11,223 acres of private land. Past activities are considered part of the existing condition and are discussed in the Existing Condition and Environmental Effects section for each resource.
WILD	100		1-87	As part of cumulative effects the draft carnivore network was considered. The draft carnivore network is designed to evaluate habitat connectivity across the Plumas in order to maintain options for linking habitat between the Tahoe and Lassen

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				National Forests. There are approximately 8,070 acres of draft Forest Carnivore Network (dFCN) in the Sugarberry terrestrial wildlife analysis area (38,545 acres).Other projects being implemented are Watdog, Slapjack and the Basin Project. In the Watdog and Slapjack Project no treatments are proposed in the Draft Carnivore Network. In the Basin Project a portion of the corridor runs along the Middle Fork of the Feather. Out of the 17,034 acres of Draft Carnivore Network in the Basin Project approximately 17 (0.1%) acres are proposed for ITS and 407 acres for GS (2.4%). Other project are discussed in the Sugarberry BE/BA in Table 14 (BE/BA Page 99) which displays past, current (or on going), or reasonably foreseeable future activities on public lands within or adjacent to the Sugarberry project area. Table 15 displays past, current (or on going), or reasonably foreseeable future activities on private lands within or adjacent to the Sugarberry Project area (BE/BA Page 99).
WILD	100	"The variations in Alternative E would not greatly reduce impacts to owl habitat due to the small amount of harvest planned and the quantity of existing habitat in the area." (Ibid., p. 2-24). There is no analysis provided to support this conclusion.	1-105	Alternative E was eliminated from detail study by the line officer.
WILD	100	The BE (pp. 172-173), however, clearly establishes that there is a high risk for many owl sites that are affected by the project. This is a significant issue and justifies detailed consideration in the EIS.	1-106	Alternative E was eliminated from detail study by the line officer.
WILD	100	A significant portion of the treatment area in the Sugarberry project overlaps with areas determined by Zielinski et al. (2005) to have moderate to high	3-1	The Zielinski et al. (2005) unpublished paper was written as an evaluation tool. The paper was regarding "potential for negative competitive interactions between the cogeneric fisher and American marten, usually with martens suffering from the

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		suitability for marten, and the project area is very close to some of the highest quality habitat remaining in the northern Sierra Nevada. This is also the case for the Watdog project. Combined, these two projects affect a significant portion of the western side of the habitat area identified as moderately to highly suitable for marten.		interaction”. The Zielinski et al. 2005 paper “Selecting Candidate Areas for Fisher Conservation that Minimize Potential Effects on Martens” was considered in the effects analysis for the American marten. The opportunity for Pacific fisher conservation and re-introduction would still be available should the Pacific fisher be found on the Plumas or a decision made to re-introduce Pacific fisher to the Plumas. The paper states in it’s discussion section: 1) “…..candidate fisher conservation areas should be subjected to additional evaluation as to their on-the-ground suitability, and the implications of ownership to potential conservation activities”; 2) “The current exercise was designed to identify general areas for consideration, not to identify specific areas for management action; and 3) “Additional evaluations should include further examination of habitat modeling tools”. The model presented in the paper was intended to be used as an evaluation tool and not for individual project management, and even if the model shows suitable habitat any proposed activity does not automatically reduce suitability (personal communication William Zielinski 9/5/2007). However, Zielinski also states “Although the areas identified in this exercise may be considered candidate locations for future reintroduction of fishers into the northern Sierra Nevada, the identification of these areas are just as important for planning for the restoration of habitat connectivity for fishers in the Sierra Nevada. This benefit can be achieved even in the absence of planning for reintroduction” The draft forest carnivore network is not a management requirement in the Plumas LRMP. This network is designed to evaluate habitat connectivity across the Plumas in order to maintain options for linking habitat between the Tahoe and Lassen National Forests.
WILD	100		3-1	Currently there are no known American Martin or Pacific Fisher in the Sugarberry Project area. Protocol-level surveys completed

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				in autumn of 2002 and winter of 2003 found no sign of the target species in the Sugarberry area. Surveys follow the "American Marten, Fisher, Lynx, and Wolverine: Survey Methods for their Detection"; Zielinski/Kucera; PSW-GTR-157; August 1995. Standard Management Requirements and/or Resource Protection Measures and Mitigations would reduce or eliminate possible direct and indirect affects for riparian areas using Riparian Habitat Conservation Areas (RHCA). The habitat components identified as moderate to high are being maintained within the project. The forest carnivore network in the Sugarberry Project area includes a riparian or movement corridor along Slate Creek and Canyon Creek to the east. This habitat is within dense riparian corridors and saddles between major drainages, which could be used as trail ways. California spotted owl and Northern goshawk PACs, and Special Interest Areas such as Valley Creek provide blocks of mature/old-forest habitat for denning and resting which are connected by the riparian corridors. The design features of DFPZs would retain habitat elements within the range of those used by fisher or the marten for foraging and dispersal, such that the DFPZs would likely not create large barriers to further expansion and connectivity to fisher or marten habitat (BA/BE for the HFQLG FEIS, page 243). In addition the majority of DFPZ construction will take place on ridge tops. The Pacific fisher and American marten use ridge-top saddles to cross from one watershed to another but do not typically use ridge-tops for den or rest sites. There are approximately 8,070 acres of draft Forest Carnivore Network (dFCN) in the Sugarberry terrestrial wildlife analysis area (38,545 acres). The Sugarberry Project proposes approximately 3,295 acres of DFPZ, GS or ITS treatments. However, only approximately 133 of treatment acres are in draft forest carnivore network.

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WILD	100		3-1	Proposed treatments in the DFCN are approximately: 64 acres are DFPZ mastication and underburn; 40 acres of Group Selection; 18 acres ITS; and 11 acres of handcut, pile and burn. Habitat suitability will be retained at minimum foraging levels (40% canopy cover) or higher. This analysis is based on HFQLG FEIS p3-110. Based on the CWHR typing not all acres in the DFCN are considered suitable habitat. However, there may be suitable acres typed as riparian, drainages or creeks. Suitable CWHR acres affected in Alternatives are 56 acres of potential denning and nesting habitat and approximately 13 acres of potential foraging and travel habitat for marten and fisher. The Preferred Alternative would result in a reduction in suitability of <1% of potential denning and resting habitat and a reduction of suitability for <1% of potential foraging and travel habitat (BE/BA Page 197). In the Watdog Project no treatments are proposed in the Draft Carnivore Network.
WILD	100	The examination of aerial imagery indicates that in several instances group selection units will be located near or adjacent to areas that already have open canopies, contain brush, or very young stands. The condition of the adjacent units was not considered in the Sugarberry environmental analysis.	3-2	The terrestrial wildlife analysis area for determining direct, indirect and cumulative effects on terrestrial wildlife includes 38,545 acres of National Forest System land and 11,223 acres of private land for a total of 49,768 acres. Private land accounts for approximately 22.6 percent of the area which includes a high degree of commercial timber production and harvest. Sugarberry Project is surrounded by private land and/or other HFQLG projects. The analysis area for terrestrial wildlife was chosen based on the project treatment locations and the natural topography. The analysis area addresses the effects (direct, indirect, and cumulative) to owls at the PAC/HRCA scale. 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 cumulative effects analysis area

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				includes past, present, and reasonably foreseeable future projects occurring within the Sugarberry Project terrestrial wildlife analysis area. Past actions were considered which have occurred in and around the proposed Sugarberry Project treatments, such as timber sales and fuel reduction projects on Forest Service and on private lands. Limitations of the analysis include future activities on private land (Sugarberry Project DEIS page 3-162). Sugarberry Project analysis was designed to comply with the Record of Decision (ROD) for the 2004 SNFPA Final Supplemental Environmental Impact Statement (FSEIS) and the 1988 Plumas National Forest (NF) Land and Resource Management Plan (LRMP) as amended by HFQLG 1999 FEIS and ROD, and 2003 FSEIS and ROD. Decisions were made to meet the legal requirements of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project (1998). The HFQLG EIS was an effort to look at the Plumas and Lassen (and Sierraville on the Tahoe NF) at a cumulative perspective.
WILD	100		3-2	Refer to the Sugarberry Project- Management Indicator Species (MIS) Report. The California spotted owl and American marten are MIS species for the Pumas NF. 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. The design features of DFPZs retain habitat elements within the range of those used by fisher for foraging and dispersal such that they are not likely to create large barriers to further expansion and connectivity for fisher (Ibid, page 243).
WILD	100	We recommend evaluation of a modified	10-19	Under section 2.5.2 Alternatives Considered but Eliminated from

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TM	600	alternative that combines features of the 2001 Sierra Nevada Forest Plan Amendment Record of Decision (2001 SNFPA ROD) with those of the Preferred Alternative C, which would maintain additional canopy cover and reduce habitat fragmentation. For instance, consider design features that would allow thinning of trees up to 20-inches in diameter at breast height (dbh) in Old Forest Emphasis Areas and Home Range Core Areas of sensitive species, 40 % canopy cover limits in east-side pine forest, 50 % canopy cover limits in red-fir forest, and thinning of trees up to 30-inches dbh in the Wildland Urban Interface (WUI) Defense Zones. Such a modified alternative may enhance the timber volume output and improve cost effectiveness of the originally eliminated 2001 SNFPA ROD Alternative D while also reducing potential adverse effects on old forest associated species in comparison with the Preferred Alternative C.		Detailed Study, Alternative D is an alternative that would fully implement the 2002 Sierra Nevada Forest Plan Amendment. The Sugarberry IDT recommended that the alternative be eliminated from detailed consideration because it would not fully meet the purpose and need or resolve the need for the project. The recommendation is based on the limitations to constructing an effective DFPZ, the poor economics associated with removing mostly small diameter material and the inability to pay for needed fuel reduction work (DEIS 2-21 and 2-22).
WILD	100	I request that you turn “Thus, ITS if applied properly can favor wildlife species.” into a positive statement instead of this negative statement.	11-22	The Sugarberry FEIS will reflect this information.
WILD	101	The Sugarberry Project and Related Projects Threaten the Viability of the California Spotted Owl.	1-3	Refer to the response under “general” above. On May 23,2006 in response to a second petition to list the spotted owl the U.S. Fish and Wildlife Service provided a news release stating “Listing of California Spotted Fowl found not

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				warranted –Service finds most populations stable or increasing in the Sierra Nevada" (Federal Register May 24, 2006 Volume 71, Number 100) (page 68). The California spotted owl population is well above the estimated number of owl pairs projected by the 1988 Plumas National Forest Land and Resource Management Plan during the first and second decades (Forest Plan, chapter 4, page 4-14). Based on the estimated number of pairs and singles from 1996-2005 the owl population on the Forest appears to have an upward trend (PNF 2006)(page 69).
WILD	101	Because the Sugarberry Project implements the 2004 ROD, it contributes to the risk to the owl's viability. This conclusion is also supported by analysis provided in the Sugarberry BE.	1-4	See response to comment letter number 1-3.
WILD	101	The Sugarberry BE (pp. 69-70) identifies that there are 21 PACs in the Sugarberry analysis area but only 10 fledglings have been found in the project area over a 13-year survey period. The poor performance of owls in the area may in part be attributed to the low quality of habitat in the area, particularly high quality habitat necessary for owl survival. A primary focus for management should be to avoid "actions which further reduce the survival probabilities for adult females (which) will have disproportionately large and negative effects on population growth rate" (Blakesley et al. 2001). The most positive step that can be taken to reverse the apparent decline is to identify, and implement, those actions that will	1-5	Surveys were conducted seasonally from 1990-2006, however as stated in the BE/BA (page 70)… not all years where surveyed consecutively and not all areas were surveyed every year. Surveys for the Sugarberry Project were done from 2004-2006. Also, California spotted owls typically do not breed every year and the years of the surveys could have occurred during a low breeding period. Also see the response to comment letter number 1-10.

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		lead to increases in adult survival probabilities. Owl studies to date suggest that this will occur with increased retention and recruitment of large trees and retention of closed-canopy conditions throughout the Sierra Nevada landscape."		
WILD	101	The risk assessment in the BE (pp.172-173), however, indicates that closed canopy conditions in the project area will not be retained and that there is a high risk to more than half of the owl sites affected by the project area. The high risk to habitat quality noted in the risk assessment conflicts with the determination in the BE (p. 160) that indirect effects are "expected to be low."	1-6	The use and presentation of the "risk assessment" will be re-analyzed for the Sugarberry Project FEIS and associated BA/BE. The Sugarberry Project MIS Report provides an assessment for the California spotted owl at the Forest level. The HFQLG FEIS BA/BE provide an assessment for the California spotted owl at Pilot Project level.
WILD	101	The Existing Condition of the PACs and HRCAs Should be Disclosed.	1-7	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 Sugarberry Project 38,545 acre terrestrial wildlife analysis area (not including private), there are approximately 33,813 acres classified as suitable CSO habitat and approximately 4,732 acres of nonsuitable habitat. Based on of the 33,813 acres of suitable CSO habitat there are approximately 10,498 acres classified as suitable CSO nesting habitat (5M,5D)

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				and approximately 23,315 of acres classified as suitable CSO foraging habitat (4M,4D). Also, of the 33,813 acres of suitable CSO habitat there are 25,564 acres of suitable habitat are outside of PAC and SOHAs and 8,249 within PACs and SOHAs. This estimate is based on the most recent vegetation data available for Sugarberry, which is from aerial photo interpretation and Plumas National Forest "e-veg" timber type coverage's (based on 1997 aerial photographs) in the Geographic Information System (GIS). The photographs were used to determine timber strata, CWHR size, and densities. The GIS coverage was also used to determine land classifications and allocation. The Sugarberry Project proposes to treat 3,295 acres in total, which is 9.7% of the 33,813 acres of suitable owl habitat, and 8.5% of the 38,545 acre terrestrial wildlife analysis area (FS lands), and 0.2% of the 1,528,667 acre Pilot Project area. Table 26 Pages 163-165 Details the acres impacted in HRCAs by Group Selection in California spotted owl foraging habitat associated with each PAC. Additional information regarding individual PACs CWHR habitat type will be considered in the FEIS. Further Analysis will be done in the FEIS were necessary.
WILD	101		1-7	The canopy cover across Sugarberry is comprised primarily of CWHR 4M (40-59 % canopy cover) and 4D (60-80% canopy cover), with varying degrees of overlapping in canopy layers. The effects on canopy cover by implementing Individual Tree Selection would be decreased from a maximum of approximately 70 percent to 50 percent while trees per acre would be reduced from about (> 9 inch dbh) 121 trees per acre pre-treatment to about approximately 80 trees per acre. The CWHR size for the total 2,100 acres are as follows: 1,228 acres of 4Ds; 209 acres of 4M; and 94 acres 5D; and 569 acres of 3D/3P; and no acres of 5Ms (BE/BA Page 165). For Alternative

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				C the total acres of all DFPZ (2,100) including DFPZ mechanical thinning units account for approximately 5 percent of the acreage in the wildlife analysis area (38,545). The HRCA standard and guidelines within the SNFPA FSEIS/ROD do not apply to HFQLG FEIS/ROD projects, the term HRCA was used to refer to the GIS-mapped “foraging habitat” for each California spotted owl protected Activity Center (PAC). However foraging habitat for each spotted owl PAC is required to be analyzed under the HFQLG FEIS/ROD. There are a total of 21 PACs, and associated HRCAs, and five SOHAs established in the wildlife analysis area. Of the 10,498 acres of suitable nesting habitat; 6,110 acres are in PACs, 2,139 acres are in SOHAs and 2,249 acres outside of PACs and SOHAs. There Habitat descriptions for activity centers were provided as part of the survey record. Treatments in HRCAs could have low effects to owl’s dispersal and foraging habitat based on treatments, Mitigation measures, such as LOPs for road reconstruction activities that occur in PACs and canopy cover would be maintained at 50 percent for the majority of DFPZs and CWHR 5 (trees 11-24 inches) and approximately 40 percent canopy cover for CWHR 4 (24 inches or greater). The decision assumes some short-term risk because it decreases spotted owl habitat suitability, and potentially, owl use of the treated areas.
WILD	101		1-7	The HRCAs are 700-acre foraging buffers that surround 300-acre PACs. Some HRCAs maintain less than 700 acres of foraging habitat. There is a varying level of overlap of HRCAs due to the lack of available suitable habitat, predominately due to the amount of surrounding private lands (SNFPA ROD 2004, page 39). However, the HRCA standard and guidelines within the SNFPA FSEIS/ROD do not apply to HFQLG FEIS/ROD projects, the term HRCA was used to refer to the GIS-mapped

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				"foraging habitat" for each California spotted owl protected Activity Center (PAC). Foraging habitat for each spotted owl PAC is required to be analyzed under the HFQLG FEIS/ROD. There are 21 HRCA in the wildlife analysis area. Of the 21 HRCAs, 18 HRCAs would be affected. Of the 23,315 acres of suitable foraging within the Sugarberry. The preferred alternative would reduce foraging habitat suitability within HRCAs by 553 acres. Treatments will affect less than 10 percent of HRCAs. See below for a break down of treatments in HRCAs. There are 3,295 acres proposed for DFPZ/GS/ITS treatment. Of the 3,295 acres, there are 1,055 acres of the treatments within HRCAs (BE/BA, pages 161-162). The 1,055 acres are 8.9% of the 11,799 acres of HRCA acres available within the analysis area. Treatments in Home Range Core Areas (HRCA) (considered foraging acres) will not be reduced beyond foraging suitability. • Of the 2,100 acres of DFPZ there are approximately 360 acres (3%) would be affect HRCAs. Of the 250 acres of DFPZ thinning treatments there are approximately 108 acres in HRCAs, 0.9% of the available HRCA acres. Of the 1,850 acres of non-thinning DFPZ there are approximately 258 acres in HRCAs, 2.2% of the available HRCA acres. • Of the 1,040 acres of GS, habitat suitability would be reduced on approximately 553 acres (4.8%) on HRCAs. • Of the 155 acres of ITS, habitat suitability would be reduce on for approximately 127 acres (1.1%) on HRCAs.

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WILD	101		1-7	Table 26 Pages 163-165 Details the acres impacted in HRCAs by Group Selection in California spotted owl foraging habitat associated with each PAC.
WILD	101	The risk analysis completed indicated a degree to which habitat within the home range core area (HRCA) would be altered, but there is no information presented on the existing quality of each PAC and HRCA. The persistence of owls in PACs and HRCAs where the existing habitat condition is less than optimal may be disproportionately affected by harvest activities that present a high risk. This potential for additional risk due to habitat fragmentation and degradation is supported by a number of recent studies.	1-8	See response to comment letter number 1-7.
WILD	101	The risk analysis presented in the BE should be combined with an evaluation of the existing condition of each PAC and HRCA to further identify the potential for abandonment of nest sites by spotted owl as a result of project activities.	1-9	See response to comment letter number 1-6 and 1-7.
WILD	101	Impacts to nest areas are not evaluated.	1-10	The management direction found in the 2004 ROD and HFQLG EIS and applicable standards and guidelines refers to management of owls at the SOHA (1000 ac), PAC (300 ac) and HRCA scale (1,000 ac; which includes the 300 acre PAC). There is no requirement or standard and guideline provided for managing owls at the home range scales beyond 1,000 acres. Therefore effects analysis are focused on effects to habitat at the SOHA, PAC and HRCA scale. Analysis at a larger scale is disclosed when suitable habitat is analyzed at the analysis area scale, since the analysis area sets the bounds for the effects analysis. At this scale, the amount of suitable habitat retained

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				across the analysis area is disclosed. California spotted owl surveys conducted for the Sugarberry Project were not designed to be a “demographic study” but were to determine location of activity centers (nest, pair, young, etc.) and reproductive success for the three years surveyed. Demographic studies are being conducted for the California spotted owl in the Sierra Nevada which look at demographic parameters including age-specific nesting and nest success rates, age-specific fecundity, age- and sex-specific survival rates, the finite rate of population change, and sex and age class structure of the population. The 2006 meta-analysis concludes that the potential consequences of the Forest Service management plan to spotted owls are unknown because: (1) the extent of vegetation manipulations is largely under the control of local managers and will likely vary across the Sierra Nevada; and (2) threshold levels of quality habitat necessary to maintain individual pairs of spotted owls on a site are largely unknown. The recommendations from the meta-analysis are to develop well designed experimental studies coupled with the spotted owl demographic studies. The PLAS administrative study is mentioned as quasi-experimental limiting the scope of the results of the studies.
WILD	101		1-10	Blakesley’s guidance was considered during the analysis of the Sugarberry project, however, due to the limited amount of suitable habitat being affected, the lack of treatments within PAC, SOHAs, and the implementation of LOPs, owl sites within the Sugarberry project will not be affected by project activities, therefore the Blakesley analysis was not completed. There are a total of 21 PACs/SOHAs/HRCAs designated in this analysis area. Changes to suitable owl habitat across this analysis

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				area have been disclosed in the BA/BE and the DEIS. Impacts to habitat within individual Home Range Core Areas was analyzed and documented in the Project BA/BE and DEIS. This analysis included changes to habitat as a result of fuel treatments, group selection and ITS in terms of acres treated and acres of suitable habitat changed to unsuitable habitat within HRCAs. Refer to Appendix E for a summary of the HFQLG FEIS/ROD and the SNFPA FEIS and the SNFPA FSEIS/ROD directions, standards and guidelines, and effects discussion for the California spotted owl. No activity (trees will not be removed) will be conducted within Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs). The wildlife analysis area for the Sugarberry Project was developed to include owl PACs/SOHAs/HRCAs that would incur direct impacts as a result of changes to habitat due to project effects, as well as additional PACs/SOHAs/HRCAs that would not be directly impacted by project activities and habitat modifications. The treatments would be situated to avoid California spotted owl Protected Activity Centers (PACs), Spotted Owl Habitat Areas (SOHAs), federally listed Threatened and Endangered species, and old-forest stands (CWHR size 5M, 5D, and 6D within late-successional old-growth rank 4 and 5 stands). For “core areas” comment see response to #6 below
WILD	101		1-10	Management objectives are to protect owl habitat. Several ways this is accomplished: 1) The treatments would be situated to avoid California spotted owl Protected Activity Centers (PACs), Spotted Owl Habitat Areas (SOHAs), federally listed Threatened and Endangered species, and old-forest stands (CWHR size 5M, 5D, and 6D within late-successional old-growth rank 4 and 5 stands).

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				2) For DFPZ, GS and ITS there is a 30" dbh maximum cut level. Canopy cover would be maintained at 50 percent for the majority of DFPZs. The minimal requirement for spotted owl foraging is 40% canopy cover. 4) Spotted owl PACs and associated HRCAs in the project area would be created in the future, if required. The establishment of spotted owl PACs and HRCAs, as well as northern goshawk PACs, would conserve habitat for this species. In addition, the large tree component is protected (>30 inches), there is approximately 0.3% total number of trees that would be removed for operability. This is a high estimate based on vegetation modeling, however, Forest Inventory and Analysis (FIA) plots on the ground show that the numbers may be much lower.
WILD	101	Blakesley et al. (2005) and Blakesley (2005) provide guidance on an evaluation of existing condition and the alternatives that can indicate those owl sites at greatest risk from project activities. Such an evaluation should be included in the project analysis.	1-11	See response to comment letter number 1-11.
WILD	101	The DEIS Does Not Ensure That Minimum Thresholds in the HRCAs and Home Ranges for Owls are Being Maintained	1-12	See response to comment letter number 1-7.
WILD	101	Treatments must be designed to avoid the highest quality habitat and existing suitable habitat must be retained (although some habitat may be modified to meet fuels objectives).	1-13	See response to comment letter number 1-7.

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WILD	101	The Sugarberry project documents do not explain how this desired condition is being met. All the studies on HRCAs suggest that the HRCA area of 1,000 acres is critical habitat within an owl's home range that must be protected to insure viability. It may be that in some PACs, the current nest core habitat is already degraded such that the HRCA habitat is critical to avoid an isolated "island" surrounded by unsuitable habitat.	1-14	See response to comment letter number 1-7.
WILD	101	The Sugarberry Project also does not adequately disclose impacts to owls at the broader home range scale. This is a particular concern because some home range core areas have marginal habitat quality (BE, p. 161). The Forest Service has not examined the number of owl home ranges that would have less than 50 percent suitable habitat after project implementation. Therefore, the DEIS lacks any assessment of likely indirect negative impacts on the owl population, breeding or territory occupancy that this reduction in habitat may lead to. Indirect effects to home range in combination also need to be weighed with other past present and future actions in the analysis area.	1-15	See response to comment letter number 1-7.
WILD	101	The protection of PACs alone is inadequate to ensure owl survival and thus the Forest Service's failure to consider the existing condition and the	1-16	See response to comment letter number 1-7.

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		impacts of the project impacts on nest core areas, HRCAs, and home ranges does not constitute the hard look analysis required under NEPA.		
WILD	101	The DEIS should be revised to include an evaluation of desired conditions in HRCAs and an assessment of home ranges.	1-17	See response to comment letter number 1-7.
WILD	101	The Forest Service should avoid treatments that reduce the amount or degrade the condition of high quality habitat.	1-18	See response to comment letter number 1-7.
WILD	101	The DEIS does not consider project impacts on an appropriate temporal scale. The DEIS should disclose longer term impacts to owls including the fact that it would take "several decades" to re-establish the abundance of hypogenous fungi necessary to support the flying squirrels, the primary prey. Since "several decades" is well beyond the life expectancy of the existing owl population, the DEIS should more clearly address the indirect effects of logging and disruption of the prey base in the Sugarberry project and its impact on owl survival in the project area. The BE (p. 170) states there is uncertainty with regard to predicting effects of the proposed logging such as group selection on prey species. The project documents do not explain how this "uncertainty" was accommodated in the analysis of effects.	1-19	The purpose of the habitat modeling conducted for the Sierra Nevada Forest Plan Amendment Environmental Impact Statement (2001) and subsequent supplemental EIS (2004) 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 the long term would be very small (BE/BA Page 170). Large woody debris material meets or exceeds the recommended threshold in the majority of the proposed treatment units surveyed under the existing condition (Be/BA Page 173). The SNFPA FSEIS (HFQLG Land Allocation) standard and guideline for snags would be followed for the Sugarberry Project: four of the largest snag per acre using snags larger than 15 inches dbh, clumped and distributed irregularly. The average snags > 15 inch dbh within the Sugarberry Project, based on stand data consists on average of 4-6 snags per acre. The potential loss of

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		For a decision maker to make an informed decision, the effects must be estimated and disclosed.		some snags due hazard removal or use of prescribed fire should be considered during project planning to achieve desired snag retention levels. These levels were evaluated under the HFQLG FEIS and SNFPA FSEIS for TES species. Due to operability and safety, it is anticipated that most snags within group selections would be felled and the standard target level of snags would not be retained within all of the groups but would exist on the periphery of the groups. However, depending on each stands density and tree sizes, tree growth could be affected at varying rates due to competition for nutrients and space. While maintaining the minimum snag requirements in the short-term, reducing the tree competition could increase the recruitment of large trees and future snags, and LWM, for the long-term. However large woody debris material meets or exceeds the remanded threshold in the majority of the proposed treatments. The guidelines in the HFQLG FEIS (as amended by the SNFPA final EIS) provide protection for occupied nests and foraging habitat.
WILD	101		1-19	Responses of prey species, including small mammals and passerine bird use of group openings is one of the main objectives of the post implementation monitoring that would be conducted by PSW research through the Pumas and Lassen National Forests Case Study (BE/BA Page 191).
WILD	101	Conclusions about California Spotted Owl Population Trend are not Supported by the Data.	1-20	See response to comment letter number 1-3.
WILD	101	The MIS report (Appendix 1, p. 36) claims that the population trend for California spotted owl is stable on the Plumas National Forest. This finding is	1-21	See response to comment letter number 1-3.

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		contradicted by the results and conclusions in the Plumas-Lassen Administrative study annual report.		
WILD	101	There is a possibility that owl numbers have declined in the study area. The MIS report should be corrected to reflect the findings in the Plumas-Lassen Administrative study annual report.	1-22	See response to comment letter number 1-3.
WILD	101	The lack of significant reproduction in the planning area over the past 13 years combined with the declining levels of crude density of spotted owl in the QLG planning area suggest that this population is at risk. These results do not support the conclusion in the BE that the project impacts coupled with past habitat loss and other factors will not lead to a trend towards federal listing.	1-23	See response to comment letter number 1-3.
WILD	101	The boundary of the assessment area for the Sugarberry project is at a minimum 1 mile from a treatment unit boundary. The home range sizes and movement patterns of spotted owl, northern goshawk and marten are extensive. As a result, the cumulative effects of habitat alteration on individuals outside of the assessment boundary but still affected by past, present and reasonably foreseeable projects are not considered.	1-89	The terrestrial wildlife analysis area for determining direct, indirect and cumulative effects on terrestrial wildlife includes 38,545 acres of National Forest System land and 11,223 acres of private land for a total of 49,768 acres. Private land accounts for approximately 22.6 percent of the area which includes a high degree of commercial timber production and harvest. Sugarberry Project is surrounded by private land and/or other HFQLG projects. The analysis area for terrestrial wildlife was chosen based on the project treatment locations and the natural topography. The analysis area addresses the effects (direct, indirect, and cumulative) to owls at the PAC/HRCA scale. The direct and indirect effects of the project would not magnify beyond this boundary and would encompass cumulative effects to owls as a

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				result of project treatments. The cumulative effects analysis area includes past, present, and reasonably foreseeable future projects occurring within the Sugarberry Project terrestrial wildlife analysis area. Past actions were considered which have occurred in and around the proposed Sugarberry Project treatments, such as timber sales and fuel reduction projects on Forest Service and on private lands. Limitations of the analysis include future activities on private land (Sugarberry Project DEIS page 3-162). Sugarberry Project analysis was designed to comply with the Record of Decision (ROD) for the 2004 SNFPA Final Supplemental Environmental Impact Statement (FSEIS) and the 1988 Plumas National Forest (NF) Land and Resource Management Plan (LRMP) as amended by HFQLG 1999 FEIS and ROD, and 2003 FSEIS and ROD. Decisions were made to meet the legal requirements of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project (1998). The HFQLG EIS was an effort to look at the Plumas and Lassen (and Sierraville on the Tahoe NF) at a cumulative perspective.
WILD	101		1-89	Refer to the Sugarberry Project- Management Indicator Species (MIS) Report. The California spotted owl and American marten are MIS species for the Pumas NF. 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. The design features of DFPZs retain habitat elements within the range of those used by fisher for foraging and dispersal such that they are not likely to create large barriers to further expansion and connectivity for fisher (Ibid, page 243).

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WILD	101	Owls that disperse as a result of project induced effects could range many miles from their nest site in an attempt to find improved nesting habitat. These newly sought territories could be impacted by additional projects outside the Sugarberry analysis area and in turn have a cumulative impact on the subpopulation. It is likely that logging adjacent to the Sugarberry project area will exacerbate existing habitat fragmentation. However, the BE does not include the information that would be necessary to assess this issue.	1-90	See responses to comment letter numbers 1-2 and 1-33.
WILD	101	The Sugarberry cumulative effects analysis also does not take into consideration the home range size for marten and goshawk.	1-91	See response to comment letter number 1-89.
WILD	101	Conclusions about indirect and cumulative impacts or species viability made using an analysis area limited to 1 mile from the unit boundaries underestimates the project's adverse impacts on the marten or goshawk and the habitat that is potentially affected by the project.	1-92	See response to comment letter number 1-89.
WILD	101	The Forest Service has implemented or is planning to implement at least ten large (greater than 1,000 acres) fuel reduction projects on the Plumas National Forest. The cumulative effect of these projects, which are proposed for implementation at approximately the same time as the	1-93	Refer to response to 1-4 above for the California spotted owl. Under Alternative B, there are 3,295 acres proposed for DFPZ/GS/ITS treatment. Of the 3,295 acres, there are 1,055 acres of the treatments within Home Range Core Areas (HRCA). The 1,055 acres are 8.9% of the 11,799 acres of HRCA acres available within the analysis area.

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		Sugarberry project, is to reduce the suitability of many thousands of acres of nesting and foraging habitat for spotted owl and denning, resting, and foraging habitat for marten.		Minimal foraging habitat is being maintained for the owl as directed by the SNFPA ROD 2004 - Table 2 and HFQLG FEIS and ROD. Canopy cover in DFPZ units for the Sugarberry Project would be maintained at 50 percent (80 acres) except for two units that will be maintained at 40 percent (170 acres). DFPZ acre treatments that do not substantially affect canopy cover include mastication (750 acres), underburn and hand cut and pile burns (155 acres), underburn and hand cut tractor pile (250 acres) and Mastication/underburn (205 acres). Implementation of Defensible Fuel Profile Zones (DFPZs) is to reduce fire hazards around rural communities by as directed by the HFQLG Act. DFPZs are situated along on ridge-tops. Ridge-tops are not typically utilized for nesting habitat by the California spotted owl or Northern Goshawk. The Pacific fisher and American marten use ridge-top saddles to cross from one watershed to another but do not typically use ridge-tops for den or rest sites. Proposed treatments are not allowed in nesting habitat. These areas are protected in Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs). Foraging can also occur in what is considered nesting habitat. See responses to comment letter numbers 1-87 and 1-94.
WILD	101	Consideration of these projects in the cumulative effects analysis is important for at least three reasons. First, the Slapjack and Watdog projects are essentially adjacent to the Sugarberry project. Units for these projects occur within less than 2.5 miles from the boundary of units within the Sugarberry project. As mentioned above, these distances are well within the movement	1-94	Further Analysis will be done in the FEIS.

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		expected for several species of concern.		
WILD	101	The timing and scale of habitat degradation proposed in the projects listed in Table 4 could lead to an expansion of existing AOC 2 to the south or AOC 3 to the north, or to the creation of a new AOC. This potential cumulative effect is not considered in the DEIS.	1-95	The report entitled "The California Spotted Owl: a Technical Assessment of Its Current Status (also called the CASPO Report 1993)" identified Areas of Concern (AOC) within the range and distribution of the California spotted owl (USDA 1992). The Areas of Concern are all outside of the Feather River Ranger District of the Plumas National Forest. The two AOC's identified in the CASPO report are both on the Lassen National Forest, adjacent to the Plumas National Forest (page 46-49 of CASPO Report). These AOC are identified simply to indicate the potential areas where future problems may limit owl populations and where future problems may be the greatest if the owl's status were to deteriorate. As far as the projects listed in Table 2, page 4 (Summary of information for ten projects across the Plumas) of the comment letter, none of those projects are located in either AOC. The U.S. Fish and Wildlife Service (USFWS) on October 12, 2000 announced its 90-day finding to list the California spotted owl as Threatened or Endangered (Federal Register, Vol. 65, No. 198, 60605-60607). After the USFWS reviewed the best available science and commercial information available, they found the petitioned action not warranted. On May 23 2006, in response to a second petition to list the species the U.S. Fish and Wildlife Service provided a news release stating "Listing Of California Spotted Owl Found Not Warranted - Service finds most owl populations stable or increasing in the Sierra Nevada" (also see Federal Register, May 24, 2006, (Volume 71, Number 100)". AOC and implementation of HFQLG projects were considered in their "finding".

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WILD	101	The cumulative change to habitat resulting from all of these projects on the persistence and movement of marten and other species dependent on late seral forests has not been addressed in the DEIS.	1-96	The draft carnivore network is not a management requirement in the Plumas LRMP. This network is designed to evaluate habitat connectivity across the Plumas in order to maintain options for linking habitat between the Tahoe and Lassen National Forests. The 2004 SNFPA ROD identifies higher than average canopy closure as habitat attributes important to the Pacific Fisher, stating a minimum of 40% canopy cover needed. HFQLG FEIS BA/BE (page 121) identifies denning/resting habitat at greater than 60% canopy cover and forage/travel habitat at greater than 40% canopy cover (SNFPA 2001).
WILD	101		1-96	The canopy cover across Sugarberry is comprised primarily of CWHR 4M (40-59 % canopy cover) and 4D (60-80% canopy cover), with varying degrees of overlapping in canopy layers. Under Alternative C, post-thinning canopy cover is 40 to 50 percent. Note* The CWHR percentages reported do not reflect the canopy cover in protected areas, such as for the California spotted owl or Northern goshawk, which is typically above 70 percent canopy cover. Table 19 in the BE/BA Page 117 summarizes the incremental changes in CWHR size 4M, 4D, 5M and 5D pre- and post-project for Alternative C. In general the CWHR5M/Ds are reduced by 1% and the CWHR4M/Ds are reduced by 3%. Of the 10 projects listed in Table 2 (page 4 of the comments), three are found on the Feather River Ranger District; they are Watdog, Slapjack and the Basin Project. In the Watdog and Slapjack Project no treatments are proposed in the Draft Carnivore Network. In the Basin Project a portion of the corridor runs along the Middle Fork of the Feather. Out of the 17,034 acres of Draft Carnivore Network in the Basin Project Approximately 17 (0.1%) acres are proposed for ITS and 407 acres for GS (2.4%).

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WILD	101		1-96	Habitat retained. The habitat for carnivores such as Marten travel and forage primarily along rivers, streams and den and rest in mature/old forest habitat. Dens are found in trees, snags, downed logs and rocks in structurally complex mature/old forests. The Plumas network is comprised of four components: (1) the riparian zone, (An estimated 1.2% of total acreage of the treatment units is in riparian habitat conservation areas (RHCAs). (2) old-forest habitat, (3) connectors, and (4) known sightings. Much of the “draft” forest carnivore network is in areas reserved from harvest for other reasons (for example, California spotted owl PACs and northern goshawk PACs, or designated wild and scenic). Protection of corridors between “reserves” allows immigration and emigration to maintain healthy populations. Additional forest carnivore habitat exists outside of the “draft” forest carnivore network (page 195). Other project are discussed in the Sugarberry BE/BA in Table 14 (BE/BA Page 99) which displays past, current (or on going), or reasonably foreseeable future activities on public lands within or adjacent to the Sugarberry project area. Table 15 displays past, current (or on going), or reasonably foreseeable future activities on private lands within or adjacent to the Sugarberry Project area (BE/BA Page 99).
WILD	101	By tiering to the 1999 QLG FEIS and 2004 Framework FEIS, the Sugarberry project documents avoid assessing the habitat quality, and activities affecting such habitat quality, outside the assessment area. However, such avoidance is not supported by these analyses. In fact, both environmental documents expect that cumulative effects analyses will be conducted at the appropriate scale for each project undertaken.	1-97	See response to comment letter number 1-96.

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WILD	101	The cumulative effects analysis for spotted owl, marten and northern goshawk should be revised to address the effects of projects occurring on the Plumas National Forest and the intervening private land.	1-98	See response to comment letter number 1-94.
WILD	101	Why are you injecting HRCA land allocations into this project when they do not apply to the QLG Pilot Project?	11-1	Although the HRCA standard and guidelines within the SNFPA FSEIS/ROD do not apply to HFQLG FEIS/ROD projects, the term HRCA was used to refer to the GIS-mapped "foraging habitat" for each California spotted owl protected Activity Center (PAC). Foraging habitat for each spotted owl PAC is required to be analyzed under the HFQLG FEIS/ROD.
WILD	102	Recent research indicates that the marten's population may be imperiled in the northern Sierra and that the project area may play an important role in providing north-south habitat connectivity for the species.	1-25	Refer to the Plumas National Forest - MIS Report, 2007 and the Sugarberry MIS Report, 2007.
WILD	102	The DEIS does not discuss or acknowledge the apparent gap in the marten's distribution in the northern Sierra Nevada. Based on this new information, the marten's status is more imperiled than implied in the DEIS. NEPA requires that the project be reconsidered in light of this significant new information.	1-26	Refer to the Plumas National Forest - MIS Report, 2007 and the Sugarberry MIS Report, 2007.

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WILD	102	The DEIS fails adequately to disclose the project's likely adverse impacts to marten in several important respects. First, the BE underestimates the adverse project impacts to marten and fisher. The analysis assumes that marten and fisher utilize CWHR 4 with 40% canopy cover to the same extent as habitat with higher canopy cover and larger trees, therefore, "indirect effects as a result of implementing Alternatives B and C should have minimal effects on nesting or foraging habitat of forest carnivores." (BE, pp. 195-196). However, this is simply incorrect and the conclusions of the studies cited above contradict this assumption. According to Freel (1991, pp. 6-7), canopy cover of 40 percent is considered to provide "low" quality habitat for marten denning and resting, and inadequate habitat for travel corridors. Thus, the DEIS underestimates the project's adverse impacts to marten.	1-27	The analysis was designed to comply with the 2004 SNFPA FEIS Record of Decision (ROD) and the 1988 Plumas National Forest Land and Resource Management Plan (Forest Plan) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) EIS and ROD (1999). Both decisions were made to meet the legal requirements of the HFQLG Forest Recovery Act Pilot Project (1998). The habitat of best quality and the habitat that would provide denning/resting, and corridors for foraging and of connectivity would not be adversely affected by the Sugarberry Project. The forest carnivore network in the Sugarberry Project area includes a riparian or movement corridor along Slate Creek and Canyon Creek to the east. This habitat is within dense riparian corridors and saddles between major drainages, which could be used as trail ways. Moderate to high foraging habitat exists throughout the project area. However, high denning habitat and the best foraging habitat are located only in the southwestern half of the landscape, with only a few scattered patches in the northeastern half. Therefore, distribution of quality denning habitat within the project area is considered poor. The design features of DFPZs would retain habitat elements within the range of those used by fisher or the marten for foraging and dispersal, such that the DFPZs would likely not create large barriers to further expansion and connectivity to fisher habitat (BA/BE for the HFQLG FEIS, page 243). In addition the majority of DFPZ construction will take place on ridge tops. The Pacific fisher and American marten use ridge-top saddles to cross from one watershed to another but do not typically use ridge-tops for den or rest sites. In DFPZ units, treatment in RHCAs would be limited to underburning, hand piling, and hand thinning except in some plantation where mechanical treatment (mastication) is prescribed.

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WILD	102		1-27	There are approximately 8,070 acres of draft Forest Carnivore Network (dFCN) in the Sugarberry terrestrial wildlife analysis area (38,545 acres). The Sugarberry Project proposes approximately 3,295 acres of DFPZ, GS or ITS treatments. However, only approximately 133 of treatment acres are in draft forest carnivore network. Proposed treatments in the DFCN are approximately: 64 acres are DFPZ mastication and underburn; 40 acres of Group Selection; 18 acres ITS; and 11 acres of handcut, pile and burn. Although the existing suitability of habitat would be reduced, habitat would not be totally removed. Habitat suitability will be retained at minimum foraging levels (40% canopy cover) or higher. This analysis is based on HFQLG FEIS p3-110. Currently there are no known American Martin or Pacific Fisher in the Sugarberry Project area. Protocol-level surveys completed in autumn of 2002 and winter of 2003 found no sign of the target species in the Sugarberry area. Surveys follow the “American Marten, Fisher, Lynx, and Wolverine: Survey Methods for their Detection”; Zielinski/Kucera; PSW-GTR-157; August 1995.
WILD	102	Vegetation treatments such as mastication, burning, and tree removal may eliminate snags and trees for future snag recruitment, and downed woody materials – all critical habitat elements for marten. The DEIS fails to address marten’s need for up to 10 snags over 24” and down wood over 15” per acre. Furthermore, multi-layered stands with a developed understory have been identified as important habitat elements of suitable habitat for marten. DFPZ treatments eliminate understory altogether, thereby eliminating habitat for prey species such as tree squirrels and	1-28	Table 2 of the SNFPA FSEIS provides standards and guidelines to follow for snags recruitment and for large wood material.

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		small rodents needing cover and downed woody material as well. The Sugarberry documents fail to take a hard look at these likely impacts on the viability of marten in and adjacent to the project area.		
WILD	102	The extent of cumulative impacts to marten habitat have not been recognized in the DEIS. The DEIS finds that marten habitat on private timber lands in the Sugarberry project area has “been either heavily harvested or at least thinned, thereby removing the old growth component and leaving vast areas of open fragmented lands.” Studies have identified the negative influence of forest openings on marten presence and movement.	1-29	See response to comment letter number 1-27.
WILD	102	The BE concludes that even though the action alternatives would create habitat fragmentation, the project “would not increase any large-scale high-contrast fragmentation above existing levels.” This conclusion is both contrary to the analysis in the BE and contrary to recent research cited above. When combined with past projects, the implementation of the Sugarberry Project could result in significant reductions in habitat quality and quantity in 38% of the analysis area. Given the marten’s sensitivity to forest fragmentation and habitat degradation, the implementation of the proposed action could threaten marten’s viability and restrict its distribution. The DEIS	1-30	See response to comment letter number 1-27.

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		does not address the fragmented existing condition in the project area and as a result underestimates the impacts of further reducing the quality and quantity of marten habitat. The DEIS should be revised to evaluate the amount and distribution of openings and open canopy habitat existing on private and public lands and to evaluate the site specific effect of placing groups selection openings near areas that currently support open habitat conditions.		
WILD	102	The BE (pp.195-196) assumes that impacts to marten will be low because the Plumas forest carnivore network is assumed to be effective and because any marten den sites are assumed to have been identified, and none were. Neither of these assumptions is supportable.	1-31	See response to comment letter number 1-27.
WILD	102	There is no basis for assuming that the forest carnivore network will ameliorate the impacts of the Sugarberry project. The fact that no den sites have been identified by no means imply that none exist or may be affected by the Sugarberry project. The BE and DEIS should be revised to reflect the likely habitat degradation in the carnivore network and the effects that this activity will have on the persistence of marten.	1-32	

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WILD	102	The DEIS fails to adequately address the adverse impacts of high road density on the marten. The BE (p. 97) acknowledges that the Duncan Furbearer Interagency Workgroup (1989) recommends reduction of the road density down to 2.0 mi/mi^2. Greater road density degrades the quality of marten habitat, which may well contribute to the marten's apparent absence from much of the area.	1-33	Alternatives proposing road decommissioning are being considered for the Sugarberry Project FEIS.
WILD	102	The DEIS should evaluate alternatives involving a significant reduction in road density to benefit the marten, water quality in watersheds at or over their TOC, as well as other wildlife species.	1-34	See response to comment letter number 1-33.
WILD	102	The BE found that "the project treatments will remove some possible nesting habitat and bring the foraging habitat down to a minimal of 40% canopy cover" (BE, p. 194) and that the project would result in "modification or loss of habitat or habitat components, especially in regards to denning/resting habitat and foraging/travel habitat." (BE, p. 196). However, the summary of effects to marten and fisher contradicts these statements: "Although the existing suitability of habitat would be reduced, habitat would not be totally removed." (BE, p.194).	1-35	In the Sugarberry project terrestrial wildlife analysis area there are 23,674 acres of suitable denning/resting habitat (4D and 5D) and 10,139 acres of suitable foraging/travel habitat (4M and 5M). There are no CWHR 6s in the Sugarberry project area. Refer to Table 11 and Table 12 in the BE/BA (Page 80). Habitat suitability will be retained at minimum foraging levels or higher. Approximately 3,295 acres are proposed for DFPZ, GS or ITS treatments. However, only approximately 133 of treatment acres are in draft forest carnivore network. Proposed treatments in the DFCN are approximately 64 acres are DFPZ mastication underburn, 40 acres of Group Selection, 18 acres ITS and 11 acres Hand –cut pile and burn. Although the existing suitability of habitat would be reduced, habitat would not be totally removed. Habitat suitability will be retained at minimum foraging levels or higher. This analysis is based on HFQLG FEIS p3-110. Although the existing suitability of habitat would be reduced, habitat would not be totally removed. This analysis is based on

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				HFQLG FEIS p3-110. Additional forest carnivore habitat may exist outside of the forest carnivore network. Forest carnivores primarily travel and forage along rivers and streams, whereas they den and forage within mature/old forest habitat. The American marten prefers moderate-to high canopy closure, and in interspersion of riparian areas and meadows (SNFPA 2001). The mature/old forest blocks are predominately encompassed by California spotted owl PACs (6,110 acres) and SOHAs (2,139 acres) within Sugarberry analysis area) and Northern goshawk PACs (3,382 acres) within Sugarberry analysis area). Action alternatives B and C treatments would not enter known owl sites (PACS and SOHAs). Riparian zones, used as travel corridors, in general will not be altered. The project treatments will remove some possible nesting habitat and bring the foraging habitat down to a minimal of 40% canopy cover. The 2004 SNFPA ROD identifies higher than average canopy closure as habitat attributes important to the Pacific Fisher, stating a minimum of 40% canopy cover needed. HFQLG FEIS BA/BE (page 121) identifies denning/resting habitat at greater than 60% canopy cover and forage/travel habitat at greater than 40% canopy cover.
WILD	102	The BE lists potential adverse effects of the project including “Implementation of Alternatives B and C could effect….10,139 acres of foraging and travel habitat to low suitability for fisher or marten,” and “Group Selection in the project has the potential to create fragmentation of contiguous areas...” (BE, p. 198). Nonetheless, the paragraph concludes that “The proposed alternatives would not increase any large-scale high-contract fragmentation above existing levels.” (Ibid.) Thus, the determination	1-36	The BE/BA has been re-worded to reflect the meaning intended for the sentence. "Implementation of Alternatives B and C could effect l0,139 acres of foraging and travel habitat to low suitability for fisher or marten," Not all acres will be affected. In the Sugarberry project terrestrial wildlife analysis area there are 23,674 acres of suitable denning/resting habitat (4D and 5D) and 10,139 acres of suitable foraging/travel habitat (4M and 5M). Of those acres approximately 3,295 acres are proposed for DFPZ, GS or ITS treatments. Of the 3,295 acres approximately 133 acres are in draft forest carnivore network. There are 40 Groups Selection acres proposed in the Draft Forest Carnivore Network (DFCN). There are 18 acres of ITS treatments proposed in the DFCN. DFPZ Thinning treatments would reduce canopy cover

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		that “indirect and cumulative effects to marten are expected to be low” as a result of the Sugarberry project (BE, p. 212) is contradicted in the effects section.		
WILD	102	The timing and scale of habitat degradation proposed in the projects listed in Table 2 could lead to an expansion of existing AOC 2 to the south or AOC 3 to the north, or to the creation of a new AOC. This potential cumulative effect is not considered in the DEIS.	3-3	The report entitled “The California Spotted Owl: a Technical Assessment of Its Current Status (also called the CASPO Report 1993)” identified Areas of Concern (AOC) within the range and distribution of the California spotted owl (USDA 1992). The Areas of Concern are all outside of the Feather River Ranger District of the Plumas National Forest. The two AOC's identified in the CASPO report are both on the Lassen National Forest, adjacent to the Plumas National Forest (page 46-49 of CASPO Report). These AOC are identified simply to indicate the potential areas where future problems may limit owl populations and where future problems may be the greatest if the owl’s status were to deteriorate. As far as the projects listed in Table 2, page 4 (Summary of information for ten projects across the Plumas) of the comment letter, none of those projects are located in either AOC. The U.S. Fish and Wildlife Service (USFWS) on October 12, 2000 announced its 90-day finding to list the California spotted owl as Threatened or Endangered (Federal Register, Vol. 65, No. 198, 60605-60607). After the USFWS reviewed the best available science and commercial information available, they found the petitioned action not warranted. On May 23 2006, in response to a second petition to list the species the U.S. Fish and Wildlife Service provided a news release stating “Listing Of California Spotted Owl Found Not Warranted - Service finds most owl populations stable or

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				increasing in the Sierra Nevada" (also see Federal Register, May 24, 2006, (Volume 71, Number 100)". AOC and implementation of HFQLG projects were considered in their "finding".
WILD	102	The BE does not recognize that significant portions of the network will be degraded by future projects. The cumulative change to habitat resulting from all of these projects on the persistence and movement of marten has not been addressed in the DEIS.	3-4	The 2004 SNFPA ROD identifies higher than average canopy closure as habitat attributes important to the Pacific Fisher and Marten, stating a minimum of 40% canopy cover needed. HFQLG FEIS BA/BE (page 121) identifies denning/resting habitat at greater than 60% canopy cover and forage/travel habitat at greater than 40% canopy cover (SNFPA 2001). The canopy cover across Sugarberry is comprised primarily of CWHR 4M (40-59 % canopy cover) and 4D (60-80% canopy cover), with varying degrees of overlapping in canopy layers. Under Alternative C, post-thinning canopy cover is 40 to 50 percent. Note* The CWHR percentages reported do not reflect the canopy cover in protected areas, such as for the California spotted owl or Northern goshawk, which is typically above 70 percent canopy cover. Table 19 in the BE/BA Page 117 summarizes the incremental changes in CWHR size 4M, 4D, 5M and 5D pre- and post-project for Alternative C. In general the CWHR5M/Ds are reduced by 1% and the CWHR4M/Ds are reduced by 3%. Habitat retained. Forest carnivores such as Marten and Fisher travel and forage primarily along rivers, streams and den and rest in mature/old forest habitat. Dens are found in trees, snags, downed logs and rocks in structurally complex mature/old forests. The Plumas network is comprised of four components: (1) the riparian zone, (An estimated 1.2% of total acreage of the treatment units is in riparian habitat conservation areas (RHCAs)). (2) old-forest habitat, (3) connectors, and (4) known sightings. Much of the "draft" forest carnivore network is in areas reserved from harvest for other reasons (for example, California spotted owl PACs and northern goshawk PACs, or designated wild and scenic). Protection of corridors between "reserves"

Subject Code	Category Code	Comment	Comment Letter Number	Response
				allows immigration and emigration to maintain healthy populations. Additional forest carnivore habitat exists outside of the “draft” forest carnivore network (page 195).
WILD	102		3-4	Other project are discussed in the Sugarberry BE/BA in Table 14 (BE/BA Page 99) which displays past, current (or on going), or reasonably foreseeable future activities on public lands within or adjacent to the Sugarberry project area. Table 15 displays past, current (or on going), or reasonably foreseeable future activities on private lands within or adjacent to the Sugarberry Project area (BE/BA Page 99). Of the 10 projects listed on in Table 2 page 4 of the comments, three are on the Feather River Ranger District; they are Watdog, Slapjack and the Basin Project. In the Watdog and Slapjack Project no treatments are proposed in the Draft Carnivore Network. In the Basin Project a portion of the corridor runs along the Middle Fork of the Feather. Out of the 17,034 acres of Draft Carnivore Network in the Basin Project approximately 17 (0.1%) acres are proposed for ITS and 407 acres for GS (2.4%).
WILD	103	The Forest Service is required by its own regulations and management plans to monitor the populations of management indicator species (“MIS”) and other wildlife. The Forest Service failed to comply with these requirements in the Sugarberry documents. As a result, the DEIS also failed adequately to assess the project’s environmental impacts to these species and their habitat.	1-37	See response to comment letter number 1-33. Refer to the Sugarberry MIS Report including an appendix for the Plumas National Forest MIS Report.
WILD	103	The Plumas plan as amended in 2004 includes the monitoring originally specified in the forest plan as well as the additional monitoring identified in	1-38	See response to comment letter number 1-37.

Subject Code	Category Code	Comment	Comment Letter Number	Response
		Appendix E. As described below, the Forest Service has failed to comply with these requirements.		
WILD	103	The forest wide MIS report states that there are currently 144 protected activity centers (PACs) established for goshawks on the forest. (MIS report, p. 23). The LRMP requires the survey for occupancy in 25% of established nest groves annually. (USDA Forest Service 1988, Table 5-1, p. 5-7). Thus, the LRMP monitoring requirement is to survey 25% of the 144 nest stands or 36 nest stands. The MIS report (p. 10) indicates that “forest plan monitoring and survey efforts (USDA 1988) to determine occupancy on 25 percent of known nest groves was attempted annually from 1988 to 2000.” However, the results of these surveys are not reported. The MIS report (p. 31) does indicate that 38, 28 and 21 active nests were monitored in 2004, 2005, and 2006, respectively. In all but the first year of this monitoring, less than 25% of the PAC across the forest had been surveyed. Based on the data provided, it appears that the annual monitoring requirements of the forest plan as adopted in 1988 have only been met for one out of 18 years.	1-39	See response to comment letter number 1-37.

Subject Code	Category Code	Comment	Comment Letter Number	Response
WILD	103	The type of monitoring and frequency required by the LRMP, as originally adopted in 1988, has not been completed for goshawk, an MIS. Therefore, conclusions regarding the effects of this project on the goshawk population can not be determined.	1-40	
WILD	103	Annual distribution and demographic monitoring is required for northern goshawk, an MIS. (USDA Forest Service 2001, Appendix E, p. E-51; MIS report, p. 9). The MIS report does not display the results of such distribution and demographic monitoring.	1-44	Survey results can be found in the Sugarberry BE/BA. Surveys completed to protocol for the Sugarberry Project, separate Northern goshawk survey efforts occurred in: Sugar Etals (lower Sugarberry), Strawberry Etals (upper Sugarberry) and Lower and Upper Slate. Holmes-TerraMar conducted surveys in Strawberry Etals for the Northern Goshawk beginning June to the end of August (2005 & 2006). North State Resources, Inc. (NSR) conducted surveys for the Northern Goshawk in Sugar Etals during June through August 2004 and 2005. From 2002 through 2005, ECORP Consulting Inc. conducted three years of surveys for California Spotted Owls and Northern Goshawks in several selected areas on the Plumas National Forest-FRRD for past project monitoring. Additionally, outside the project area, the Arroyo Chico Resources conducted surveys 2004 and 2005 for northern goshawk in accordance with the Survey Methodology for Northern Goshawks in the Pacific Southwest Region, U.S. Forest Service (2002). The area surveyed was for the Bald Mountain Project, located above the Sugarberry Project and to the Northwest side of Little Grass Valley. In 1989–1997 historical surveys reported 3 nest site locations. In 2001, surveys were conducted for both Upper and Lower Slate, yielding 5 nests. Forest Wheeler Environmental Corporation in 1999-2000, surveyed Upper Slate.
WILD	103	We believe this project would harm some MIS and SAR species for which annual population monitoring is required by App. E of the 2001 Framework, but for	8-12	For the Sugarberry Project analysis, habitat and population information for each Pumas MIS was gathered from several sources. As per “MIS Analysis and documentation in Project Level NEPA” dated May 23, 2006 (PSW Region 5), when

Subject Code	Category Code	Comment	Comment Letter Number	Response
		which no such monitoring has been conducted. As such, the project cannot proceed unless either the required monitoring is conducted, or it is substantially redesigned such that it will not harm habitat for these MIS and SAR species		governing Forest LRMP “requires population monitoring or population surveys, the MIS effects analysis for the project must be informed by habitat monitoring or surveys, the MIS effects analysis for the project my be informed by habitat monitoring and/or analysis”. There is no such requirement by the LRMP to analyze effects of SAR species that are not MIS. Forest level population monitoring data has been presented in the November 2006 Pumas NF MIS Report, which was incorporated by reference and served as the main source for the Forest level population information for the Management Indicator Species Report developed for the Sugarberry Project. The MIS whose habitat would be either directly or indirectly affected by the Sugarberry Project, identified as Category 3 in Table 1 of the Sugarberry MIS report, are carried forward in analysis. This MIS report will evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of the Category 3 non-TES MIS and summarize effects to those TES MIS discussed in the BA/BE. The MIS in the Sugarberry Project are: California Spotted Owl, Northern Goshawk, American Marten, Mule Deer and Trout group. See Page 10-12 “How MIS Monitoring Requirements are being Met”. Management indicator species for the Project Analysis for the Sugarberry Project that not discussed because of lack of habitat for the species are the Bald eagle, Peregrine Falcon, Canada Goose, Prairie Falcon and Largemouth bass (See the Sugarberry MIS report). Management Indicator Species (MIS) for the Plumas NF are identified in the LRMP (USDA 1988). The MIS analyzed for the Sugarberry Project were selected from this list of MIS identified in the LRMP, Table 1 of the MIS document.

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WILD	103		8-12	In addition, Table 1 in the Sugarberry MIS identifies the status of the MIS (2nd column), the reason each MIS was identified in the LRMP (3rd column) and discloses whether or not the MIS is potentially affected by the Sugarberry Project (4th column) (page 7). Hence, where the Plumas NF LRMP requires population monitoring or population surveys for an MIS, the project-level effects analysis for that MIS may be informed by population monitoring data, which are gathered at the forest or bioregional scale. Population monitoring and survey data are not generally gathered for site-specific projects, consistent with the 2005 planning rule, which states, “Site-specific monitoring or surveying of a proposed project or activity area is not required, but may be conducted at the discretion of the Responsible Official” (36 CFR 219.14(f)). For certain MIS, the Plumas NF LRMP does not require population monitoring or surveys; for these MIS, project-level MIS effects analysis can be informed by forest-scale habitat monitoring and analysis alone. The Plumas NF LRMP requirements for MIS analyzed for the Sugarberry Project are summarized in Section 3 of the MIS report. (MIS report page 4/5). Forest or bioregional scale monitoring requirements for the Plumas NF’s MIS are found in the Monitoring Plan of the LRMP (USDA 1988, Chapter 5, pages 5-1 to 5-21) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement and Record of Decision (SNFPA FEIS/ROD) (USDA 2001), as adopted by the 2004 Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement and Record of Decision (SNFPA FSEIS/ROD) (USDA 2004) and modified by Chapter 2 of the 2004 SNFPA SEIS (MIS report page 5).

Appendix I

National Forest Management Act Findings

Appendix I:
National Forest Management Act Findings

Finding of Facts Pursuant to the National Forest Management Act

Based on the environmental analysis and prescriptions for stands in the Watdog Project Area, the following finding of facts pursuant to the National Forest Management Act, as follows:

A. The minimum specific management requirements to be met in carrying out projects and activities for the National Forest System are set forth in this section. Under 16 U.S.C. 1604 (g)(3)(E) a Responsible Official may authorize project and activity decisions on NFS lands to harvest timber only where:

1. Soil, slope, or other watershed conditions will not be irreversibly damaged

The Plumas National Forest Land and Resource Management Plan (LRMP) Forest-wide Standards and Guidelines as amended by *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) and the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (SNFPA FSEIS ROD) relating to soil cover, water quality, and riparian system protection, along with Scientific Assessment Team guidelines and Best Management Practices (BMPs) would be implemented to protect and mitigate potential impacts to soil and water quality.

The District Hydrologist has determined through a Cumulative Watershed Effects (CWE) Analysis that no irreversible or irretrievable commitments of soils, riparian, or water resources are expected for any alternative (see Hydrology and Soils Reports).

2. There is assurance that such lands can be adequately restocked within five years after harvest

All trees proposed for removal under the Watdog Project would be by thinning from below for the Defensible Fuel Profile Zones (DFPZs) and group selection, which is an uneven-age (all-aged) method. Therefore, no regeneration harvests are proposed under this project. However, the areas proposed for harvest under group selections can be regenerated using standard reforestation techniques.

3. Protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat

The Plumas National Forest LRMP forestwide Standards and Guidelines as amended by the HFQLG Act SNFPA FSEIS ROD relating to soil cover, water quality, and riparian system protection, along with Scientific Assessment Team guidelines and BMPs would be implemented to protect and mitigate potential impacts to soil and water quality.

4. The harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber.

All trees proposed for removal under this project are in segments of DFPZs called for by the HFQLG Act. The purpose of removing trees is to reduce ladder fuels and crown density. Harvest and treatment methods are used to implement this direction within the limits imposed by the SNFPA EIS ROD. In those areas where trees are removed for commercial purposes, the primary silvicultural method is intermediate harvest (thinning from below) and utilizes ground-based equipment.

It is not likely there would be no economic timber sale with this proposal, but there would be service contracts with an embedded timber sale. Wood products would be removed from the area for use in local mills or energy plants but not in the quantities anticipated with the HFQLG Act.

SNFPA FSEIS ROD standards and guides reduce most opportunities for an economical return and produce nominal timber outputs. The various treatment methods and systems were prescribed to provide a viable method of meeting a wide variety of resource management objectives without optimizing one resource at the expense of another.

B. A Responsible Official may authorize project and activity decisions on NFS lands using clearcutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an even-aged stand of timber as a cutting method only where:

Even-aged management would not be applied to the stands at this time.

1. For clearcutting, it is determined to be the optimum method, and for other such cuts it is determined to be appropriate, to meet the objectives and requirements of the relevant land management plan (16 U.S.C. 1604 (g)(3)(F)(i))

Group selection harvests (0.5 – 2.0 acres) are an uneven-aged management method and are allowed by SNFPA EIS ROD, Table 2, page 68.

2. The interdisciplinary review as determined by the Secretary has been completed and the potential environmental, biological, esthetic, engineering, and economic impacts on each advertised sale area have been assessed, as well as the consistency of the sale with the multiple use of the general area (16 U.S.C. 1604 (g)(3)(F)(ii))

The interdisciplinary team (IDT) used a systematic, interdisciplinary approach to analyze the affected area and estimate the environmental effects. The analysis included input through public involvement. The interdisciplinary analysis was based on LRMP direction, as amended by HFQLG Act and SNFPA FSEIS ROD of 2004.

3. Cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain (16 U.S.C. 1604 (g)(3)(F)(iii))

Even-aged management would not be applied to the stands at this time. However, group selection areas are dispersed, and the shapes are, indeed, naturally appearing.

4. There are established according to geographic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal; provided, that such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm (16 U.S.C. 1604 (g)(3)(F)(iv))

The Watdog Project is designed to fulfill the management direction specified in the Plumas National Forest LRMP, as amended by the HFQLG ROD (1999) and the SNFPA FSEIS ROD (January 21, 2004).

To implement group selection harvest from 0.5 to 2.0 acres in size, as directed in the HFQLG Act (Section 401 (b) (1) and (d) (2)) and the HFQLG Forest Plan Amendment, to test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multi-story, fire resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and promote ecological health of the forest.

The HFQLG Act specifies treating annually 0.57 percent of the pilot project acreage with group selection harvests. In the HFQLG EIS (Appendix E – Group Selection Analysis) there is a calculation of 8,700 acres being treated annually over the pilot project land base. The proposed group selection harvests (231 acres) are within the calculated 20-year re-entry levels (271 acres) of group selection targets for the Watdog Project area.

5. Such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource (16 U.S.C. 1604 (g)(3)(F)(v))

No harvest cuts are designed to regenerate even-aged stands. However, soil, watershed, fish and wildlife, recreation, and aesthetic resources would be protected. Also, as stated above all areas can be regenerated using standard methods.

6. Under 16 U.S.C. 1604 (m) even-aged stands of trees scheduled for regeneration harvest generally have reached culmination of mean annual increment of growth, unless the purpose of the timber cutting is excepted in the land management plan (FSM 1921.17f)

Even-aged management would not be applied to the stands at this time. Group selection harvests (0.5–2.0 acres) are an uneven-aged management method.