Chapter 3. Affected Environment and Environmental Consequences

3.1 Changes Between the Final Environmental Impact Statement and the Final Supplemental Impact Statement

Edits, minor changes, and clarification were completed throughout this chapter to augment the extent of the analysis and clarify information previously presented. Changes and supplementary analysis were accomplished to respond to agency and public review and comments on the Draft Supplemental EIS. Most notable of the changes include additional discussion on potential effects to: wildlife species under the No Action Alternative, snags and associated snag-dependent wildlife species, soils and California Wildlife Habitat Relationship size classes 4 and 5 landscape structure types linked to Old Forest-associated species (in particular the American marten and Pacific fisher). Clarification of design criteria and practices related to black oak stand treatment practices and down wood retention design features relative to size class were incorporated. Additionally, sawlog values were updated to reflect recent market data along with clarification of the Secure Rural School Self-Determination Act.

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

3.1.1 Scope of the Analysis

The existing condition describes the baseline condition against which environmental effects can be 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 Forest Plan standards and a summary of monitoring required by the *National Environmental Policy Act of 1969* (NEPA) and *National Forest Management Act*. The discussion centers on direct, indirect, and cumulative effects along with applicable mitigation measures. Irreversible and irretrievable effects are also discussed for each resource indicator. Effects can be neutral, beneficial, or adverse. These effects are defined as follows:

- Direct effects are caused by the action and occur at the same place and time as the action.
- Indirect effects are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable.
- Cumulative effects are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

- Irreversible effects are 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 effects are losses of productivity or use for a period of time. One example is road construction on suitable timberlands. Timber growth on the land is irretrievably lost while the land is used as a road; however the timber resource is not irreversibly lost because the land could grow trees again in the foreseeable future.

3.1.2 Description of Alternatives

Brief descriptions of the four alternative management scenarios analyzed for this proposal are provided below. Alternatives B, C, and D are referred to collectively as the action alternatives.

Alternative A – No-Action Alternative. Under this alternative, the Forest Service would not construct Defensible Fuel Profile Zones (DFPZs), harvest timber using group selection silvicultural methods, conduct watershed and wildlife habitat restoration activities, or improve transportation systems at this time.

Alternative B – Preferred Alternative. This alternative proposes to reduce canopy cover to 40 percent in stands of medium to large trees greater than 24 inches diameter at breast height (dbh) (California wildlife habitat relationships [CWHR] Size Class 5 stands). Stands of small, 11 to 24 inches dbh trees (CWHR Size Class 4 stands) would be thinned to 70 trees per acre at 25 foot spacing. This alternative addresses two design criteria in the Herger-Feinstein Quincy Library Group (HFQLG) FEIS Appendix J, Fire and Fuels. These criteria are: (1) for aerial fuels, overstory crowns are spaced at distances that reduce the potential for crown fire spread, and (2) treat surface fuels to produce less than 4 foot flame length or be below the fire intensity threshold that would result in 10 percent mortality within the residual stand. No trees 30 inches dbh or larger would be cut except as needed for operability.

Alternative C – Maintain 40 Percent Canopy Cover in CWHR Size Class 4 and 5 Stands. This alternative is designed to retain 40 percent canopy cover in CWHR Size Class 5 stands (medium to large trees greater than 24 inches dbh) and CWHR Size Class 4 stands (small trees 11–24 inches dbh) in DFPZs. This alternative addresses the canopy cover design criteria in HFQLG FEIS Appendix J, Fire and Fuels. The criteria is to retain 40 percent canopy cover and, if less than 40 percent, make up the difference with trees 12 to 24 inches dbh. For the CWHR Size Class 4 stands, instead of thinning to 70 trees per acre, each stand would be thinned from below to 40 percent canopy cover. No trees 30 inches dbh or larger would be cut except as needed for operability.

Alternative D – Maintain 50 Percent Canopy Cover in CWHR Size Class 4 and 5 Stands with 20-inch upper diameter limit. This alternative proposes to retain 50 percent canopy cover in CWHR Size Class 4 and 5 stands with a less than 20-inch dbh harvest limit in DFPZs. Acres of group selection would be reduced to 151 acres in order to maintain an average of 50 percent canopy within each of the stands. No trees 30 inches dbh or larger would be cut except as needed for operability.

3.1.3 Cumulative Effects Analysis

Each resource section includes a discussion of cumulative effects focused on evaluating the effects of the proposed action in context with relevant effects from past, present, and reasonably foreseeable actions. Past, present, and foreseeable future actions considered in the cumulative effects analyses will vary for each resource. Relevant actions are those expected to generate effects on a specific resource that will occur at the same time and in the same place as effects from the proposed action. 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.

Table 3-1 displays recently past, current (or ongoing), reasonably foreseeable future, and future activities within or near the Watdog Project that are or could contribute to relevant effects (i.e., effects that overlap in space and time with effects of the proposed action). This table is not intended to provide an all-inclusive list of relevant actions. As explained in the "Cumulative Effects" section for each resource, the analysis for each resource may not consider all actions listed in table 3-1 or it may consider additional actions not listed in the table. Several resource areas refer to table 3-1, while others provide a separate list of actions considered in the analysis of cumulative effects. No recreation projects, Notices of Intent (NOIs), Plans of Operations, or Special Use Authorizations are known from the project area for the recent past or foreseeable future.

Table 3-1. Past, present, future, and foreseeable future actions in and near the Watdog Project area.

Project	Location	Activity	Time Period
Camel Peak	Camel Peak	1,080 acres of site prep for planting and seeding, planting, release, and pre-commercial thinning	1965–1984
Lava	Camel Peak	321 acres of commercial harvest	1985
Table Mountain	Table Mountain	400 acres of commercial harvest	1986–1987
Hartman II	Hartman Ridge	672 acres of commercial harvest	1988
Watson - North	Watson Ridge	255 acres of clearcut; 47 acres overstory removal (OSR)/sanitation; 32 acres OSR/thinning	1987–1990
Watson - South	Watson Ridge	151 acres clearcut; 14 acres thin; 74 acres OSR/sanitation	1987–1990
Tamarack Flat	Lumpkin Ridge	350 acres of commercial harvest	1987–1990
South Branch	Whiskey Hill	95 acres of commercial harvest	1991
Mountain House	Mountain House	123 acres of commercial harvest	1991
Watson Ridge Underburn	Westernmost portion of Watson Ridge	500 acres of underburn	1995
Watson Thinning	Watson Ridge	100 acres commercial thin; 90 acres biomass thin; 65 acres mastication; and 25 acres precommercial thin	1995–1996
Steward Thinning	Steward Ravine	188 acres intermediate cut thinning	1997
Brush Creek Fuel Reduction Project	Between French Creek Basin, Bald Rock, and the Middle Fork of the Feather River	690 acres thin from below and biomass removal; 335 acres plantation maintenance; 755 acres underburn	2000

Table 3-1. Past, present, future, and foreseeable future actions in and near the Watdog Project area (continued).

Project	Location	Activity	Time Period
Watershed Improvement Projects	Head of Fall River and Table Mountain Meadow Complexes, Daley Cow Camp and Watson Cabin Meadows	22 acres of conifer removal, fencing, streambank stabilization	Past
	South Branch Middle Fork Feather River, low water crossing near 22N94	7 acres of bank stabilization	Past
	Throughout the project area	11.5 miles of road closure, decommissioning, and/or stabilization	Past
Black Rock Hazard	Little Grass Valley Resevoir	Removal of hazard trees on approximately 225 acres	2005-2006
South Fork DFPZ	Mooreville Ridge	31 acres mechanical removal of fire-killed trees; 840 acres mechanical thin and biomass removal; 400 acres mastication; and 1,410 acres underburn	Present
Feather Falls Salvage	Private land near Feather Falls	14,314 acres of salvage (harvest of dead, dying, or diseased trees of any size in amounts less than 10 percent of average volume per acre)	Present
Bald Onion	Bald Mountain, Onion and Little Grass Valley	1,263 acres thin from below and biomass removal; 1,584 acres underburn only	Present
Range / Grazing	Project area	One active range permit in Fall River grazing allotment	Present
Bald Mountain	Near Little Grass Valley Reservoir and South Fork Feather River	90 acres group selection; 100 acres individual tree selection	2006
Hartman Bar Hazard Tree	22N94 road and Hartman Bar trailhead (T22N, R8E, sections 23, 26, 27, 33, 34	Removal of hazard trees on approximately 275 acres along roadside and at trailhead	2006-2007
Meadow Valley	Bucks Lake and Meadow Valley	5,700 acres of DFPZ fuel treatments, and 675 acres of group selection	2006–2007
Tamarack Flat Hazard Tree	T22N, R8E, Sec. 17, 18, and 19; T22N,R7E, Sec. 13, 23, and 24	Removal of hazard trees on approximately 220 acres	2006-2007
Lost Creek Hazard Tree	T21N, R8E, Sec. 30; T21N, R8E, Sec. 27	Removal of hazard trees on approximately 175 acres	2007-2008
Mule Hazard Tree	T22N, R8E, Sec. 25, 26, and 35	Removal of hazard trees on approximately 110 acres	2007-2008

Table 3-1. Past, present, future, and foreseeable future actions in and near the Watdog Project area (continued).

Project	Location	Activity	Time Period
Basin	Granite Basin and Buckhorn Valley	1,109 acres of group selection, 72 acres of individual tree selection, and 82 acres of aspen enhancement	Foreseeable future (2007)
Chimney Rock Tie	Chimney Rock: Forest Service and private lands	20 acres of roadway clearing; construct 2.5 miles of new road and decommission 0.5 mile existing road on Forest Service land	Foreseeable future (2006–2007)
Fowler Peak Hazard	T22N, R8E, Sec. 24; T21N,R8E, Sec. 24; T22N, R9E,Sec. 17, 19, 20, and 30 (portion of project area is within Watdog treatment units: 101, 105, and 106)	Removal of hazard trees on approximately 250 acres	2008
Lexington Hill Hazard	T22N, R9E, Sec. 16, 17, 19, and 20	Removal of hazard trees on approximately 250 acres	2008
Devils Gap Hazard	T21N, R9E, Sec. 7, 18, 19, and 30; T21N, R8E, Sec. 12	Removal of hazard trees on approximately 150 acres	2008-2009
Grizzly Summit Hazard Tree	T23N, R6E, Sec. 11, 14, 15, 22, 21, and 28	Removal of hazard trees on approximately 120 acres	Foreseeable
Noxious Weed Treatments	Forestwide	Roadside weed treatments; proposed action not yet developed	Future (2007)
Pinchard Creek	Pinchard Creek watershed	Approximately 500 acres of group selection, and 500 acres of individual tree selection, and 5–10 acres of aspen stand enhancement	Future
Bald Rock	Bald Rock	Approximately 300 acres of group selection and 400 acres of individual tree selection	Future
Berry Creek Stevens	Berry Creek	Approximately 700 acres of urban interface fuel treatments	Future
Haskins Oak	Bucks Creek	Approximately 2,800 DFPZ fuel treatments, 1,550 acres of urban interface fuel treatments, and 200 acres of group selection	Future
Big Sky	Granite Basin	Approximately 1,100 DFPZ fuel treatments, 300 acres of individual tree selection, and 150 acres of group selection	Future
Letter Box	Grizzly Creek	Approximately 1,100 DFPZ fuel treatments, 300 acres of individual tree selection, and 150 acres of group selection	Future
Four Granite	Granite Basin	Approximately 2,400 DFPZ fuel treatments and 300 acres of group selection	Future

To better illustrate the connectivity of the Watdog Project with other fuel reduction projects, "Appendix C: Map C-14" 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

3.2.1.1 Scope of the Analysis

The analysis area for air quality includes the area potentially affected by smoke emissions and fugitive dust and emissions from proposed treatments: the project area and the air basins in which the project area is located. Approximately 25 percent of the project area is in the Sacramento Valley air basin and 75 percent is in the Mountain Counties air basin (figure 3-1). These air basins are administered by local Air Quality Management Districts with oversight regulation by the California Air Resources Board.

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

Figure 3-1. California air basins and counties.

The air quality analysis for activities associated with each alternative includes: identification of adjacent and downwind air basins of concern (class 1 and nonattainment areas), comparison of the amount of smoke and particulate matter (PM) to be produced as a result of fuels treatment and other project activities in DFPZ and group selection units, and discussion of the consequences of wildfire in regards to air quality.

3.2.1.2 Conformity Determination

Activities that affect air quality in the project area are: (1) prescribed burning on National Forest lands for hazard reduction, (2) dust from construction and use of unpaved roads, and harvest activities and, (3) wildfire occurrence.

Butte County is currently in Federal non-attainment status for ozone, a product of volatile organic compounds (VOCs) or nitrogen oxides (NO_x). There are no published emission factors that isolate ozone. Standards have been set for the ozone precursors such as VOC and NO_x. The current VOC and NO_x emissions allocations for this project are 50 tons each per year according to the 1995 Pacific Southwest Region Air Quality Conformity Handbook.

Particulate matter less than 10 microns in size (PM_{10}) has been established by the U.S Environmental Protection Agency (EPA) as one of six criteria pollutants because of adverse human health effects. Butte County is in attainment for PM_{10} so emission levels are not mandated in the project area. However, efforts to reduce PM_{10} (e.g., burning on Air Quality Management District-declared burn days with best smoke dispersion) will be implemented due to the potential health threat associated with PM_{10} emissions.

Prescribed burning affects air quality in ways similar to wildfires. However, prescribed burning offers many advantages over wildfire. The effects of prescribed fire can be manipulated to reduce adverse effects to air quality. Guidelines that will reduce the adverse effects of prescribed burns are termed Best Available Control Measures and are based on the *Prescribed Burning Background Document and Technical Information Document for Prescribed Burning Best Available Control Measures* (EPA). Best Available Control Measures are based on avoidance, dilution, and emission reduction strategies. Smoke mitigation techniques include consideration of atmospheric conditions, season of burn, fuel and duff moisture, diurnal wind shifts, appropriate ignition techniques and rapid mop-up. Following these Best Available Control Measures and identifying them in burn plans is critical in preventing adverse air quality effects.

Assumptions for Emission Calculations. For this analysis, assumptions used for determining emissions from timber operations and prescribed burns are:

- Emission factors used to determine effects from the project were taken from EPA Document 42 for prescribed burning, and from NEPA Air Quality Desk Reference Guide, table 3.3.2-1 for timber harvest operations.
- All harvest thinning equipment will be diesel-powered with emissions calculated over an estimated five-year period for completion of project activities.

- Harvest operations include harvesting, processing, skidding, loading, hauling, and road watering.
- Slash piles will be constructed free of dirt, with 90 percent consumption.
- Annual emission estimates are based on burning approximately 500 acres annually. Burning would occur over a 5-year period and would not be continuous (i.e., separated by both space and time).
- Based on previous burn experience on the Feather River District, daily emission estimates are based on burning approximately 100 acres a day. These acres would not be continuous and would be separated by seasonality (i.e., spring and fall burns).

3.2.1.3 Regulatory Framework

Air quality is managed through a complex series of federal, state, and local laws and regulations. The 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. States and local Air Pollution Control Districts and Air Quality Management Districts have the primary responsibility of carrying out the development and execution of the 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 Amendments of 1970, 1977, and 1990. The *Clean Air Act* is the primary legal instrument for air resource management. The *Clean Air Act* requires the EPA to identify pollutants that have adverse effects on public health and welfare and 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, 10 microns in diameter or smaller (PM_{10}) and 2.5 microns and smaller ($PM_{2.5}$). If National Ambient Air Quality Standards are violated in an area, that area is designated as "nonattainment" 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 set similar standards for these pollutants.

The Clean Air Act Amendment of 1977 set up a process to designate Class I and Class II areas for air quality management. 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 Measures. Class I areas include international parks, National Parks larger than 6,000 acres, and National Wildernesses Areas larger than 5,000 acres.

On the Plumas National Forest, the 1988 Plumas National Forest Land and Resource Management Plan (LRMP; p. 4-46), the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) FEIS, and the 1999 HFQLG FEIS provide direction for coordination and cooperation with local Air Quality Management Districts. The Watdog Project is located within the Butte County and Northern Sierra Air Quality Management Districts (figure 3-2).

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

Figure 3-2. California Air Quality Management Districts and counties.

The following operating procedures are taken from the HFQLG FEIS (1999) and the SNFPA FEIS (2001):

- 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 Measures.
- Avoid burning on high visitor days and notify the public prior to 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 Prescribed Burning with the California Air Resources Board.
- Dust from project activities would be mitigated by standard dust abatement requirements in the sale and project contracts.

3.2.1.4 Analysis Methods

Particulate emissions production was calculated using the First Order Fire Effects Model (FOFEM). FOFEM predicts the quantity of natural or activity fuels consumed by prescribed fire and the resultant emissions. Fuel loadings are derived from forest cover type classifications as represented in the analysis area. One major assumption of FOFEM is that the entire analysis area experiences fire. To more accurately model discontinuous burns, results are weighted by the percent of the area burned. For the purposes of this analysis, it is assumed 75 percent of the acres to be treated mechanically or by fire would actually produce particulate emissions.

FOFEM models emissions production, not visibility or dispersion. Until recently, few field sensors were capable of detecting and measuring 2.5 micron particles. As a result, research indicates that 70–80 percent of recorded PM_{10} emissions are actually $PM_{2.5}$. The assumptions and methods used in FOFEM for modeling emissions were taken from Hardy (1996). Emissions production depends both on fuel consumption and the combustion efficiency of the fire. Therefore, quantities of emissions are derived from tons of fuel consumed, not tons of fuel treated.

Both PM_{10} and $PM_{2.5}$ emissions are modeled for this analysis as both categories are monitored by the State of California. Alternative management scenarios (alternatives A, B, C, and D) considered in this analysis are compared by estimating PM emissions from acres burned by prescribed fire. Prescribed fire emissions for alternatives B and C are compared to emissions that would be produced in the event of a wildfire (alternative A – no action). After thinning has been completed, approximately 2,800 acres of underburning would be conducted.

Fire effects were calculated using FOFEM version 5.21 for estimating PM_{10} and $PM_{2.5}$. All FOFEM runs were done based on fall burning, when fuels specialists believe most burning should occur. Parameters for wildfire, underburn, and pile burn are:

- *Wildfire* – Very dry conditions with fuel moistures for 0.25 inch to 1 inch fuels at 6 percent, fuels greater than 3 inches at 10 percent, and duff at 20 percent.
- *Underburn* – Moderate conditions with fuel moistures for 0.25 inch to 1 inch fuels at 16 percent, fuels greater than 3 inches at 30 percent, and duff at 75 percent.

- *Pile burn* – Concentrated and compact fuel bed with 80 percent of fuels greater than 3 inches and fuel moistures less than 30 percent.

Table 3-2 shows PM emissions for underburning, wildfire, and pile burning. It is important to remember that the majority of underburn units would be pretreated to reduce fuel loading. Underburning would only be approved for fuel conditions where experience and predictive models estimate that all resource objectives, including air quality objectives and regulations, could be met.

Table 3-2. FOFEM PM emission estimates by burn type, stand type, and fuel loading.

Burn Type	Stand Type	Fuel Loading	PM_{10}	$PM_{2.5}$
			(tons per acre)	
Wildfire	Mixed conifer	Heavy	1.705	1.445
		Typical	1.284	1.088
	Red fir	Heavy	1.349	1.433
		Typical	0.888	0.753
Underburn	Mixed conifer	Light	0.313	0.266
		Typical	0.624	0.529
	Red fir	Light	0.360	0.305
		Typical	0.639	0.542
Pile burn	Mixed conifer	Typical	0.704	0.597
	Red fir	Typical	0.681	0.577

Existing fuel load conditions are represented by the wildfire burn type shown in table 3-2. Pile burn fuel loading is based on assumptions used in the FOFEM model. Typical fuel loading for underburns were taken from local fuel inventory data and input into FOFEM. For underburn units scheduled for pretreatment, fuel loadings are estimated by using local fuels inventory data and subtracting the amount of fuels likely to be removed during pretreatment. Where mastication is the pretreatment, emissions would be similar to those for typical fuel loadings. Mastication does not change overall fuel loading. Instead, mastication fragments woody material, resulting in a shift from larger size classes of fuel to smaller size classes of fuels.

Underburning primarily involves consumption of the litter layer, dead woody fuels, and scorching of shrubs, trees, and limbs less than 15 inches in height. Pile burning consumes the duff layer and piled material within the fireline. Wildfires typically consume most of the duff layer, the litter layer, dead woody fuels, and a large proportion of the live vegetation, including the crowns of the largest trees. Vegetation not consumed is often scorched. FOFEM model predictions calculate that for mixed conifer stands with typical fuel loading, wildfire emissions are approximately 200 percent greater than would be produced by underburning (table 3-2). Wildfires burning in red fir stands with "typical" fuel loading generally produce 39 percent more emissions than underburning. Model input parameters, output values, and emissions worksheets can be found in the project file at the Feather River Ranger District.

3.2.2 Existing Condition and Environmental Effects

3.2.2.1 Introduction

Prescribed fire is the main activity proposed as part of the Watdog Project that has a direct impact on air quality. Underburning would be conducted during fall, spring, or winter, the most favorable times in terms of smoke dispersion. Proposed pile burning would not have a measurable impact on air quality, because it would be conducted under optimal smoke dispersion conditions. Another impact to air quality would be dust and emission from the project activities.

3.2.2.2 Particulate Matter and Ozone Precursors

Existing Condition. PM emission is affected by both the burning method used and the extent of the burning. Particulate concentrations are regulated through compliance with Title 17 of the California Air Pollution Control Laws and the *Clean Air Act* as enforced by the California Air Resources Board and local Air Quality Management Districts. Air quality of the Watdog analysis area is generally considered good to excellent for most of the year. Dust from native-surfaced roads, smoke from prescribed burning, and wildfires can have localized adverse effects on air quality.

Particulate concentrations in the Mountain Counties and Sacramento Valley air basins (figure 3-1) are influenced by climatic conditions and other emission-generating activities carried out in the air basin. Climatic conditions in the project area are governed by a combination of large- and small-scale factors. Large-scale factors affecting climatic conditions in the project area include 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 of the Middle Fork of the Feather River as well as vegetation cover (Schroder and Buck 1970).

The pre-settlement natural range of variability for smoke probably ranged from clear and clean in the non-fire months (November to May) to hazy and smoky for extended periods during the fire months (June to October). Current air quality during non-fire months is most likely close to the historical range. During fire months with extended periods of high pressure, air quality is most likely outside the historical range (i.e., much dirtier), indicating that the amount of smoke, dust, and other types of particulates has increased from pre-settlement conditions. Air quality in the Watdog Project area is estimated to be in compliance with Federal, State, and local standards because: (1) industrial, agricultural, recreational, and residential uses are limited; and (2) the topographic location exposes the area to dispersing winds.

Lassen Volcanic National Park, approximately 70 miles north of the Watdog Project area, is the closest Class I airshed. No previous prescribed burns on the Feather River Ranger District have had an impact on the air quality of the park or resulted in smoke complaints.

3.2.2.3 Effects of Alternative A

Direct Effects. There would be no direct effect on the existing air quality condition from this alternative because no prescribed burning would occur. No PM or ozone precursors would be produced and visibility would not be impaired due to prescribed burning or other project activities.

Indirect Effects. An indirect effect of alternative A would be a continued increase in fuel loading and increased probability of wildfires. Without treatment to reduce fuel loading, wildfire would be expected to produce two to four times the PM emissions than would be generated by prescribed fire (USDA Forest Service 2001, vol. 2). Wildfires burn large quantities of green fuels and generate much higher emissions than low-intensity prescriptive fires that burn primarily dead fuel. Implementation of alternative A would increase the potential for wildfire with emissions that exceed all Federal and State air quality laws.

Cumulative Effects. Cumulative effects of the no-action alternative would be the continued buildup of hazardous fuels in the project area. Dead fuels and shaded forest floors inhibit natural regeneration of fire tolerant tree and plant species. The buildup of hazardous fuels would increase the occurrence of wildfire, resulting in increased PM emissions compared to prescribed burning.

3.2.2.4 Effects of Alternatives B, C, and D

Under all action alternatives, prescribed burning would be used to reduce fuel loadings to an acceptable level. Resulting smoke would likely affect air quality during ignition and for approximately three days following ignition, under favorable smoke dispersal conditions. Harvest activities would also reduce fuel loadings to acceptable levels. These activities would result in emissions and dust during project operations. Burning and other project activities may occur simultaneously and elevate PM emissions. However, because burning would be staggered (i.e., separated by both time and space) it is not likely that emissions caused by the project would exceed California Air Quality Standards for the two air districts.

Direct Effects. PM released into the air as a result of prescribed burning can have adverse effects on visibility as well as public health. Two methods of prescribed burning would be used to accomplish fuel load reduction: underburning and machine/hand piling. Underburning would be used to reduce both natural and activity-created fuels. The objective of the burning would be to reduce fuel loadings while protecting the residual overstory trees from damage due to heat and flames. Since underburning is deliberately set to burn cool and slow, combustion is likely to be inefficient. Underburning is likely to produce more PM per acre than other methods of prescribed fire.

Machine and hand pile burning would also be used to reduce both activity-created and natural fuels. This method of burning is the most efficient in terms of air quality. Due to the dryness and compactness of the fuels in the pile, less PM is released during this type of burning than underburning. Piled areas have much better combustion than underburn areas.

Table 3-3 displays annual criteria pollutant totals for the Watdog Project. Assumptions used for determining emissions from timber operations and prescribed burns are described in section 3.2.1.2 above. For all action alternatives, prescribed fire proposed for the Watdog Project (approximately 500 acres annually) would produce a total of 28.36 tons of VOCs, 10.0 tons of NO_x, and 64.68 tons of PM_{10} annually. Prescribed fire would be implemented during spring, fall, or winter months as these are the best times of year for smoke dispersion.

Table 3-3. Annual criteria pollutant totals for Watdog Project timber operations and prescribed burning.

Year	Timber Operations		Prescribed Burning		Project Totals	
	NO_x	VOC	NO_x	VOC	NO_x	VOC
	(tons)					
1	7.1	.40	10.0	28.36	17.1	28.76
2	7.1	.40	10.0	28.36	17.1	28.76
3	4.7	.20	10.0	28.36	14.7	28.56
4	4.7	.20	10.0	28.36	14.7	28.56
5	2.3	.10	10.0	28.36	12.3	28.46

Comparing the amount of NO_x and VOCs produced by project activities to the current allocation of 50 tons per year for each pollutant, it is determined that the Watdog Project is in conformity and no further analysis is required.

Indirect Effects. In the event of a wildfire, parts of the Watdog Project area treated by pile burning or underburning would produce less PM, VOCs, or NO_x emissions than untreated areas.

Cumulative Effects. Past prescribed burning projects in and around the Watdog Project area have left no lingering effects on current air quality because of the temporal effects of dead and live biomass combustion. There are no other planned Plumas National Forest prescribed burning projects that would be occurring within the project area at the same time as the Watdog Project.

PM_{10} and $PM_{2.5}$ atmospheric concentrations for Butte and Northern Sierra Air Quality Management Districts currently do not exceed national standards. However, for all action alternatives, emissions could exceed California Air Resource Board standards if: (1) weather conditions predicted by California Air Resource Board meteorologists do not prevail, (2) emissions are not dispersed as predicted, and/or (3) emissions from other Air Quality Management Districts adversely impact air quality in local districts. Forest Service and California Air Resource Board smoke dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework.

PM emissions from project activities under alternatives B, C, and D would contribute to PM loading locally and regionally. Based on past burning experience on the District, the area directly affected could be as far as 50 miles from the project burn units. Localized effects on air quality include cumulative emissions from prescribed burning conducted on Federal, State, and private lands near the Watdog Project area. Prescribed burning on private property or other State or Federal lands close enough to impact and or worsen emissions in the two Air Basins during Watdog Project implementation would also be regulated by the local Air Quality Management Districts.

Project-related emissions could possibly reach smoke sensitive areas such as Feather Falls, Brush Creek, and La Porte. Smoke sensitive areas include such places as population centers, heavily used campgrounds and trails, hospitals, and schools. However, these effects would be mitigated by using the nine operating procedures described in the regulatory framework section and by working with the local air quality management districts. Dust from project activities would be mitigated by standard

operating procedures specified in project contracts (see appendix B). Any cumulative effects from burning in the Watdog Project would be temporary and, when performed in accordance with Air Quality Management District regulations, would not violate any air quality standard.

3.2.3 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.

Alternative A—Possible irreversible air quality impacts are health effects on humans and wildlife caused by unplanned and unmitigated wildfires. Smoke with PM_{10} and $PM_{2.5}$ particles in concentrations above National Ambient Air Quality Standards is a known hazard to the young people with certain health conditions, as well as certain wildlife species (Sandberg et al. 2002). As stated earlier, emissions are estimated to be 200 percent greater in wildfires than in prescribed burning. In addition, because wildfires typically burn for a longer period of time under highly variable weather conditions, wildfires are more likely to cause air quality impacts on populated areas than prescribed burns.

Alternatives B, C, and D—No irreversible impacts on air quality are expected. Irretrievable impacts, including a temporary loss of scenic views and poor air quality that temporarily affects human quality of life, may occur for limited periods of time as a result of prescribed burning and other operations. These effects would vary depending on the extent of prescribed burning on any given day and weather conditions during the burn period.

3.2.4 Summary of Cumulative Effects

Cumulative effects of the no-action alternative would be the continued buildup of hazardous fuels in the project area. Dead fuels and shaded forest floors inhibit natural regeneration of fire tolerant tree and plant species. The buildup of hazardous fuels would increase the occurrence of wildfire, resulting in increased PM emissions compared to prescribed burning. The action alternatives would have cumulative effects to air quality in the project area and local air basins (Sacramento Valley and Mountain Counties), but these impacts would be managed within California Air Resources Board regulatory standards. Dust from the project activities would be mitigated by standard operating procedures through sale and other project contracts.

3.3 Botany and Noxious Weeds

3.3.1 Introduction

Forest Service Manual 2672.42 specifies that a BE be prepared to determine if a project may affect any Forest Service Sensitive species or U.S. Fish and Wildlife Service Threatened, Endangered, or Proposed species. The objectives of the BE are:

- To ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species.
- To ensure that Forest Service actions do not hasten the federal listing of any species.
- To provide a process and standard through which Threatened, Endangered, Proposed and Sensitive species receive full consideration throughout the planning process, reducing negative impacts on species and enhancing opportunities for mitigation.

"Section 3.3: Botany and Noxious Weeds" presents a summary of the results of the BE for the following United States Department of Agriculture (USDA) Forest Service Region 5 Sensitive and Plumas National Forest Special Interest species: *Hydrotheria venosa*, *Clarkia mosquinii, Fritillaria eastwoodiae, Lupinus dalesiae*, and *Penstemon personatus*, *Botrychium simplex, Bulbostylis capillaris, Cardamine* sp. *novum* (Clifton #3), *Clarkia mildrediae* ssp. *lutescens, Clarkia mildrediae* ssp. *mildrediae*, *Erigeron lassenianus* var. *deficiens*, and *Viola tomentosa*.

The BE (on file at the Feather River Ranger District office) includes complete discussions of: (1) Region 5 Sensitive species and potential habitat within the project area, (2) project effects on Plumas National Forest Special Interest species (see BE, appendix A of the "Botany Report"), (3) MIS,[a] (see the Botany BE) and (4) noxious species (see BE, appendix C of the "Noxious Weed Risk Assessment" report). No Federal or State listed Threatened, Endangered, Proposed plant species are located in the Watdog Project area.

3.3.2 Regulatory Framework

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

- Maintain viable populations of sensitive plant species (p. 4-34).
- The LRMP also includes forest-wide standards and guidelines to:
  - Protect Sensitive and Special Interest plant species as needed to maintain viability.
  - Inventory and monitor Sensitive plant populations on a project-by-project basis (p. 4-34).
  - Develop species management guides to identify population goals and compatible management activities/prescriptions that will maintain viability (p. 4-34).

a. Management Indicator Species on the Plumas National Forest for this project are *Fritillaria eastwoodiae*, *Lupinus dalesiae*, and *Penstemon personatus.* These species are on the Sensitive species list and are managed as such.

Noxious Weed Management. The HFQLG Act FEIS and the 2004 SNFPA ROD amend the management direction in the LRMP to address management of noxious weeds and invasive exotic 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 2004 SNFPA ROD, and table 2-4 of the HFQLG Act FEIS and 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 onsite 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 onsite 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.

Appendix A of the 2004 SNFPA ROD (p. 36) establishes goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 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 2004 SNFPA ROD.

3.3.3 Methodology for Assessing Impacts on Botany and Noxious Weeds

3.3.3.1 Scope of the Analysis

Surveys of the Watdog Project area for noxious weeds and Threatened, Endangered, Proposed, and Sensitive, and Special Interest plants were performed in 2002 (Dittes and Guardino 2002). Additional surveys were completed in spring 2003 for Threatened, Endangered, Proposed, and Sensitive, and Special Interest plants and in 2003 and 2004 for noxious weeds, focusing on roads, landings, and campgrounds (see BE, "Appendix C – Noxious Weed Risk Assessment"). Non-vascular surveys were performed by Colin Dillingham, Shana Gross, Linnea Hanson, and John Dittes (Dillingham and Gross 2002). All surveys were floristic in nature; as such an attempt was made to identify all observed taxa. Also, surveys were performed at an appropriate phenological time. Cumulative effects of Threatened, Endangered, Proposed, and Sensitive, Special Interest, and noxious weed information are limited to relevant past, present, and reasonably foreseeable future projects within the project area. The effects of specific past projects are discussed by species in section 3.3.4.

3.3.3.2 Geographic Scope of the Analysis

The Watdog Project boundary (approximately 6,000 acres) was used as the geographic boundary for the effects analysis because the direct and indirect effects of project actions on rare plants will be limited to the areas where treatments would occur. Therefore, cumulative effects on botanical resources would only be expressed within the project boundary. Roadside surveys and analysis for noxious weeds extended five miles beyond the project boundary based on mobility of weed seeds.

The relative rarity of a species was also considered when defining the scope of the analysis. Based on the professional judgment of Linnea Hanson (Forest Botanist, 25 years) and Chris Christofferson (Assistant Botanist, 4 years) and information presented in the California Natural Diversity Database and rarity listings by the California Native Plant Society, the twelve species considered in this analysis are locally abundant and/or widely distributed. None of the species are so rare to warrant an analysis which extends beyond the project area to the geographic boundary of their distribution.

3.3.3.3 Temporal Scope of the Analysis

The timeframe for determining cumulative effects depends on the length of time that lingering effects of the past action will continue to negatively impact the species in question. This will vary widely between species because some rare plants require and tolerate disturbances that would harm others. For example *Clarkia* species would likely benefit from ground disturbing activities that reduce canopy cover and expose bare mineral soil, whereas, such actions would likely kill orchid species.

3.3.3.4 Analysis Methods

The project area was reviewed using aerial photographs, soils maps, and known occurrences to help determine potential habitat for Threatened, Endangered, Proposed, and Sensitive, and Special Interest species. Areas identified as potential habitat include: ultramafic soils, meadows, riparian areas, seeps, and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). All field surveys occurred at the appropriate time to identify rare plants and

noxious weeds. Plant location data were recorded using global positioning systems. Data were then entered into a geographic information system.

3.3.3.5 Cumulative Effects Analysis

Cumulative effects are disclosed by species in sections 3.3.2.2 through 3.3.2.13. In order to have cumulative effects, several conditions must first exist:

- There must be direct/indirect adverse effects to the specific species from the proposed project.
- There must be geographic overlap of past, present, or reasonably foreseeable future projects that occurred where a species is located within the analysis area (see Scope of the Analysis above).
- There must be lingering negative effects to the species from past projects that have occurred within the specified analysis area, or
- There are present or future projects planned in the area where species are located that are likely to contribute adverse effects to the species.

3.3.4 Existing Condition and Environmental Effects

3.3.4.1 Introduction

This section summarizes the existing conditions and environmental effects for twelve USDA Forest Service Region 5 Sensitive and Plumas National Forest Special Interest species found within the analysis area for the Watdog Project (table 3-4). Project actions were also analyzed for their potential to increase noxious weeds within treatment units.

Five USDA Forest Service Region 5 sensitive plant species were found within the analysis area: *Hydrotheria venosa*, *Clarkia mosquinii*, *Fritillaria eastwoodiae*, *Lupinus dalesiae*, and *Penstemon personatus*. The following Plumas National Forest Special Interest species are found within the project area as well: *Botrychium simplex*, *Bulbostylis capillaris*, *Cardamine* sp. *novum* (Clifton #3), *Clarkia mildrediae* ssp. *lutescens*, *Clarkia mildrediae* ssp. *mildrediae*, *Erigeron lassenianus* var. *deficiens*, and *Viola tomentosa*. Table 3-4 lists the acres of known occurrences of these species within treatment units. Existing conditions and environmental effects for these species are presented in section 3.3.4.

These Sensitive and Special Interest plant species would be protected by either (1) avoidance (flagging and avoiding), (2) imposing Limited Operating Periods to allow Sensitive species to finish their life cycle, or (3) changes in prescription, for example, conducting an underburn in the spring rather than the fall. In some cases, depending on the species and the management prescription, no protection would be given for disturbance-tolerant Sensitive status species. Specific recommendations for each occurrence are found in the Botany Protection Plan, appendix B of the Botany BE.

Table 3-4. Acres of Sensitive and Special Interest species identified in the project area and within treatment units.

Species	No Treatment	Group Selection	Handcut Pile Burn	Masticate	Thinning and Biomass Removal	Underburn	Total Acres
Botrychium simplex	—	—	—	—	0.3	—	0.3
Bulbostylis capillaris	—	—	—	—	0.3	—	0.3
Cardamine #3	39.5	0.3	—	—	6.7	41.5	88.1
Clarkia mildrediae ssp. *lutescens*	13.9	—	—	—	1.0	95.3	110.1
Clarkia mildrediae ssp. *mildrediae*	21.1	—	—	—	—	24.4	45.5
Clarkia mosquinii	95.1	0.9	—	—	30.5	64.9	191.3
Erigeron lassenianus v. *deficiens*	66.5	1.5	—	0.8	10.9		79.7
Fritillaria eastwoodiae	26.7	0.3	—	—	5.1	5.2	37.2
Hydrotheria venosa	0.1	—	—	—	0.2	—	0.3
Lupinus dalesiae	1.0	—	2.5	3.9	—	—	7.5
Penstemon personatus	55.1	—	—	8.2	18.7	—	81.9
Viola tomentosa	3.5	0.3	—	0.2	0.8	—	4.8

No Federal- or State-listed Threatened, Endangered, Proposed plant species are known or have potential habitat in the Watdog Project area. In addition the following USDA Forest Service Region 5 Sensitive species have not been analyzed further because there is no potential habitat in the project area (table 1 of the BE): *Astragalus lemmonii*, *Astragalus lentiformis, Astragalus pulsiferae* var. *coronensis*, *Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragalus webberi, Helodium blandowii*, *Ivesia aperta* var. *aperta, Ivesia sericoleuca, Ivesia webberi, Lomatium roseanum*, *Penstemon sudans*, *Pyrrocoma lucida, Rupertia hallii, Scheuchzeria palustris* var. *Americana,* and *Silene occidentalis* ssp. *longistipitata*.

Plant species that are limited to these habitats would not be directly or indirectly impacted by the Watdog Project. This applies to the following species: *Allium jepsonii, Arabis constancei, Botrychium ascendens, Botrychium crenulatum, Botrychium lineare, Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Buxbaumia viridis*, *Eleocharus torticulumis*, *Eriogonum umbellatum* var. *ahartii*, *Lewisia cantelovii*, *Lewisia kellogii* ssp. *hutchinsonii*, *Lewisia kellogii* ssp. *kellogii*, *Meesia longiseta*, *Meesia triquetra*, *Meesia uliginosa*, *Monardella follettii*, *Monardella stebbinsii*, *Oreostemma elatum*, *Sedum albomarginatum*, *Senecio eurycephalus* var. *lewisrosei,* and *Senecio layneae*.

The potential habitat of *Bruchia bolanderi*, *Calycadenia oppositifolia*, *Calystegia atriplicifolia* ssp. *buttensis*, *Clarkia biloba* ssp. *brandegeae*, *Clarkia gracilis* ssp. *albicaulis*, *Clarkia stellata*, *Cypripedium montanum*, *Dendrocollybia racemosa*, *Fissedens aphelotaxifolius*, *Fissedens pauperculus*, *Helodium blandowii*, *Lewisia cantelovii*, *Mielichhoferia elongata*, *Phaeocollybia*, *olivacea*, and *Vaccinium coccinium* may be treated under the proposed action. Although adequate botanical surveys have been performed in the project area, it is possible that isolated undiscovered populations may be impacted. For this reason (potential impact to undiscovered populations) a

determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. If any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard management requirements, such as flagging and avoidance or a limiting operating period. They will not be further analyzed in this document.

3.3.4.2 Existing Conditions and Analysis of Effects for *Botrychium simplex* (Yosemite Moonwort)

Yosemite moonwort is a member of the adder's-tongue family. It is a primitive fern that is found in open marshes and wet meadows. It is widely distributed globally but uncommon in California.

There is approximately 0.3 acre of Yosemite moonwort within a treatment unit (table 3-4). The occurrence will be protected as a controlled area. There will be no project activities within the controlled area. Consequently, there will be no direct or indirect effects to this species. In the absence of direct and indirect effects there will be no cumulative effects as a result of this project. This project will have no detrimental effect to the Yosemite moonwort.

3.3.4.3 Existing Conditions and Analysis of Effects for *Bulbostylis capillaries*

Bulbostylis capillaris is a member of the sedge family. It is known to occur in California from Fresno County north through Tehama County. It is known outside of California in Arizona, New Mexico, Texas, and Oregon. It extends beyond the western states into eastern North America, the Caribbean, Central America, and eastern Asia. It is found in meadows and grassy clearings including vernal creek beds and vernally moist sandy depressions. On the Plumas National Forest, it is known from Little Bald Rock, Big Bald Rock, Hartman Bar Ridge, and near Tamarack Flat. The trend for this species is currently unknown. Surveys for this species began in 2002.

There is approximately 0.3 acre of *B. capillaries* within a harvest unit (table 3-4). The area where it occurs will be excluded from project activities and has been designated as a controlled area. As a result, there will be no negative direct or indirect effects from this project on this species. In the absence of negative direct and indirect effects there will be no cumulative effects. This project will have no detrimental effect to *B. capillaris*.

3.3.4.4 Existing Conditions and Analysis of Effects for *Cardamine* sp. *novum* (Clifton #3), Marbled Toothwort

This species is a member of the mustard family. On the Plumas National Forest, it is known to occur on the Feather River and Mount Hough Ranger Districts. There are approximately 100 acres of known occurrences on the Feather River Ranger District. According to *Plumas County and Plumas National Forest Flora* (Clifton 2005), plants with green and purple marbled leaves are found in deep woods from Shasta County to Nevada County. The species has also been observed in semi-open stands of trees, in skid trails (trails along which logs are dragged or skidded during logging), and fire lines. Plants under heavy canopy cover are typically not reproductive. There are approximately 88 acres within the project area. About 40 acres are located within treatment units (table 3-4).

Effects of Alternative A on Marbled Toothwort.

Direct Effects—No direct effects because project activities would not occur.

Indirect Effects—Gradual decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Marbled Toothwort.

Direct Effects—

- **Group selection and harvest** – There are 7 acres of marbled toothwort within group selection treatment units. Activities in these areas may physically damage and kill plants. However, this is expected to be a minor effect because plants are tolerant of moderate disturbance. On the Feather River Ranger District, this species has been observed on skid trails, fire lines, and road shoulders. Plants in these disturbed areas generally appeared healthy while those in closed canopy, nondisturbed areas generally were not flowering. Logging operations will not commence until plants have completed their life cycle for the season (see Botany Protection Plan, appendix B of the Watdog Botany BE).

- **Underburn** – There are approximately 42 acres of marbled toothwort within an underburn unit. If underburns are hot the reproductive tuber may be killed. However, this is unlikely because (1) these structures are usually three to six inches below the soil surface, and (2) areas with a sufficient level of surface fuel to support such a hot fire are unlikely to have habitat supporting the marbled toothwort. This species has been monitored for two years following a spring underburn on the Feather River Ranger District. There seems to be no apparent reduction in plant vigor post fire. Digital images of monitoring plots are available by contacting Chris Christofferson, Assistant Botanist (cchristofferson@fs.fed.us).

Direct effects from these treatments to the marbled toothwort are expected to be minor.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – There is a low risk of noxious weed invasion following the underburns associated with this project because the prescribed underburns will occur in the spring or fall when fuel moisture levels, temperature, and humidity are favorable for low intensity burns that will not completely remove the duff layer or remove the canopy. Data suggest the degree of fire-induced disturbance is an important factor in post-fire noxious weed invasion. According to Crawford (cited in Keeley 2001), studies of high and low intensity burns showed that noxious weed invasion is favored when fire intensity is sufficient to open the canopy and destroy the litter layer. Also, Brooks et al. (citing Keeley et al. in preparation) explains how recent studies throughout the southern Sierra Nevada have shown cheatgrass (*Bromus tectorum*) invasions to be the most predictable in forest patches that were burned with high intensity. He explains that such impacts could be potentially more profound now due to unnaturally high fuel loads.

One objective of the Watdog Project is to reduce the unnaturally high fuel loads that would support the kind of high intensity wildfire that would result in conditions favorable to noxious weed invasion.

Cumulative Effects—In 1996, a timber project (Watson Thin; see table 3-1) occurred in an area where a small population of the marbled toothwort is currently located. Surveys for this species began in 2002, so population size before that time is unknown. However, because the marbled toothwort is found in disturbed areas, it is unlikely that this 10-year-old timber project is still contributing lingering environmental effects on the marbled toothwort. Also, there are no current or future projects from table 3-1 planned in the areas where this species occurs within the analysis area. Consequently, there are no cumulative effects as a result of this project.

Summary. This project will have a minimal to no negative impact on *Cardamine* sp. *novum*, marbled toothwort, for the following reasons:

- The direct and indirect effects of the project alternatives are minor.
- There are no cumulative effects.
- This species tolerates disturbance.
- Population viability appears stable.

3.3.4.5 Existing Conditions and Analysis of Effects for *Clarkia mildrediae* ssp. *lutescens* (Golden-Anthered Clarkia)

Golden-anthered clarkia is a member of the evening primrose family. It is a summer annual that completes its lifecycle in one season. It occurs primarily in eastern Butte and western Plumas Counties but is also known from several populations in Yuba and Sierra Counties. It is considered to be a plant of limited distribution. It is a California Native Plant Society List 4 species, indicating that it is rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time. It is endangered in approximately 20 percent of its range.

Observations of this and other *Clarkia* species in the field indicate that relatively open habitats are generally preferred, some degree of forest disturbance may be tolerated, and in some cases, disturbance may be required for population regeneration. This is evidenced by numerous occurrences in which *Clarkia* plants grow in bare soil on cut road banks. At these sites, plants appear to extend into adjacent forested habitat only to the extent of available light and litter-free soil. Undisturbed, naturally open rock outcrops, erosion features, and wind-throw areas can support *Clarkia* populations. Low-intensity fires may enhance habitat by creating a disturbance that removes litter and exposes mineral soil, creating conditions that favor establishment of the species.

Effects of Alternative A on Golden-Anthered Clarkia.

Direct Effects—No direct effects.

Indirect Effects—Gradual decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Golden-Anthered Clarkia.

Direct Effects—

- **Underburning** – There are approximately 95 acres of this species within underburn treatment units (table 3-4). Plants are frequently found in open areas with little to no litter or ground cover. If underburns occur in the spring, some seedlings will likely be killed by the low intensity fire. Underburns occurring in the fall are unlikely to damage the plants because they are annuals and will be nearly completed with their life cycle. Some seeds may be destroyed if the underburns are high intensity.

- **Thinning and Biomass Removal –** There is approximately one acre of plants located within a product removal unit. There will be no direct impacts to the plants because implementation of a Limited Operating Period will delay harvest activities until after the plants have completed their life cycle.

Indirect Effects—

Risk of Noxious Weed Invasion – See discussion under marbled toothwort.

Cumulative Effects—There are no negative cumulative effects from this project for the following reasons:

Although, some plants may be killed by spring burns, the golden anthered clarkia will benefit from the prescribed fire because it will kill overstory shrubs and other competing vegetation. Also, the indirect risk from noxious weed invasion is minor. Consequently, there are no negative effects adding to a cumulative harm to this species.

The 1991 South Branch commercial harvest project impacted approximately 0.5 acre of a golden anthered-clarkia population. This species likely benefited from the disturbance associated with the project. It is unlikely that there are any lingering negative effects.

There are no other current or foreseeable future projects from table 3-1 in the areas where the golden-anthered clarkia is located which could contribute negative effects.

Summary. This project will have minimal to no negative impact on *Clarkia mildrediae* ssp. *lutescens*, golden-anthered clarkia, for the following reasons:

- There will be no negative direct effects and indirect effects are minor.

- There are no cumulative effects.

- This species requires disturbances.

- Population viability appears stable.

3.3.4.6 Existing Conditions and Analysis of Effects for *Clarkia mildrediae* ssp. *mildrediae* (Mildred's Clarkia)

Mildred's clarkia is a member of the evening primrose family. It is a summer annual known to occur in semi-shaded openings on granitic soils and volcanic soils. This species approaches the end of their life cycle in the fall. Often it is found on cut road banks but is also found in undisturbed natural openings such as those created by fire. It is known to occur in the Sierra Nevada south of the North Fork of the Feather River in Butte, Plumas, Sierra and Yuba counties. On the Plumas National Forest, Mildred's clarkia is known from the Feather River and Mount Hough Ranger Districts. Surveys have been conducted for this species since 1993. There are 45 acres of Mildred's clarkia within the analysis area. Approximately half of these acres are located within an underburn unit (table 3-4). This species is not located in any other treatment area.

Effects of Alternative A on Mildred's Clarkia.

Direct Effects—No direct effects.

Indirect Effects—Gradual decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Mildred's Clarkia.

Direct Effects—

- **Underburning** – Approximately 21 acres of Mildred's clarkia are located within an underburn unit. It is not located in any other treatment area. If underburns occur in the spring, some seedlings will likely be killed by the low intensity fire. Underburns occurring in the fall may destroy some Mildred's clarkia seed but are not likely to affect mature plants because these are annual plants that would be approaching the end of their life cycle at that time. Underburning is considered to be an important beneficial direct effect to this species because it creates habitat. Fire and other disturbances remove ground cover, and create openings in the forest that will promote the establishment of this species.

Indirect Effects—

Risk of Noxious Weed Invasion – See above discussion under marbled toothwort.

Cumulative Effects—There are no cumulative effects for the following reasons.

- The direct and indirect effects do not represent a significant risk to this species. Underburning will be beneficial to this species.

- There are no known past projects in the areas where Mildred's clarkia is found in the analysis area. Consequently, there is no spatial overlap.

- There are no ongoing, current projects.

- There are no future projects planned for the area where the species is found.

Summary.

- There will be no negative direct effects and indirect effects are minor.
- There are no cumulative effects.
- This species requires disturbances.
- Population viability appears stable.

3.3.4.7 Existing Conditions and Analysis of Effects for *Clarkia mosquinii* (Mosquin's Clarkia)

Mosquin's clarkia is a member of the evening primrose family. It is known to occur in foothill woodland and the lower elevation mixed conifer forest in Butte and Plumas counties. This species was thought to be extinct when the only known location was eliminated with the formation of Lake Oroville. The species was rediscovered in 1993 and surveys for this species began on the Plumas National Forest that year. Twenty occurrences have been located in the lower elevations of the Feather River Ranger District. There are approximately 190 acres of Mosquin's clarkia within the analysis area (table 3-4).

Effects of Alternative A on Mosquin's Clarkia.

Direct Effects—No direct effects.

Indirect Effects—Plants will gradually decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Mosquin's Clarkia

Direct Effects—

- **Underburning** – Approximately 65 acres are located within an underburn unit. Underburning will benefit this species. See *Clarkia* species above for a more detailed explanation.
- **Thinning and Biomass Removal** – Approximately 31 acres are located in a removal unit. There will be no direct effects from removal because a Limited Operating Period will protect plants during flowering and fruiting so they can complete their life cycle.
- **Group selection** – Approximately 0.1 acre are located within a group selection unit. Plants may be buried, uprooted, and killed as a result of harvest activities in this unit. However, the area affected is very small and the disturbance will result in an overall increase in habitat for this species.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – Thinning and group selection activities will disturb soil, and remove over-story canopy creating favorable conditions for noxious weed invasion. However, noxious weed surveys along roads and within treatment units did not identify any high priority noxious weeds within the immediate project area (see table 3-5). Also, equipment will be washed and inspected prior to starting ground disturbing work (Clause B.6.35). This will minimise the risk of noxious weed seeds being introduced into the project area.

Cumulative Effects—There are no cumulative effects for the following reasons:

- The direct and indirect effects do not represent a significant risk to this species. Underburning, harvest, and group selection will all create habitat for this species.
- There are no known past projects within the analysis area where Mosquin's clarkia is found, consequently, there is no spatial overlap.
- There are no ongoing, current projects.
- There are no future projects planned for the area where the species is found.

Summary.

- There will be no negative direct effects and indirect effects are minor.
- There are no cumulative effects.
- This species is tolerant of disturbance and may benefit from this project.
- Population viability appears stable.

3.3.4.8 Existing Conditions and Analysis of Effects for *Erigeron lassenianus* var. *deficiens* (Rayless Lassen Daisy)

Rayless Lassen daisy is a member of the Sunflower family. It grows on gravelly or vernally moist flats and swales both off and on serpentine soils in open mixed conifer and red fir forest plant communities. It can be found on roadsides and other disturbed areas. This variety is known from Plumas County from scattered locations on the Feather River and Mount Hough Ranger Districts. Surveys for this species began in 1998. There are approximately 80 acres of the Rayless Lassen daisy in the analysis area (table 3-4).

Effects of Alternative A on Rayless Lassen Daisy.

Direct Effects—No direct effects.

Indirect Effects—Plants will gradually decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Rayless Lassen Daisy.

Direct Effects—

- **Thinning and Biomass Removal** – Approximately 11 acres of rayless Lassen daisy are located within a removal unit. Timber removal may kill adult plants by crushing, burying, or up-rooting plants. Timber removal will take place after flowering and seed dissemination. Timber removal will reduce canopy cover and may create habitat for this species.

- **Group selection** – There are approximately 1.5 acres of rayless Lassen daisy within a group selection unit. Disturbance associated with group selection harvest will be similar to that associated with mechanical thinning and biomass removal.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – See previous discussion under Mosquin's clarkia above.

Cumulative Effects—There are no cumulative effects that would add to the direct and indirect effects of the action alternatives for the following reasons:

- There are no known past projects in the analysis area where the rayless daisy is found, consequently, there is no spatial overlap between past actions that could be contributing negative effects that could add to the direct and indirect effects of the Watdog Project.

- There are no ongoing, current projects where it is found.

- There are no future projects planned for the area where the species is found.

Summary. This project is unlikely to detrimentally impact this species or its viability.

3.3.4.9 Existing Conditions and Analysis of Effects for *Fritillaria eastwoodiae* (Butte County Fritillary)

Butte County fritillary is a member of the lily family. Five distinct, stable population centers are known from Shasta, Butte, Yuba, Nevada, Placer and Tehama counties. There is also a single report of this species from Napa County.

There are 75 known occurrences of Butte County fritillary on the Plumas National Forest and seven on the Tahoe National Forest. Some of the historical occurrences on the Plumas have not been relocated during subsequent survey efforts in areas where: (1) the tree canopy has been completely removed, or (2) the canopy has closed in and covered the ground with litter. Some of the plants on the Plumas and Tahoe are not reproducing. Quite often, the habitats where this plant is flowering are areas of moderate or light disturbance (e.g., old timber cuts). Plants that are found in areas with

heavier tree canopy or shrub cover are often not flowering (basal leaves only). It appears that plants need some canopy openings to maintain viability.

There are approximately 37 acres of this species within the analysis area with approximately 11 acres within treatment units (table 3-4).

Effects of Alternative A on Butte County Fritillary.

Direct Effects—No direct effects.

Indirect Effects—Plants will gradually decline in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Butte County Fritillary.

Direct Effects—

- **Group Selection** – There is approximately 0.3 acre located within group selection treatment units. Mechanical removal of timber could physically damage both above and below ground plant structures.

- **Thinning and Biomass Removal** – There are approximately 5 acres of fritillary within removal units. Plants could be crushed, up-rooted, or buried.

- **Underburn** – There are approximately 5 acres within underburn treatment units. Underburns may kill some plants; however this treatment will reduce competition from woody shrubs. Photo point monitoring on the Feather River Ranger District suggest that this species responds positively to underburning.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – See previous discussions under marbled toothwort and Mosquin's clarkia.

Cumulative Effects—There are no cumulative effects to this species for the following reasons.

- The direct and indirect effects of this project are minimal because only a small number of plants are likely to be impacted. In general, these actions will improve habitat for this species because this plant requires openings in the forest. In the absence of disturbance the forest canopy becomes very dense, and the fritillary stops flowering. Plant populations that are not reproducing are not sustainable.

- One past project is known to have occurred where fritillary is located. The project consisted of a 700-acre underburn in the Watson Ridge and Jackson Ranch area (table 3-1), conducted in spring and early summer of 1994 and 1995. Photo point monitoring on the Feather River Ranger District suggest that this species responds

positively to underburning, so it is unlikely that this past project is contributing lingering negative effects to this species.

- There are no other current projects or future projects to contribute negative effects.

Summary. The population trend for Butte County Fritillary (*Fritillaria eastwoodiae)* appears to be stable on the Plumas National Forest. When the LRMP was developed in 1988, there were 17 documented occurrences of *Fritillaria eastwoodiae.* Many of the occurrences documented since development of the LRMP are attributed to increased survey efforts for Sensitive Plants across the Forest as a result of pre-project planning and landscape assessments. The implementation of Interim Management Prescriptions has also helped contribute to this stable trend.

3.3.4.10 Existing Conditions and Analysis of Effects for *Hydrotheria venosa* (Veiny Aquatic Lichen)

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 of California. It is also found in the northern coast range in the Mendocino National Forest, and northwestern California in the Shasta-Trinity National Forest. *Hydrotheria venosa* also occurs in Oregon, Washington, and British Columbia. The California occurrences are disjunct from U.S. populations in Massachusetts, New Hampshire, Vermont, Tennessee, and Georgia. Many of the eastern occurrences are historic sightings and some have apparently become extirpated.

Surveys have been conducted for this species since 1998. Twenty-one occurrences are known on the Plumas National Forest, two on the Sequoia, one on the Shasta-Trinity, eleven on the Sierra, and eight on the Stanislaus. There are also two occurrences in Calaveras Big Trees State Park and one occurrence on private land within the Mendocino National Forest. There are approximately 0.3 acre within the project area (table 3-4).

Effects of Alternative A on the Veiny Aquatic Lichen.

Direct Effects—No direct effects.

Indirect Effects—No indirect effects.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Veiny Aquatic Lichen.

Direct and Indirect Effects—Riparian Habitat Conservation Areas will be entered for underburning and hand cut/pile burning. These treatments are not expected to reduce streamside canopy cover or increase sediment input into the stream. Consequently, there will be no direct or indirect effects. RHCAs in plantations may be entered for mastication, but would not provide suitable habitat for the veiny aquatic lichen.

Cumulative Effects—There will be no cumulative effects from this project because it will not contribute any direct or indirect effects on the species.

Summary. This project will not detrimentally impact the veiny aquatic lichen because the plants and habitat will be avoided.

3.3.4.11 Existing Conditions and Analysis of Effects for *Lupinus dalesiae*, Quincy Lupine

Quincy lupine is a member of the pea family and it is also a Forest MIS plant. It has a limited range but is abundant within its specific habitat. It is known from 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. 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. There are approximately 7.5 acres within the project area (table 3-4).

Effects of Alternative A on Quincy Lupine.

Direct Effects—No direct effects.

Indirect Effects—Gradual decline of Quincy lupine in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Quincy Lupine.

Direct Effects—No direct effects.

- **Hand cut/pile burning –** Approximately 2.5 acres of Quincy lupine are located within treatment units. Pile burning on top of the lupine would likely kill the adult plants and sterilize the seed bed. However, these direct effects will be minimal because operations will not begin until plants have released seed and piles will be placed in areas without plants (see Botany Protection Plan, appendix B of the Botany BE).

- **Mastication –** Approximately 1 acre of lupine is located within a mastication unit. Treatments will not occur until after seeds have matured and the plants have released the seeds. This treatment is unlikely to have a significant impact on this species because it is tolerant of moderate to high disturbances. This plant can be found in highly disturbed areas such as road cuts, and old dirt roads.

Indirect Effects—

- **Risk of Noxious Weed Invasion in Hand Cut and Pile Burn Areas –** Low priority noxious weeds such as bull thistle (*Cirsium vulgare*) and wooly mullein (*Verbascum thapsus*) will likely colonize the areas where piles were burned. It is unlikely that these areas will be invaded by high priority weeds due to the lack of a local seed source (see Noxious Weed Risk Assessment, appendix C of the Botany BE).

- **Risk of Noxious Weed Invasion in Mastication Units –** Mechanical ground based equipment will masticate trees less than 10 inches dbh unless needed for proper spacing, and masticate shrubs. Most trees masticated would be less than 6 inches dbh. Spacing of residual conifers would range from 18 feet (± 25 percent) in smaller tree size aggregations to approximately 25 feet (± 25 percent) in larger tree size aggregations. This would allow retention of the healthiest, largest, and tallest conifers and avoid creating openings. Mastication will result in very little ground disturbance. Masticators create a mulch layer from 1 to 6 inches thick. Consequently, mineral soil will not be exposed. This will help prevent the establishment of noxious species that require mineral soil to become established. Units will retain approximately 30 percent canopy cover and greater. Overall, there is a low risk of noxious weed invasion in masticated areas.

Cumulative Effects—There will be no cumulative effects to Quincy lupine for the following reasons:

- The direct and indirect effects of project activities will not negatively affect this plant because it is tolerant of moderate to high disturbance. Disturbances associated with this project are characterized as moderate to low in intensity and would occur on less than half of the area occupied by this species in the project area.

- There are no known past projects in the areas where this species is located, so there are no lingering additive negative effects.

- There are no current or future projects to contribute negative effects to this species within the analysis area.

Summary. Populations of Quincy lupine appear stable at this time and this project will not jeopardize the viability of populations in this area. Forest-wide habitat and population trends for this MIS plant are expected to remain stable.

3.3.4.12 Existing Conditions and Analysis of Effects for *Penstemon Personatus*, Closed-throated Beardtongue

The closed-throated beardtongue is a member of the snapdragon family. The species is found in mixed conifer and red-fir forests from 4,000 to 6,200 feet in Butte, Nevada, Plumas, and Sierra counties. Close-throated beardtongue is a Forest MIS plant.

Two occurrences near Bucks Lake contain 80 to 90 percent of the total known plants in a relatively small area. These occurrences are scattered patches of plants over a 40 to 50 square mile area, making it difficult to delineate individual "occurrences." Although the many individual stems are easy to find in the population center, outside of this central area the plant is difficult to find and is quite rare. In addition, individual above ground stems in a patch can be connected underground by rhizomes; therefore, the number of genetic individuals may be much less than what is perceived when counting the above ground plants.

Although there are may be local fluctuations, the overall population appears stable. A study in 2001 found no overall significant differences between the amount of *P. personatus* in stands in the Bucks Lake area from 1988–2001.

This species can be found in areas that have been disturbed as well as areas that do not appear to have been disturbed at all. It seems to tolerate limited disturbance activities but not heavy soil compaction (e.g., tractor logging) or a complete change in the microhabitat (e.g., total canopy removal). It has been noted that plants that grow under complete canopy cover typically remain short and do not flower while plants in partial sun become sexually reproductive. Partially open canopies may be needed to maintain a viable population.

The intensity, extent, or frequency of disturbance associated with these occurrences has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes. A report on the biology of *P. personatus* in 2001 found that the species is typically less abundant on south-facing soils, and that occurrences on south-facing aspects (particularly those with thin soils) may be less tolerant of disturbance. However, the species appears to be tolerant of moderate activities performed on north-, east-, or west-facing aspects with deeper soils.

There are approximately 82 acres of *P. personatus* within the project area (table 3-4).

Effects of Alternative A on the Closed-Throated Beardtongue.

Direct Effects—No direct effects.

Indirect Effects—No indirect effects.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B-D on the Closed-Throated Beardtongue.

Direct Effects—

- **Mastication** – There are approximately 8 acres of this species within a mastication unit. There should be no direct effect from mastication. It has been observed on the Feather River Ranger district that *P. personatus* responds favorably to mastication treatments.

- **Thinning and Biomass Removal** – Approximately 19 acres are located within a removal unit. Some plants may be killed during removal operations.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – See discussions under Quincy lupine and Mosquin's clarkia.

Cumulative Effects—In the early 1990s, a small portion of a *P. personatus* occurrence first mapped in the early 1980s appears to have been impacted by the Watson North and South timber projects (table 3-1). Botanical surveys in 2002 reported three distinct clusters of penstemon, but failed

to relocate small portions of the occurrence in the areas affected by the timber sales. Linnea Hanson (Forest Botanist on the Plumas National Forest for 25 years) has observed that complete canopy removal on south and southwest aspect slopes can eliminate *P. personatus*. One of the past timber sales was located on a southwest aspect and it is possible that this action led to the extirpation of the portion of the occurrence from that area. However, the occurrence was first documented in the early 1980s, when Global Positioning System equipment was not available. Lack of precise mapping equipment could have led to the overmapping of the occurrence. For the purposes of this analysis, however, it is assumed that a small portion of the population was extirpated and that there are some lingering effects from the past project.

The direct effects from mastication and timber removal associated with the Watdog Project are unlikely to contribute adverse effects to penstemon because plot treatments will maintain at least 40 percent canopy cover. Observations by Linnea Hanson in 2004–2005 of masticated *P. personatus* areas south of Bucks Lake, revealed a carpet of penstemon one year after a mastication treatment. It was the most plentiful flowering plant over acres of treated land.

Summary. *P. personatus* populations in this area appear stable. This project will not detrimentally impact this species. Forest–wide habitat and population trends for this MIS plant are expected to remain stable.

3.3.4.13 Existing Conditions and Analysis of Effects for *Viola tomentosa*, Wooly Violet

Viola tomentosa is an herbaceous perennial with stems and leaves covered with gray woolly hairs. This violet is found in flat, gravelly openings in the forest, as well as highly disturbed, open areas such as skid trails, road sides and old log landings. This species is known to occur in the Sierra Nevada range from Plumas County to El Dorado County. Surveys for this species began in 1979. There are approximately 5 acres of wooly violet within the analysis area (table 3-4).

Effects of Alternative A on wooly violet.

Direct Effects—No direct effects.

Indirect Effects—Gradual decline of wooly violet in the absence of disturbance.

Cumulative Effects—No cumulative effects.

Effects of Alternatives B, C, and D on Wooly Violet.

Direct Effects—

- **Group selection** – There is 0.3 acre of wooly violet within group selection units.
- **Mastication** – There is 0.2 acre located within mastication units.
- **Thinning and Biomass Removal** – There is 0.8 acre located within removal units.

None of these actions pose a threat to this species because the violet requires open areas for habitat and appears to be tolerant of disturbance. It is commonly found in old logging landings, roadsides, logging skid trails, as well as other gravelly open areas. It has been noted by previous botanists on this district that a primary threat to this species appears to be encroachment by shrubs and grasses. Subsequent surveys have confirmed these observations.

Indirect Effects—

- **Risk of Noxious Weed Invasion** – See previous discussions under Quincy lupine and Mosquin's clarkia.

Cumulative Effects—There are no cumulative effects to the wooly violet for the following reasons:

- There are no past projects that overlap known violet occurrences.
- Direct and indirect impacts of proposed activities on the species will not be significant.
- Wooly violet will benefit from disturbances and canopy removal associated with this project.

Summary. Local populations of wooly violet appear stable at this time and this project will not jeopardize the viability of this species.

3.3.4.14 Existing Conditions and Analysis of Effects for Noxious Weeds

The alternatives considered in this FSEIS were analyzed for their potential to spread noxious weeds. Following a summary of the existing condition for noxious weeds in the project area, the results of this analysis are presented in section 3.3.4.14. Risk of noxious weed invasion as related to specific rare plants is discussed in sections 3.3.4.2 through 3.3.4.13.

Existing Conditions for Noxious Weeds. The California Department of Food and Agriculture's noxious weed list (www.cdfa.ca.gov/phpps/ipc/encycloweedia) divides noxious weeds into categories A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. Eradication or containment is at the discretion of the County Agricultural Commissioner with B-listed weeds. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

Two common weeds found within the project area are Klamathweed and bull thistle (tables 3-5 and 3-6). Klamathweed is listed with a C-rating on the California Department of Food and Agriculture's noxious weed list. Bull thistle was recently listed but is presently unrated. Klamathweed can be found along most Forest Service roads 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).

Table 3-5. Known noxious weed occurrences within and near Watdog Project treatment units.

Noxious Weed Species		Number of Occurrences within DFPZ and Group Boundaries	Number of Occurrences within 5 Miles of DFPZ Boundaries
Barbed goat grass	*Aegilops triuncialis*	0	1
Hairy white-top	*Cardaria pubescens*	0	5
Spotted knapweed	*Centaurea maculosa*	0	1
Yellow starthistle	*Centaurea solstitialis*	0	3
Bull thistle	*Cirsium vulgare*	common	common
Scotch broom	*Cytisus scoparius*	0	12
French broom	*Genista monspessulana*	0	18
Klamathweed	*Hypericum perforatum*	common	common

Table 3-6. Area estimations of known noxious weed occurrences in the Watdog Project area based on ocular observation.

Noxious Species	Estimated Infestation Area (square feet)	Percent Weed Cover of Infested Areas
Aegilops triuncialis	500	0.5
Cardaria pubescens	600	7
Centaurea maculosa	400	10
Centaurea solstitialis	800	7
Cirsium vulgare	common	common
Cytisus scoparius	60,000	5
Genista monspessulana	65,000	25
Hypericum perforatum	common	common

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, but does not normally form dense thickets on the Feather River Ranger District. Although not 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 upon request. Furthermore, bull thistle does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals like some A and B rated noxious weeds (Bossard 2000). Two biocontrol insects (*Urophora stylata* and *Rhinocyllus conicus*) have been released and help reduce population levels.

There are approximately 5.3 miles of designated summer off-highway vehicle (OHV) trails and approximately 1 mile of user-created trails in the project area. All designated trails have been examined for noxious weeds.

Effects of Alternative A on Noxious Weeds.

Direct Effects—No direct effects.

Indirect Effects—Gradual decline of noxious weed populations in the absence of disturbance.

Cumulative Effects—Gradual decline in the absence of disturbance and increase in overstory shade. However, as fuel levels increase, so does the risk of large and intense wildfire that may potentially denude large tracts of land, exposing these areas to noxious weed invasion.

Effects of Alternatives B, C, and D on Noxious Weeds.

Direct Effects—DFPZ construction and group selection harvest would remove some overstory canopy and disturb the soil and duff layers.

Indirect Effects—Environmental conditions in DFPZ and group selection units would become more favorable to noxious weed establishment.

Cumulative Effects—Disturbance levels associated with DFPZ construction are relatively low. Additionally, there are few high priority weed species in the project area. DFPZ construction would facilitate the reintroduction of fire into this area, eventually reestablishing a low-intensity fire regime. This will reduce the risk of large and intense wildfire and the associated risk of noxious weed invasion following such an event.

Group selection units will likely become established with low priority noxious species such as bull thistle and Klamathweed. These species will persist until native species such as *Ceanothus* spp., *Arctostaphylos* spp., *Pinus* spp., and *Abies* spp. exclude available sunlight. The cumulative impact of alternatives B, C, and D to noxious weed invasion will be moderate. See the Noxious Weed Risk Assessment (appendix C of the BE; on file at the Feather River Ranger District office) for the complete analysis.

3.3.5 Irreversible, Irretrievable Effects

Due to project-specific threatened and endangered plant species mitigations such as Limited Operating Periods and avoidance (appendix B), no irreversible, irretrievable effects on botanical resources are expected as a result of the implementation of this project.

3.3.6 Summary of Project Effects

The extent of cumulative effects resulting from the alternatives depends on the management of potential direct and indirect effects, as well as the attributes of the rare plant species located within the analysis area, their distribution within the analysis area, and the ability to design future activities with rare plant attributes in mind. Overall, management of the direct and indirect effects through project design and mitigation measures will minimize the potential for cumulative effects. Implementation of the Watdog Project is not expected to result in adverse cumulative effects on botanical resources for the following reasons:

- The project area has been adequately surveyed for Sensitive species, MIS plants, Special Interest species, noxious weeds, and special habitats.
- Areas of concern have been identified and the project design incorporated rare plant protection measures.
- The viability of all species discussed in this section appears stable and this project will not hasten the Federal or State listing of any. Habitat and population trends for MIS plants will remain stable.
- Direct and indirect effects to all species are expected to be minor to negligible.
- Cumulative effects from this project are absent for all species except ***P. personatus.***
- Noxious weed mitigation measures shall be applied to the project.
- There is a lack of high priority noxious weeds within the project area.

3.4 Economics

3.4.1 Introduction

3.4.1.1 Scope of the Analysis

The social and economic environment of the Plumas National Forest is described in the Forest's 1988 LRMP, as amended by the 1999 HFQLG FEIS and ROD; the 2003 HFQLG FSEIS and ROD; and the 2004 SNFPA FSEIS and ROD. 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 consistent and 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.

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 (HFQLG FEIS, appendix S, p. S-7; map 11 in appendix C of this FSEIS). The core area of the HFQLG region contains the three counties of Lassen, Plumas, and Sierra. The peripheral area of the HFQLG region contains five counties that surround the core area. These counties are Butte, Nevada, Shasta, Tehama, and Yuba. The focus of the socioeconomic analysis is on 41 communities within the HFQLG region (HFQLG FEIS, appendix T, table T-1). The Watdog Project is part of the HFQLG Pilot Project and this economic analysis will be based on the incremental effect of the Watdog Project within the HFQLG Pilot Project region.

Time Frame for the Analysis. As stated above, this economic analysis will not revisit the information presented in the HFQLG FEIS, but will focus only on the time frame associated with implementing thinning and fuels reduction treatments for the Watdog Project. The time frame for completing the timber harvest removal would take approximately 2 to 3 years. Completion of DFPZ construction activities would take an additional 3 to 6 years after timber harvest removal is completed.

3.4.1.2 Regulatory Framework

The HFQLG *Forest Recovery and Economic Stability Act of 1997* directs the Secretary of Agriculture to implement a pilot project on federal lands within the Plumas National Forest, Lassen National Forest, and the Sierraville Ranger District of the Tahoe National Forest in California. The project is designed to maintain ecological integrity, community stability, and forest health. In addition, the Secretary shall use the most cost-effective means in conducting the pilot project.

3.4.1.3 Analysis Methods

Timber harvest values used in this assessment were based on the California State Board of Equalization, Timber Harvest Values, January 1, 2008through June 30, 2008. Harvest costs and road improvement costs were developed from the latest timber sale appraisals values. Mechanical (mastication, grapple pulling), manual (hand cutting, hand piling, etc.), and prescribed fire (underburning, pile burning) treatments are based on the latest service contract prices, Knutson-Vandenberg and brush disposal sale area improvement plans.

3.4.2 Existing Condition and Environmental Effects

3.4.2.1 Introduction

The Plumas National Forest (the Forest) contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. The percentage of Plumas National Forest land in local counties is shown in table 3-7.

Table 3-7. Percentage of Plumas National Forest system lands by county.[a]

County	County Acres	Beckworth Ranger District (ac)	Feather River Ranger District (ac)	Mount Hough Ranger District (ac)	Total PNF[b] Land in County (ac)	PNF[b] Land within 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**

Notes:

a. Based on Geographic Information System (GIS) data.

b. PNF = Plumas National Forest.

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

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

Payment in Lieu of Taxes. Payments in Lieu of Taxes is administered by the Bureau of Land Management and applies to many different types of federally-owned land, including National Forest System lands. Payments in Lieu of Taxes payments compensate counties for the loss of property tax revenues due to non-taxable federal land within the county. Payments are made annually and are based on local population, Federal acreage in the county, and other federal payments during the preceding fiscal year. The minimum payment is 75 cents per entitlement acre. The funds may be used by the county for any purpose. The Forest has no control over the disbursement of these funds, and the amount disbursed every year is unaffected by Forest land management decisions.

Timber Yield Taxes. The second source of revenues to local government is the timber yield tax, 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. The taxes are collected by the State, and approximately 80 percent is returned to the counties in which the timber was harvested. Decisions about the amount of timber to be offered for sale each year on the Forest can affect the amount of revenues disbursed to the counties.

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 allocated to the State in which the Forest is situated. The amount returned 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 may not be spent on anything else.

Receipt Act payments are based on 25 percent of the total revenues collected from timber, grazing, land use, recreation, power, minerals, and user fees. Within the eleven western states, however, payments are based on 50 percent of revenue from grazing. Historically, at least 90 percent of total revenues have come from timber sale receipts. As a result, the amount of money available for distribution each year fluctuates widely, depending on the amount of timber harvested on National Forests.

Secure Rural Schools and Community Self-Determination Act. Congress passed the *Secure Rural Schools and Community Self-Determination Act* in 2000, offering counties an alternative to the *Receipt Act*. Under the *Receipt Act*, a state's three highest payment amounts between 1986–1999 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 *Secure Rural Schools and Community Self-Determination Act*. National Forests and other federal agencies that contribute to the 25 percent fund would have to generate approximately $56.4 million in total revenues in order to offset the $14 million that the counties receive under the *Secure Rural Schools and Community Self-Determination Act*.

Counties can receive variable, revenue-dependent payments under the *Receipt Act* or receive stable funding for local schools and roads under *Secure Rural Schools and Community Self-Determination Act*. The legislation promotes local involvement, decisions, and choice by creating well-balanced resource advisory committees that recommend forest projects to the Secretary of the USDA, or advise counties on county project proposals. Counties that elect to receive the full payment amount under *Secure Rural Schools and Community Self-Determination 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 (table 3-8). Like traditional 25 percent funds, Title I funds are expended for public school 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. *Secure Rural Schools and Community Self-Determination Act* full payment amounts (fiscal year 2008) for the five counties containing Plumas National Forest System lands are shown in table 3-8.

Table 3-8. Secure Rural Schools and Community Self-Determination Act full payment amounts to counties for fiscal year 2008.

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	$923,173	$738,539	80.0%	$0	0.0%	$184,635	20.0%
Lassen	$3,996,963	$3,397,419	85.0%	$148,087	3.705%	$451,457	11.295%
Plumas	$7,484,795	$6,362,075	85.0%	$374,240	5.0%	$748,479	10.0%
Sierra	$1,905,495	$1,619,671	85.0%	$142,912	7.5%	$142,912	7.5%
Yuba	$246,417	$197,134	80.0%	$0	0.0%	$49,283	20%
Total	**$14,556,844**	**$12,314,838**		**$665,239**		**$1,576,767**	

Authority for the Forest Service to make the payments under the Secure Rural Schools and Community Self-Determination Act (SRSCSD) expired at the end of fiscal year (FY) 2006. Public Law 110-28, the Iraq Accountability Appropriations Act of 2007, was signed into law on May 25, 2007 and extended provisions of the Act for one more year. The proposal to utilize land sales to partially fund Secure Rural School payments is not included in the President's FY 2009 Budget request to Congress. The county allocations for fiscal year 2008, seventh year of the Secure Rural School and Community Self-Determination Act are displayed in table 3-8. Funds were collected during Forest Service fiscal year 2007.

If the SRSCSD Act is not reauthorized due to insufficient funding, then counties would have to rely exclusively on the Receipt Act for timber-related schools and roads funding. National Forests and other federal agencies that contribute to the 25 percent fund would have to generate approximately $56.4 million in total revenues in order to offset the $14 million that the counties received under the Secure Rural Schools and Community Self-Determination Act.

3.4.2.2 Economic Environment

Existing Condition. Relative to the local economy, there is a potential to harvest 4–7 million board feet (mmbf) of timber over several years as part of the Watdog Project. Plumas and Butte Counties can expect to receive 25 percent of the revenues generated from this timber sale through the *Receipt Act* or receive full payment from the *Secure Rural Schools and Community Self-Determination Act*. Approximately 74 percent of the Watdog Project area is located within Plumas County and the remaining 26 percent is within Butte County. 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 are a measure of the overall value of the three alternative management scenarios considered in this analysis. The level of and mix of goods and services available to the public varies by alternative, resulting in a range of impacts on the social and economic environment. 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 to the U.S. Treasury, including the costs associated with implementing the treatments and direct, indirect, and induced job opportunities.

In general, the monetary value of each alternative depends on the amount and method of timber harvest and the acreage planned for fuels reduction treatments. Fuels reduction treatment costs that exceed harvest revenues would be financed through appropriated funds. Fuel reduction treatments would be implemented through service contracts.

Employment—Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Watdog Project has a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, fuel supplies, etc. Induced effects are driven by wages. Wages paid to workers by the primary and service industries are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs. This typically ranges from 10 to 15 jobs per mmbf harvested.

Revenue to the Government—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.

Payments to Counties—Local counties receiving payment through the *Receipt Act* rather than the *Secure Rural Schools and Community Self-Determination Act* would share part of the revenues generated from the timber harvest (table 3-8). Actual payment amount depends on estimated stumpage value and the price bid by the purchaser awarded the timber sale contract.

Treatment Costs—Treatment or management costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments, and mitigation measures requirements, as well as 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 all costs and values are not represented in the economic analysis. Calculations do not include costs and values for those items that cannot 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, may be funded through other sources such as watershed improvement needs, Resource Advisory Committee, wildlife habitat improvement, Knutson-Vandenberg, or other appropriated funds. Examples of costs not estimated in dollar terms are the reduction in scenic value in the early years of fuels treatments, air pollution due to wildfire, or reestablishing a forest following a stand-replacing wildfire.

For a detailed discussion of these non-priced benefits and costs, refer to the appropriate resource section in this document. These non-priced benefits and costs will be considered along with the net economic value of each alternative in order to make a judgment as to which alternative offers the best overall mix of costs and benefits to society.

Effects of Alternative A. This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the Treasury or returned to local counties. No additional employment opportunities or wages paid to the primary and service industries employees would be circulated through the local economy. Table 3-9 summarizes the economic impacts of alternatives A, B, C, and D on the local economy.

Table 3-9. Comparison of economic effects by alternative.

Revenue/Cost/ Employment	Alternative A	Alternative B	Alternative C	Alternative D
Sawlog and biomass harvest revenues	$0	$2,761,730	$2,026,782	$819,497
Timber yield tax	$0	-$80,090	-$58,777	-$23,765
Harvest costs	$0	-$2,500,710	-$2,262,162	-$1,195,502
Net harvest revenues	$0	$261,019	-$235,380	-$376,006
Non-harvest costs (DFPZ construction, reforestation, etc.)	$0	-$1,958,976	-$1,801,252	-$2,188,560
Total project value	**$0**	-$**1,697,956**	-$**2,036,632**	-$**2,564,566**
Direct jobs	0	144	119	72
Indirect jobs	0	158	134	89
Total direct and indirect jobs	0	302	253	161
Total employee related income	**0**	**$13,006,611**	**$10,868,351**	**$6,929,967**

The no-action alternative would have a negative cumulative impact on local industries dependent on Forest Service contract work or a steady supply of timber, as well as counties that use the timber yield taxes to fund county programs. These local industries would lack opportunities or business that would be provided from fuels reduction, site preparation or timber harvest activities associated with the Watdog Project. The local economy also would not benefit 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 infrastructure (i.e., local mill closures) to complete such activities. Loss of this infrastructure could significantly reduce or eliminate future economic and environmental opportunities generated by the removal of forest products from national forest lands. Fuel reduction activities in the creation and maintenance of DFPZs would not occur thereby further negating opportunities for long-term employment and rural community stability.

Under the no-action alternative, wildlife habitat, meadow, and streambank restoration and enhancement would not take place. In addition, dense standing trees and high fuel loading in the Watdog 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 wildfire reoccur in the Watdog Project vicinity.

Effects of Alternatives B, C, and D. Net harvest revenues for thinning and biomass removal would generate $261,019 for alternative B, and a losses of $235,380 for alternative C, and $376,006 for alternative D (table 3-9). Implementation of thinning, biomass removal, and other fuel treatments for alternatives B would cost $1,958,976, compared to $1,801,252 for alternative C and $2,188,560 for alternative D. However, the economic analysis does not take into account non-priced benefits such as reduced fire hazard and improved fish passage as a result of culvert work.

Thinning, biomass removal, and fuel treatments for alternative B would generate 144 full-time employment opportunities, compared to 119 under alternative C or 72 under alternative D. All action alternatives would create additional employment opportunities in service industries that serve the timber industry, such as logging supply companies, trucking companies, and fuel supplies. There is also an induced effect that is 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.

The 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 and C, 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 an estimated 302 direct, indirect, and induced jobs, compared to 253 by alternative C or 161 by alternative D.

The cumulative effects of these alternatives would include increased 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 will be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed most employment will be derived from Butte, Lassen, Plumas, Sierra and Yuba counties. The Watdog timber sale revenues and service contract employment would complement all other HFQLG-funded projects across the forest. Economic goals for the project as a whole across the Pilot Project area are discussed in the HFQLG FEIS. Table 3-10 displays the Pilot Project accomplishments of DFPZ and group selection acres treated and sawlog and biomass volumes offered over the past three years (HFQLG Oracle Database).

The Watdog Project contribution to the Pilot Project region by alternative is displayed in table 3-11. For the proposed DFPZ acres, the contribution to the Pilot Project region would be the same for all alternatives. For the proposed 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 alternative C and then D.

Table 3-10. 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 3-11. Watdog Project contribution to the HFQLG Pilot Project area.

	Alternative A	Alternative B	Alternative C	Alternative D
Proposed DFPZ (acres)	0	4,021	4,021	4,021
Percent contribution	0%	14.7 %	14.7%	14.7%
Proposed Group Selection (acres)	0	231	151	105
Percent contribution	0%	19.6%	12.8%	8.9%
Proposed Sawlog Volume (MMBF)[a]	0	16.3	12.8	4.4
Proposed Sawlog Volume (CCF) [b]	0	32,600	25,600	8,800
Percent contribution	0%	25.2%	19.8%	6.8%
Proposed Biomass Volume (tons)	0	32,640	32,640	14,685
Proposed Biomass Volume (CCF)	0	13,056	13,056	5,874
Percent contribution	0%	10.5%	10.5%	4.7%

Notes: Conversions: 1 MMBF is approximately equal to 2,000 CCF; one ton equals 0.4 CCF.

a. MMBF = million board feet.

b. CCF = hundred cubic feet.

There are no past HFQLG projects within the Watdog Project area. There is one present and one foreseeable future hazard tree project (table 3-1) in the project area that may contribute minimal revenues or breakeven depending upon the condition and salability of the hazard trees. However, neither project is part of the HFQLG Pilot Project.

See appendix F of this Watdog Project FSEIS for the complete economic analysis by alternative.

3.4.2.3 Irreversible, Irretrievable Effects

There are no irreversible or irretrievable effects on the economic environment.

3.4.2.4 Summary of Cumulative Effects

This economic analysis is focused on those revenues and treatment costs associated with implementing group selection and fuel reduction treatments within the Watdog Project area. Implementation of the no-action alternative would have a negative impact on local industries dependent on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the no-action alternative were implemented, additional funds would be needed in order to conduct fuel reduction treatments or black oak, meadow, and streambank restoration.

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternative B would generate more harvest revenue, timber yield taxes, employment opportunities, and employee-related income than alternatives C or D (table 3-8).

3.5 Fire and Fuels

3.5.1 Introduction

The Watdog Project proposes to reduce fuel loading by creating fuel breaks and harvesting trees using group selection silvicultural methods. The project would reduce fuels on a site-specific scale in order to create numerous DFPZs. The DFPZs will break up the fuel strata (the vertical and horizontal continuity of both live and dead vegetation that affects the way fuels burn), primarily along ridge tops. These treatments would reduce the risk of large and intense wildfire and enhance firefighting capabilities by providing improved access for suppression crews and increasing the amount of fireline the crew can establish in a given time period.

3.5.2 Scope of the Analysis

Potential fire behavior and fire effects (flame lengths, fire type, crown base height, and stand mortality) were modeled for both pre- and post-treatment based on fuels characteristics from representative stands proposed for treatment within the Watdog Project. The 'post-treatment outcome' represents fuel conditions expected immediately after treatment and for a minimum of eight years into the future. Time frame and geographic boundaries for consideration of past, present, and foreseeable future actions are defined below. Specific actions considered in this analysis are described in the "Cumulative Effects" sections below.

3.5.2.1 Geographic Scope of the Analysis

The analysis area for cumulative effects extends approximately one mile from the DFPZs (map 11, appendix C). Because of local topography, a wildfire starting within a one mile radius of the Watdog DFPZs would be expected to burn into the Watdog DFPZ units if it escapes initial attack. Fires burning outside the one mile area would not be expected to have an influence on the proposed DFPZ because they would be expected to burn away from the DFPZ due to slope and topography.

3.5.2.2 Time Frame for the Analysis

The cumulative effects analysis time frame spans the period from 1995 to approximately 10 years into the future for DFPZ treatments. This timeframe was chosen because, in general, DFPZ and similar fuel treatments are expected to remain effective without further treatment for approximately 10 years once established, depending on vegetation type. Fuel conditions in areas treated within that time frame still have the potential to moderate fire behavior and assist fire suppression control efforts. Because past harvest activities, fire suppression, and large wildfires that occurred before 1995 are in part responsible for shaping the existing condition of fuels in the analysis area, these actions and events are discussed in the "Existing Conditions" and "Cumulative Effects" sections below.

3.5.3 Analysis Methods

Fuel models, using Anderson (1982) and Albini (1976), were used to represent the existing fuel profile within the project area. Fuel models in the project area include Northern Forest Fire Lab Fuel Models 5, 8, 9, 10, and 12. Fuel Models 8 and 9 best represent desired conditions in terms of fire

behavior. Fuel Models 5, 10, and 12 represent existing conditions and are typified by fuel complexes of brush with increasing proportions of dead components, logging slash, or heavy timber litter and understory. More detailed descriptions of the fuel models can be found in "Section 3.5.5.4: Fuel Conditions."

Site-specific vegetation characteristics were extracted from forest inventoried data and put into the Fuels Management Analyst Suite program to display the following fire behaviors and effects: rate of spread, flame length, crown fire type, and probability of tree mortality. Crown base height was derived from inventoried data in Forest Vegetaion Simulator. The Fuels Management Analyst Suite program uses algorithms based on work by Alexander (1983); Reinhardt and Ryan (1998); Rothermel (1983); Andrews (1986); and Van Wagner (1977). Fire behavior predictions for flame length and rate of spread were made using BEHAVE (Andrews 1986).

Table 3-12 shows the 90th percentile weather conditions that were used for all fire predictions using both the BEHAVE and Fuels Management Analyst Suite programs. Data was collected from a representative weather station at the Pike County Lookout, south of the project area. Weather data from 1980–2002 were used to determine potential fire behavior for the project area. Because wind speed is affected by topography and vegetation, a wind adjustment factor was used to adjust the 20-foot wind speed that is used by the remote automated weather station. This 20-foot wind needs to be adjusted to an eye level wind to show the actual wind that would be at a flaming fire front. Different factors are used depending on whether fuels are exposed, partially sheltered, or fully sheltered. For the Watdog Project, a wind adjustment factor of 0.3 (partially sheltered) was used to reduce 20-foot winds (7 miles per hour) to mid-flame (eye height) winds (2.1 miles per hour). Because the weather data taken from Pike County is in a totally open stand with no restriction to the wind and no shading from any trees, this weather station represents a "worst-case" scenario.

Table 3-12. 90th percentile weather conditions (1980–2002) for the Pike County weather station.

Weather Parameter	Observations
Dry Bulb	92 ^{0} F
Relative humidity	14 %
20 foot wind speed	7 mph
1 hour fuel moisture	4 %
10 hour fuel moisture	5 %
100 hour fuel moisture	7 %
1000 hour fuel moisture	8 %
Live woody moisture	48 %
Live herbaceous moisture	33 %
Live fuel moisture	120 %

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. According to researchers, "fuel data today tend to smooth out variation in order to represent the "average" condition. However, the average fuel condition does not produce the average

fire behavior response because fire behavior responds nonlinearly to changes in fuels and weather" (Graham et al. 2004). It is also impossible to quantify what the fire environment will be at the time a wildfire would burn through a treatment area.

The 90th percentile weather conditions used in this analysis also tend to smooth out weather variables used as inputs, including wind, which is one of the greatest influences on how a fire will burn. It should also be recognized that the fuel models used to display post treatment conditions will not be continuous across the entire treatment area.

Historic fire regime determination was done by analyzing fire history within the analysis area, and reviewing fire history research that is relevant to this project. Current condition class was determined by observations of the vegetation and fuel composition characteristics within the project area by individuals that are trained in evaluating Fire Regime Condition Class.

3.5.4 Regulatory Framework

Standards and guidelines for fuels and vegetation management activities for the Watdog Project area are shown in table 2 of the SNFPA ROD. Table 2 includes direction for designing and implementing fuel and vegetation management activities within each of the various land allocations of the HFQLG Pilot Project.

As described in table 2 of the SNFPA ROD, no DFPZ construction is proposed within lands designated as offbase and deferred, California spotted owl protected activity centers (PACs), or spotted owl habitat areas. Within late-successional old-growth (LSOG) Rank 4 and 5 stands, only DFPZ construction is proposed. Consistent with the direction provided by the 1988 LRMP and interim guidelines for the inventoried roadless areas, timber harvesting would not be conducted within the Feather Falls Scenic area and released roadless areas. Prescribed burning is allowed within these allocations.

3.5.4.1 Desired Fire and Fuel Conditions

Desired fuels conditions are provided in the 1988 Plumas National Forest LRMP, as amended by the 1999 FEIS ROD on the HFQLG Act and the 2004 ROD on the SNFPA FSEIS. Consistent with these desired conditions, the proposed action would reduce existing surface and ladder fuels in the DFPZs and group selection units. Residual fuels (less than 3 inches in diameter) in these treatment areas would not exceed 5 tons per acre after treatment. However, where down logs exist, 10 to 15 tons per acre of the largest down logs with diameters greater than 12 inches would be retained. Ladder fuels would be removed in the DFPZ treatment units to increase canopy base heights, which would reduce the probability of convective heat igniting tree crowns. In general, canopy cover would be reduced to an average of approximately 40 percent in the DFPZ treatment units to reduce the potential for crown fire spread. Other desired conditions that would help to moderate fire behavior within the DFPZs and group selection units include flame lengths less than 4 feet and improved ability to construct and control fire lines (i.e., a decrease in resistance to control).

The proposed treatments would also be implemented in the riparian areas within DFPZs in order to enhance and protect the riparian areas from effects of large wildland fires. To create desired conditions, some hand cutting, piling, burning of piles and underburning would be considered. This type of treatment would be used if the post-thinning review of the area determines that it would be beneficial to the health of the riparian areas to do so. All of these types of treatments are designed to improve the health and fire resiliency of the riparian areas.

3.5.5 Existing Conditions and Environmental Effects for Fire and Fuels

3.5.5.1 Introduction

This section begins with descriptions of the existing conditions of fuels and fire behavior in the analysis area. Section 3.5.5.2 discusses fire history and suppression activities and how those actions and events relate to the build up of fuels. Section 3.5.5.3 introduces the concepts of fire regime and condition class, two classification systems used to describe the natural frequency and severity of fire on the landscape and how fire regime has been altered from its historic range. Current fuel conditions are described in terms of fuel models in section 3.5.5.4, followed by topography in section 3.5.5.5. Finally, section 3.5.5.6 describes how the existing conditions for fire regime, condition class, fuels, and topography contribute to expected fire behavior under hot, dry, and windy conditions typical of fire season.

3.5.5.2 Historic Fires – Watdog Project Area

Fire occurrences were analyzed and inventoried within the cumulative effects analysis area (approximately one mile from DFPZs).

The Feather River Ranger District has detailed information about all fires since 1965; only limited information is available for fires before that time. In 1927, a lightning-ignited fire burned approximately 30,000 acres in and around the project area. This was the largest fire in the project area from 1917 through 2003. From 1970 through 2003, fire history records show a total of 58 fires within the Watdog Project area. Recorded fires that burned more than 100 acres are as follows: 1981 (551 acres), 1984 (410 acres), 1987 (over 1,000 acres), 1999 (1,500 acres). There were 54 small fires that ranged from 1/10 of an acre to approximately 100 acres. Of these, 33 were lightning-caused while the remaining 21 were human-caused.

The Forest Service did not begin taking organized and consistent fire suppression action until the 1920s. Before that time, fires on the National Forest burned unconstrained regardless of cause, unless they were a threat to private property. Fires burned with varying intensity, 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-destroying fires. These stand conditions have been documented by pioneer accounts, early photo point records, and fire history records from tree ring analysis. Fuel buildup is a relatively recent issue on the Plumas National Forest; fuels from natural sources and untreated logging slash began to accumulate after the turn of the century.

3.5.5.3 Fire Regime / Condition Class

Existing Condition. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention. It does, however, include the influence of aboriginal burning (Agee 1993; Brown 1995). Coarse-scale definitions for natural historic fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five historic fire regimes are classified based on the average number of years between fires (fire frequency), combined with the severity (amount of stand replacement) of the fire on the dominant overstory vegetation. Table 3-13 shows that historic fire regimes are described by a five-tiered system, which ranks fire regimes by frequency and severity.

Table 3-13. Historical fire regimes, ranked by frequency and severity.

Rank	Frequency	Severity
Fire Regime 1	0–35 years	Low
Fire Regime 2	0–35 years	Stand replacement
Fire Regime 3	35–100 years	Mixed
Fire Regime 4	35–100 years	Stand replacement
Fire Regime 5	200+ years	Stand replacement

Condition class can be altered by disturbances such as timber harvest, livestock grazing, introduction of exotic species, introduction of insects, and other types of natural phenomena (for example, wind or water). Condition classes are described below.

- *Condition Class 1*—fire regime is within historic range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.

- *Condition Class 2*—fire regime has been moderately altered from the historic range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historic ranges by one or more return intervals (either increased or decreased). This would result in moderate changes to one of the following: fire size, intensity and severity, and landscape patterns. Vegetation has been moderately altered from the historical range.

- *Condition Class 3*—fire regime has been significantly altered from the historic range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historic frequencies by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been significantly altered from their historic range (Schmidt et al. 2002).

Fire Regime and Condition Classes are interlinked. For example, a recently-burned area classified as Fire Regime 1 would most likely be in Condition Class 1, meaning the area is within its historic range of variability. Another example is a Fire Regime 1 area that had not had a burn come through

for 100 years, meaning that it has missed at least two natural fire disturbances. In this example, the area would most likely be classified as Condition Class 2 or 3.

Historically, the Watdog Project area was considered Fire Regime 1 / Condition Class 1. Through the absence of fire, this has changed to Fire Regime 4 / Condition Class 3. Parts of the project area previously thinned or treated with underburning can be described as Condition Class 2.

3.5.5.4 Fuel Conditions

Existing Condition. Approximately 700 acres were thinned and burned in 1994 and 1995 in the Watson Ridge Project. In this project the majority of ladder fuels were removed and crown base heights (the height of the first branch of tree to the ground) were raised. Since that time, brush has increased in height and it is beginning to become more flammable.

For the most part, the portions of the Watdog Project area not treated under the Watson Ridge Project have significant surface and ladder fuels, making these areas more susceptible to crown fire initiation. These conditions are largely a result of fire exclusion and past timber harvest that favored overstory removal (OSR) and limited surface fuels treatments.

Montane chaparral is the dominant brush type within the project area covering approximately seven percent of the Watdog Project area. It is important to differentiate the montane chaparral found in the northern Sierra Nevada from chaparral typical at lower elevations, coastal, and southern regions of the state (Nagel and Taylor, in press; Holland and Keil 1995; Mayer and Laudenslayer 1998). Northern Sierra Nevada montane chaparral generally burns less intense and patchy due to low surface fuel loading. Large chaparral fires in southern California are typically high-intensity, high-severity crown fires driven by Santa Ana or foëhn-type winds (Keeley and Fotheringham 2001). In the project area, foëhn-type winds do not occur, though “north winds” can occur in late summer and fall. North winds typically effect the lower elevations of the Sacramento Valley (Schroeder and Buck 1970).

Fuel conditions are variable throughout the DFPZ treatment units and analysis area. There are six Northern Forest Fire Lab Fuel Models represented in the project area. Approximately 70 percent of the project is in Fuel Model 10, mixed conifer stand with dead and down woody fuels. About 15 percent of the units are Fuel Model 9, long-needle conifer stands and hardwood stands. The remaining 15 percent of the project area is split between Fuel Models 5, 8, 11, and 12. Descriptions of the fuel model categories in the Watdog Project area follow.

Fuel Model 5—Fuel Model 5 represents shrub and sapling fuel types. These fuel types are 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 conditions do live fuels in Fuel Model 5 pose a threat of becoming a large fire.

Fuel Models 8 and 9—Fuel Models 8 and 9 are single-story, early- to mid-succession 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 (for example, high wind speeds) do these fuel types pose a resistance to control.

Fuel Model 10—Fuel Model 10 represents decadent late-stage succession, characterized by multistory stands with ladder fuels and significant component of dead and down materials. Due to the heavy down fuel component and presence of ladder fuels, fires in Fuel Model 10 burn with a high-intensity. This can lead to torching and crowning in overstory trees, as well as spotting, which occurs when fire brands are carried by winds and produce new fires well ahead of the main fire. Fires occurring in this fuel type are difficult to control under initial attack conditions.

Fuel Models 11 and 12—Fuel Models 11 and 12 represent stands with moderate to heavy amounts of slash (dead and down woody material) often with needles still attached. Fuel Model 11 has less fuel loading than Fuel Model 12. These fuel types are associated with logging activities, storm damage, or disease and insect infestations. Both models have considerable amounts of fuel that can burn with high intensities, resulting in severe fire effects and increasing the probability of crown fire behavior.

3.5.5.5 Topography

Existing Condition. The slopes in the Watdog analysis area vary considerably, ranging between 0 to greater than 60 percent in the canyons adjacent to the DFPZ treatment units. The majority of the treatment units would be located on slopes between 0 and 35 percent. Elevation in the project area ranges from approximately 3,000 to 6,200 feet in elevation.

3.5.5.6 Fire Behavior

Existing Condition. The upper flame length limit for direct action by hand crews is generally considered to be 4 feet, and 6 feet is considered the upper flame length 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.

Table 3-14 shows rates of spread and flame length for the six fuel models in the Watdog analysis area. Rate of spread is a measure of how quickly a fire spreads horizontally. In this document, it is expressed as rate of forward spread of the fire front, and is measured in chains per hour. One chain equals 66 feet. Currently, approximately 70 percent of the project is in Fuel Model 10, conditions which produce flame lengths greater than 4 feet. This means that direct attack by hand crews would not be possible in much of the project area under 90^{th} percentile weather conditions.

As resistance to control decreases, suppression crew production rates increase, as shown in table 3-15. The table shows fireline production rates for three different suppression crews: hand crews (individual and 20-person crew), engine crews (individual and 3-person crew), and type 2 dozers on Slope Class 1 and 2. The number of trees per acre also affects production rates. Line construction rates would increase incrementally when there are fewer small trees because of the time required to fell, buck and move the trees. Assuming surface fuels and ladder fuels have been minimized, firelines built in DFPZs with wider tree spacing, and larger trees with higher crowns that do not have interlaced branches, would be easier and faster to build, safer for firefighters, and more likely to slow the progress of a wildfire, especially when combined with fire suppression efforts. Since much of the project area can currently be characterized as Fuel Model 10, and has many small diameter trees (tables 3-19, 3-39, and 3-40) the no-action alternative would result in slower production rates by fire fighting resources.

Table 3-14. Fire behavior predictions (BEHAVE GTR-194) based on uphill fire on 20 percent and 60 percent slopes.

Fuel Model	Rate of Spread (chains/hour)		Flame Length (feet)	
	20% Slope	60% Slope	20% Slope	60% Slope
5	17.9	39.6	5.7	8.2
8	1.0	2.3	0.9	1.2
9	3.8	9.0	2.1	3.1
10	6.1	13.7	4.7	6.9
11	3.3	7.2	2.8	3.9
12	8.0	16.7	6.7	9.4

Table 3-15. Fireline production rates for fire suppression crews in chains per hour.

Fuel Model	Production Rates In Chains per Hour					
	Individual on Hand Crew	20-Person Hand Crew	Individual on Engine Crew	3-Person Engine Crew	Dozer Type 2 Slope Class 1[a]	Dozer Type 2 Slope Class 2[b]
5	0.7	14.0	3.0	12.0	45–70	25–45
8 Conifers	2.0	40.0	3.0	15.0	45–70	25–45
8 Hardwoods	10.0	200.0	10.0	40.0	—	—
9 Conifers	2.0	40.0	3.0	12.0	35–55	15–35
9 Hardwoods	8.0	160.0	8.0	40.0	—	—
10	1.0	20.0	3.0	12.0	8–15	3–8
11	1.0	20.0	3.0	12.0	15–25	7–15
12	1.0	20.0	3.0	10.0	15–25	7–15

Notes:
a. Slope class 1 = 0–25% slope.
b. Slope class 2 = 26–40% slope.
c. One chain is equal to 66 feet.

3.5.6 Effects of the Alternatives on Fire and Fuels

3.5.6.1 Effects of Alternative A

Direct Effects. Surface fuels, ladder fuels, and canopy fuels would not be modified over the short term; therefore potential fire behavior would not change from the current condition.

Road closures, reconstruction, and decommissioning would not occur. Therefore, access for fire suppression resources and the public would not be modified from current levels into the near future.

Table 3-16 shows predicted conditions (flame length, fire type, and crown base height) from selected representative units for all alternatives. As shown, implementation of the no-action alternative would result in increased flame length and decreased crown base height compared to the three action alternatives. Fire type is expected to be passive crown fire. Passive crown fires burn crowns individually or in small groups. Surface fires burn surface litter, debris, and small vegetation.

Table 3-16. Predicted stand conditions for selected units for the no-action alternative (alternative A) and after treatments and prescribed burning of alternatives B, C, and D.

Unit Number	Treatment Prescription	Flame Length (feet)		Fire Type	
	Alternatives				
	B and C	A	B, C, and D	A	B, C, and D
10	Removal / underburn	6	2	Passive Crown	Surface
20	Removal / underburn	7	2	Passive Crown	Surface
31	Removal / underburn	5	3	Passive Crown	Surface
32	Underburn	6	3	Passive Crown	Surface
35	Removal / underburn	6	1	Passive Crown	Surface
40	Removal / underburn	5	3	Surface	Surface
63	Removal / underburn	6	3	Passive Crown	Surface
78	Removal / underburn	7	3	Passive Crown	Surface
85	Removal / underburn	5	2	Passive Crown	Surface
101	Removal / underburn	6	3	Passive Crown	Surface

Table 3-17. Stand level CWHR 4 predicted average crown base height for the no-action alternative (alternative A) and after primary thinning treatment of alternatives B, C, and D.

Predicted Condition	Alternative A	Alternative B	Alternative C	Alternative D
Average Crown Base	7 Feet	32 Feet	28 Feet	20 feet

Under alternative A, wildfires starting under current forest fuel conditions would be more intense and would result in mortality of approximately 70–100 percent of trees in all size classes. Because flame length and overall resistance to control would increase, suppression crew production rates would decrease. Aerial retardant application would be less effective under this alternative because the closed canopy would inhibit retardant penetration and reduce the amount of retardant available to slow the spread of fire in the surface fuels.

Indirect Effects. With no action, flame lengths, rate of spread and resistance to control of wildfires burning under 90th percentile weather conditions (table 3-12) would be expected to reduce the ability of initial attack resources to control of the fire. After a fire escapes initial attack, suppression forces would need to employ indirect attack strategies on fast-moving, high-intensity wildfires. Fires would be allowed to increase in size in order to allow suppression forces adequate time to locate firelines at strategic locations. Indirect effects of such suppression strategies include greater threats to improvements and private property, increased suppression costs for incidents, and increased fire size with associated negative impacts on vegetation and stand structure. Recent literature supports the conclusion that in landscapes with accumulations of dead woody debris and dense stands of shade-tolerant understory trees and shrubs, that the fuel and vegetation complex becomes nearly homogeneous, and fire that cannot be suppressed, becomes larger and burns more intensely (van Wagtendonk 2004).

Cumulative Effects of Alternative A. See "Section 3.5.2: Scope of the Analysis" above for discussion of the geographic boundary and timeframe for the analysis. Past, present and foreseeable future actions and events considered in the cumulative effects analysis are listed in table 3-1. Past action and natural events as they relate to the Existing Conditions are also discussed in section 3.5.5.

In general, current forest structure within the analysis area for Fire and Fuels is the result of fire exclusion and past timber harvest that favored OSR and limited surface fuels treatments. The Watson Ridge Underburn (1995), Watson Thin (1995–1996) and Steward Thin (1997) projects have reduced tree density, raised crown base height, and generally resulted in stands with lower fire behavior potential compared to much of the analysis area. However, because the treated areas are limited in size they are not expected to moderate fire spread across the landscape, and in some areas brush growth is beginning to increase fire potential. The no-action alternative would result in the continued build-up of hazardous fuels. In the event of a wildfire, continued fuel build-up would require suppression actions that are increasingly complex and dangerous to firefighters and the public.

The development of current forest structure in the analysis area has also been affected by the creation of plantations on both private and public lands through even-aged management treatments and by the Mooreville (1987) and Devils Gap (1999) fires. Together, the Mooreville and Devils Gap fires burned approximately 2,500 acres. Today, these burned areas are dominated by stands of montane chaparral. The area burned by the Mooreville fire is currently overgrown with brush and fuel loadings have increased as snags have fallen and become dead and down fuel. However, much of the area burned is on private land, and cannot be treated by the Forest Service. In the area burned by the Devils Gap fire, implementation of the current South Fork DFPZ project (see below and in table 3-20) will break up the fuel strata, reduce the risk of large and intense wildfire, and enhance firefighting capabilities. Without treatment, much of the area would be overgrown with brush and increasingly flammable within approximately 10 years.

Past even-aged management activities have created plantations (approximately 10 to 30 years old) that typically have low surface fuel loads due to past site preparation. The low surface fuel loads in these plantations will affect fire behavior at the stand level and reduce resistance to control compared to past harvested areas that have a higher density of small diameters trees and little or no reduction of surface fuels. However, because of their size and location, plantations will have a limited effect on fire spread across the landscape.

While plantations have been shown to burn with high severity under modeled conditions (Stephens and Moghaddas, in press), fires in or impacting young plantations on slopes less than 35 percent on the Feather River Ranger District have typically been of low intensity due to lack of surface fuels, discontinuous brush cover, and high live fuel moistures (Rick Case, pers. observations; Brooks Henderson, pers. comm.). One example of a high intensity wildfire burning into an older plantation with a heavy brush component occurred when the Pigeon Fire in August of 1999 (Mt. Hough Ranger District, Plumas National Forest) burned to the edge of a plantation where the spread was limited by the fuel characteristics within the plantation. Spot fires within the plantation also had limited spread because of the fuel characteristics (Phil Shafer, pers. comm.). Another example was the Mosquito Fire in August of 1999 (Feather River District, Plumas National Forest) The Mosquito Fire started from a lightning strike adjacent to a 9-year-old plantation dominated by ponderosa pine with a high component of ceanothus shrubs, much like many of the plantations in the

Watdog analysis area. 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. Without ladder and surface fuel treatment (as proposed under the action alternatives) the established plantations within the analysis area will have a higher degree of resistance to control.

Currently, the Bald Onion DFPZ is being constructed to the north of the analysis area, while portions of the South Fork DFPZ are being constructed to the south in much of the area burned by the Devils Gap fire (see map 14 in appendix C.) Alternative A will not provide any connectivity to these portions of the HFQLG DFPZ network, leaving only the montane chaparral stands created by the 1999 Devils Gap fire to act as control features in the event of a large wildfire in the analysis area. However, in approximately 10 years, areas not treated under South Fork will lose their effectiveness as control features as brush re-grows.

On private land within the analysis area, the Feather Falls Salvage will salvage less than 10 percent of the average volume per acre over approximately 14,000 acres. This project is anticipated to add some fuels to the existing fuel loading, but not enough to significantly increase fire behavior or resistance to control compared to the existing condition. In the northeastern portion of the analysis area, the Bald Mountain Project will implement approximately 90 acres of small group selection harvest units and 100 acres of individual tree selection harvest. Only a small portion of these harvest units would fall within the Watdog analysis area. Although the Bald Mountain Project would begin the process of converting high fire risk stands into more fire resilient stands, this project will not limit fire spread or improve resistance to control except at the stand level due to the limited size and placement of the group selection and individual tree selection (ITS) units.

Under the no-action alternative, the mitigation measures related to hazardous fuel reduction (Items D.5, D.6 and D.7) in Plumas County Communities Wildland Fire Mitigation Plan would not be achieved on the approximately 550 acres of public lands within the adjacent and extended wildland urban interface that is identified in the Plumas County plan.

A future project that could occur within the analysis area is the Pinchard Creek Project. A proposed action with specific treatments and locations has not yet been developed, making it difficult to fully assess the effects of the project at this time. However, because the proposed action for this project is expected to include approximately 500 acres of group selection and 500 acres of individual tree selection, it is expected that the project would not immediately change the forest structure of a stand from a high fire risk to a fire resilient one. Instead, the Pinchard Creek Project would begin the process of converting high fire risk stands into more fire resilient stands.

Both recreational activities and rangeland grazing would contribute negligible additive effects to implementation of the no-action alternative. However, human ignitions have been increasing in California (Stephens, in press). Although the Watdog area is relatively remote with few developed recreation opportunities, it is likely that this trend will occur within the analysis area as well if recreational activities such as OHV use, hiking, camping, mining, hunting, and woodcutting increase.

Reduced grazing of the Fall River allotment may result in a relatively minor accumulation of fine fuels in the project area in the form of cured grasses and forbs but is not expected to increase overall fire behavior and severity in the Watdog analysis area.

Summary. The no-action alternative would result in the continued build-up of hazardous fuels on the key ridge tops that may be used for control lines in the event of a large fire in the analysis area. The continued fuel build-up requires suppression actions that are increasingly complex and dangerous for firefighters and the public. The one large recent fire in the analysis area (Devils Gap) that breaks up the continuity of hazardous fuels is expected to lose its effectiveness as a control feature within approximately 10 years.

A portion of the HFQLG DFPZ network will not be established on key ridges that are adjacent to the steep canyons of the Middle Fork Roadless Area and South Fork of the Feather River, so there will be no connectivity between the Bald Onion and South Fork DFPZ projects. This will leave the adjacent and extended wildland urban interface that was identified by local fire safe councils at greater risk. The majority of the analysis area will remain in Condition Class 3 and remain at risk of losing key ecosystem elements in the event of a wildfire occurring under 90th percentile weather conditions.

3.5.6.2 Effects of the Action Alternatives (Alternatives B, C, and D)

Direct Effects. To achieve the desired conditions stated earlier in this section all of the DFPZ treatments in the action alternatives follow the strategy outlined by Graham et al. (2004) and Peterson et al. (2005). This strategy is: (1) reduce surface fuels, (2) increase height to live crown, (3) decrease crown density, and (4) retain larger trees.

Based on representative stands proposed for DFPZ treatments (table 3-16) fire behavior potential would be reduced by alternatives B, C and D compared to alternative A under 90th percentile weather conditions. Flame lengths will be reduced from 5-7 feet to 1–3 feet once treatment of the surface fuels is completed. Raising average crown base height from 7 feet to 32, 28, and 20 feet for Alternatives A through D respectively (see Table 3-17) would change fire type from mostly passive crown fire to a surface fire.

However, models tend to smooth out variations to represent average conditions (Graham et al. 2004). Analysis of the number of trees per acre (see Table 3-19) retained in the 6 to 11 inch dbh size class indicates that alternative B will have a lower potential for passive crown fire than alternative C because there is less ladder fuel potential, greater crown base height, and less canopy cover. Alternative D would have the highest potential of crown fire for the action alternatives because of three factors: (1) approximately 44 percent of the trees between 6–11 inch dbh would be removed compared to 85 percent in alternative B and 82 percent in alternative C; (2) canopy cover would be approximately 10-25 percent greater than B and 10 percent greater than alternative C.. Alternative B reduces canopy cover in the smaller size class trees (table 3-39); and (3) crown base height is 12 feet greater in Alternative B and 8 feet greater in Alternative C. Researchers (Graham et al. 2004) acknowledge the uncertainty associated with how much treatment is needed in each stratum to achieve the desired result because of the dynamic environment that affects how a wildland fire will spread.

Topography of the Watdog analysis area and the associated fire behavior has also been considered in this analysis. The DFPZs are located on ridge tops adjacent to slopes that exceed 60 percent in most drainages of the Middle Fork of the Feather River. As table 3-14 shows, wildfires burning up to the DFPZs are expected to have faster rates of spread and higher flame lengths than fires burning on slopes that are not as steep. Since alternative B has slightly fewer small diameter trees and greater distance between tree crowns than alternative C, fires burning into the Watdog DFPZ from adjacent canyons may moderate in intensity sooner than alternative C. It is anticipated that because of the larger amounts of small diameter trees and greater canopy in alternative D, fires will not moderate in intensity as quickly as they will in either alternative B or C.

Because of increased tree spacing and decreased shade from tree canopies, alternatives B, C and D would create slightly hotter and drier conditions, with slightly increased wind speeds in the DFPZ units. DFPZ's created by alternatives B and C may be slightly hotter and drier than alternative D with slightly higher wind speeds. The open canopy would also encourage more fine fuels and herbaceous plants. However, when the reduction in surface, ladder fuels, and flame lengths along with the increase in fire suppression production rates achieved by fuel treatment activities would mitigate any effects caused by the decrease in relative humidity and increase in temperature (Martin and Brackebusch 1974; Rothermel 1983; Agee 1996; van Wagtendonk 1996; Agee and others 2000). The same is true for group selection units. The units will average 1 ½ acres; in an opening this size the slight increase in wind speed expected as a result of treatments would be scarcely noticeable while standing within the unit because of the sheltering effect of the stand surrounding the unit. Fire behavior would not be changed to a degree that would require different tactics by ground or air suppression resources.

All of the action alternatives will reduce the amount of brush that currently exists. The canopy cover of alternatives C and D would provide enough shade to retard or minimize germination or sprouting of brush. Alternative D would have the least amount of brush regrowth while alternative B would have the most because of the more open conditions. The younger, more recently established brush in all alternatives would have a higher live to dead ratio so it would be less flammable than conditions that would exist in alternative A. 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.

In treatment units in which prescribed fire (either piles or underburning) would be required to meet the desired condition, a short-term fire hazard will exist for up to 5 years (based on past local experience) until the prescribed fire treatment can be accomplished.

Approximately 2,800 acres would be burned during project implementation. A combination of dozer and handlines would be used to construct the firelines around the perimeter of the underburn units. It is estimated that approximately 2,040 chains (134,640 feet) of handline and 800 chains (52,800 feet) of dozer line would be constructed. Approximately 1,520 chains of existing road would be used as fireline (see map 7 in appendix C of this FSEIS). Interior lines could be constructed on some of the larger units to enable Forest Service burning crews to cut off the firing in safe and effective areas if smoke or fire behavior concerns make continued burning problematic.

Prescribed burning proposed as part of alternatives B, C, and D would consume surface fuels; expose small amounts of mineral soil, and cause needle and small limb mortality. Needle and small

limb mortality would cause needles and small limbs of scorched, killed vegetation to drop to the forest floor, creating a short-term increase in fire hazard. However, proposed pre-treatment and the elimination of existing surface fuels by prescribed burning would mitigate the impacts of needle and small limb mortality on fire hazard.

The combination of proposed treatments incorporates three principles of fire resistance (Agee et al. 1999) to reduce surface fuels, increase height to live crown, and decrease crown density, while retaining the largest trees in the stand. The approach of utilizing mechanical and fire treatment methods was documented to be the most effective treatment to modify potential fire behavior and severity by Stephen and Moghaddas (2005b).

Analysis indicates that prescribed burning would result in 60 to 80 percent mortality in residual conifers, hardwoods (8 inches dbh and less), and most shrubs. This mortality would further reduce ladder fuels (i.e., the shrubs and understory trees that light on fire and allow a surface fire to get into the canopy). Watdog units treated with fire alone would receive a follow-up underburn to reduce surface fuels created by tree mortality resulting from the initial prescribed burn implementation.

The action alternatives differ in the acres of group selection treatments (231 acres alternative B, 151 acres alternative C, and 105 acres alternative D), and the acres of group selections that would be located within the DFPZs (203 acres alternative B, 123 acres alternative C, and 77 acres alternative D). For alternative B, 5 percent of DFPZ units would contain group selections, compared to three percent for alternatives C and D. Within group selection units, the majority of slash would be removed after treatment through grapple piling or hand piling and burning, resulting in lower overall surface fuel loads leading to a relatively low surface fire hazard. Reforestation efforts utilizing various conifer species would occur in group selection openings (see appendix A of this FSEIS). Once the seedlings are established, release treatments would be implemented to reduce competing vegetation (forbs and brush such as deer brush, white thorn, and manzanita) to ensure seedling survival. Small trees in group selection units would continue to be vulnerable to scorch-related mortality in the near future. Implementation of group selection harvest within the DFPZ is consistent with achieving the DFPZ desired condition of maintaining 90 percent of the area in a condition that is not susceptible to torching. Because the group selections will average 1 ½ acres and will be scattered across the project area they reduce fire behavior and resistance to control for a small, localized area.

All of the action alternatives would begin to move the analysis area from Condition Class 3 towards the desired condition of 2 or 1. Alternative B would produce the greatest change, followed by C and finally D.

Indirect Effects. All of the action alternatives increase the likelihood that wildland fires occurring within the DFPZ units will be successfully suppressed by initial attack hand crews and engines when compared to the no-action alternative. This is because of four factors: (1) reduction in fire behavior characteristics described in the direct effects section above; (2) fireline production rates will increase (table 3-15) due to reduced number of trees per acre (table 3-19); (3) repair of forest roads would improve response times for fire suppression resources to initial attack wildland fires; and (4) reduction of the canopy cover would improve effectiveness of firefighting aircraft because more retardant or water would penetrate through the canopy to reach the surface fuels and slow the fire spread until ground units could establish control lines.

Table 3-18 shows size CWHR Size Class 4 stands that were analyzed to show the effect of a fire after treatment and the stand mortality based on trees per acre for alternative B. The table shows that there is less overall tree mortality with alternative B compared to alternative C and the most with alternative D.

Table 3-18. Effect of modeled post-treatment wildfire on stand mortality for CWHR Size Class 4 stands in Watdog treatment units for alternative B.

Unit Number	Post-Treatment Canopy Cover	Post-Treatment Trees per Acre	Projected Stand Mortality
Alternative B			
78	30%	64	23%
98	30%	76	16%
109	30%	74	30%
Alternative C			
78	40%	108	29%
98	40%	149	25%
109	40%	127	36%
Alternative D			
78	50%	178	38%
98	43%	165	25%
109	50%	209	44%

Modeling indicates the action alternatives differ only in the density of forest canopy, in the trees between 6 and 20 inch dbh in the CWHR Size Class 4 and CWHR Size Class 5 treatment groups as explained in "Section 3-12: Vegetation" of the Watdog FSEIS. In addition, stand structure and fuel ladder potential by alternatives are also displayed in tables 3-39, 3-40 and in figures 3-3, 3-4, and 3-5 (Vegtaton Section 3.12.3.11)

Table 3-19. CWHR 4 stand structure by averaged trees per acre by size classes.

Alternatives	0–6 inches dbh	6–11 inches dbh	11–20 inches dbh	20–30 inches dbh	>30 inches dbh	Total Trees 0–999 inches dbh
A	605.3	68.5	78.9	26.5	7.2	786.4
B	0.6	0.9	35.8	25.6	7.2	70.0
C	1.8	5.1	49.2	25.8	7.2	89.1
D	0.0	29.0	63.2	26.5	7.2	125.8

Alternative D leaves the most ladder fuels (0–11 inch dbh) that could potentially torch and affect the crowns of large trees, slow ground suppression resources, and reduce effectiveness of aerial suppression resources during a wildfire. The table above also shows that alternative B has the greatest reduction in fuel ladder vegetation including trees between 0–6 inch dbh and 6–11 inch dbh size classes.

Aerial firefighting resources are typically used to slow the advance of wildland fires, by delivering water or retardant. The water or retardant is most effective on surface fuels by raising the level moisture present on and around those fuels making them less available for burning, the fuels must dry out before they can ignite. This leads directly to less fire behavior and a lower rate of spread

in the affected fuels. A problem associated with closed canopy stands and the use of air resources is that the water or retardant will land in the canopy vegetation rather than the surface fuels. If more canopy cover is present, then less retardant or water will reach the surface fuels.

There have been several examples of improved effectiveness of retardant in more open canopy one was observed on the 2003 Peterson Fire on the Feather River District of the Plumas National Forest, when both Rick Case, District Fuels Officer, and Brooks Henderson, Fire Management Officer, observed effective penetration of aerial retardant in timber harvested areas where canopy cover had been reduced when compared to areas without any prior harvest.

The Bell fire, on the Beckwourth Ranger District of the Plumas National Forest also illustrates this principal. This fire occurred in September of 2005. During the Bell Fire, it was witnessed that there was a decrease in retardant penetration in an untreated stand when compared with an adjacent treated stand. In untreated areas, retardant primarily ended up in the upper tree crowns where it was less effective at containing and reducing surface fire spread," (Moghaddas and Craggs 2007).

Another example of reduced canopy aiding suppression resources was on the 2007 Moonlight incident on the Mount Hough Ranger District of the Plumas National Forest. On September 11, 2007, firefighters were making a direct attack on the Moonlight fire, in Division R and Division N, trying to bring fire lines together in Hungry Creek. The Division R side of Hungry Creek was burning in a 60% canopy with fire behavior that included torching, spotting and a well formed smoke column which caused the suppression crews in Division R to pull out for safety. The column bent to the east and spotted on the east side of Hungry Creek into Division N, causing the resulting spots to run uphill. Because of this, firefighters had to pull out of Division N. After the fire had made the initial uphill run and spread laterally through Divisions R and N, firefighters regrouped and started direct attack again on both sides of the drainage where the fire had burnt laterally into retardant lines that had been put in the previous day. The retardant lines were effective on the Division R side because they had been put in old clear cuts that had been replanted. The retardant lines on the Division N side of the drainage were in a previously thinned and masticated unit which was estimated at 40% canopy cover and less. The lack of canopy in both divisions allowed for penetration of retardant to the surface fuels. The resulting fire behavior gave suppression resources the opportunity to use direct attack and tie the fire lines into Hungry Creek that evening. This was personally observed by John Truett Operation Section Chief California incident Management Team 2 and Larry Jansen Operations Branch Director California Incident Management Team 2, per. Comm. 2007.

Currently, there is no research that quantifies the efficiency of retardant or water delivered by aerial resources, but we can draw the conclusion that less canopy will give better retardant coverage to surface fuels.

Wildland fires that do escape initial attack within the analysis area are expected to have a higher likelihood of being suppressed at a smaller size in alternative B compared to C because of the difference in tree density. The more open conditions of alternative B would moderate the intensity of fires burning out of the adjacent canyons sooner than alternative C and would increase the amount of retardant or water that will reach the surface fuels. These two factors in combination would increase the probability that a more direct suppression strategy would be effective. Alternative D is expected to be less effective than B or C because the amount of small diameter trees that would remain would not moderate fire intensity as quickly and because less retardant could penetrate the canopy to reach

surface fuels. The higher number of trees per acre and amount of interlaced branched in this alternative would reduce fireline construction rates compared to having fewer trees that would need to be removed to construct an effective control line or safety zone.

Cumulative Effects of Alternatives B, C, and D. See "Section 3.5.2: Scope of the Analysis" above for discussion of the geographic boundary and timeframe for the analysis. Past, present, and foreseeable future actions and events considered in the cumulative effects analysis for fire and fuels are listed in table 3-20.

All action alternatives will meet the mitigation measures related to hazardous fuel reduction in the Plumas Counties Community Wildland Fire Mitigation Plan (Items D.5, D.6 and D.7) on approximately 550 acres of public lands identified as adjacent and extended wildland urban interface. The treatments proposed under the action alternatives—combined with other fuel reduction projects in the analysis area—will begin to move the analysis area from Condition Class 3 towards the desired condition of Condition Class 2 or 1. Alternative B would produce the greatest change, followed by C and finally D.

Table 3-20. Projects and events considered in the cumulative effects analysis for fires and fuels.

Project	Location	Activity	Time Period
Mooreville Fire	Lumpkin Ridge	Approximately 1,000-acre wildfire	1987
Devils Gap Fire	South of Little Grass Valley Reservoir on Mooreville Ridge	Approximately 1,500-acre wildfire	1999
Watson Ridge Underburn	Westernmost portion of Watson Ridge	500 acres of underburn	1995
Watson Thinning	Watson Ridge	100 acres commercial thin; 90 acres biomass thin; 65 acres mastication; and 25 acres precommercial thin	1995–1996
Steward Thinning	Steward Ravine	188 acres intermediate cut thinning	1997
South Fork DFPZ	Mooreville Ridge	31 acres mechanical removal of fire-killed trees; 840 acres mechanical thin and biomass removal; 400 acres mastication; and 1,410 acres underburn	Present
Feather Falls Salvage	Private land near Feather Falls	14,314 acres of salvage (harvest of dead, dying, or diseased trees of any size in amounts less than 10 percent of average volume per acre)	Present
Bald Onion	Bald Mountain, Onion and Little Grass Valley	1,263 acres thin from below and biomass removal; 1,584 acres underburn only	Present
Bald Mountain	Near Little Grass Valley Reservoir and S. Fork Feather River	90 acres group selection; 100 acres individual tree selection	2007
Pinchard Creek	Pinchard Creek watershed	Approximately 500 acres of group selection, 500 acres of individual tree selection and 5 to 10 acres of aspen restoration	Future
Range / Grazing	Project area	One active range permit in Fall River grazing allotment	Ongoing

In general, current forest structure within the analysis area for fire and fuels is the result of fire exclusion and past timber harvest that favored OSR and limited surface fuels treatments. The Watson Ridge Underburn (1995), Watson Thin (1995–1996) and Steward Thin (1997) projects have reduced tree density, raised crown base height, and generally resulted in stands with lower fire behavior potential compared to much of the analysis area. However, because the treated areas are limited in size they are not expected to add to the effects of the action alternatives on fire spread across the landscape. In addition, brush growth is beginning to increase fire potential in some areas.

The development of current forest structure in the analysis area has also been affected by the creation of plantations on both private and public lands through even-aged management treatments and by the Mooreville (1987) and Devils Gap (1999) fires. Together, the Mooreville and Devils Gap fires burned approximately 2,500 acres. Today, these burned areas are dominated by stands of montane chaparral. The area burned by the Mooreville fire is currently overgrown with brush and fuel loadings have increased. However, much of the area burned is on private land, and cannot be treated by the Forest Service. In the area burned by the Devils Gap fire, implementation of the current South Fork DFPZ project (see below and table 3-20 above) will break up the fuel strata, reduce the risk of large and intense wildfire, and enhance firefighting capabilities. Without treatment, much of the area would be overgrown with brush and increasingly flammable within approximately 10 years.

Currently, the Bald Onion DFPZ is being constructed in the north part of the analysis area, while portions of the South Fork DFPZ are being constructed to the south in much of the area burned by the Devils Gap fire (see map 14 in appendix C). The DFPZ treatments proposed in the Watdog Project action alternatives would provide connectivity with the present activities of the Bald Onion DFPZ to the north, and portions of the South Fork DFPZ to the south. The action alternatives would meet the purpose and need identified for this project by adding to the DFPZ network to reduce the potential for sustained crown fire and to allow fire suppression personnel a safer location from which to take action against a wildfire.

On private land within the analysis area, the Feather Falls Salvage will salvage less than 10 percent of the average volume per acre over approximately 14,000 acres. This project is anticipated to add some fuels to the existing fuel loading, but any effects are expected to be negligible in terms of fire behavior and associated change in suppression effectiveness. In the northeastern portion of the analysis area, the Bald Mountain Project will implement approximately 90 acres of small group selection harvest units and 100 acres of individual tree selection harvest. Only a small portion of these harvest units would fall within the Watdog analysis area. Although the Bald Mountain Project would begin the process of converting high fire risk stands into more fire resilient stands, this project will not limit fire spread or improve resistance to control except at the group or ITS areas due to the limited size and placement of the group selection and ITS units. Any effects on fire behavior and associated change in suppression effectiveness are expected to be negligible.

The Pinchard Creek project that is expected to occur in the future may include approximately 500 acres of group selection and 500 acres of individual tree selection within the analysis area. A proposed action with specific treatments and locations has not yet been developed, making it difficult to fully assess the cumulative effects of the project at this time. The contribution of this project on fire behavior and fuels will depend on: (1) where the groups and ITS units are located in relation to the proposed Watdog DFPZ units; and (2) if small diameter material is removed as biomass or left on-

site. If biomass is removed and units are located adjacent to a Watdog DFPZ unit, Pinchard Creek project treatments could benefit suppression efforts by reducing wildfire behavior before the fire enters a Watdog DFPZ unit.

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. Appendix H of this FSEIS describes potential DFPZ maintenance for the Watdog Project. Based past experience for similar activities, fuel treatments are expected to remain effective for approximately 10–20 years once established and without further treatment, depending on vegetation type. Additional growth of understory vegetation and conifer regeneration may occur in fuel treatments; these treatments would be monitored as specified in the maintenance and monitoring plan of the Watdog Project. Overall, future fuel treatment maintenance activities, as analyzed in the 2003 HFQLG FSEIS, would enhance the longevity and effectiveness of these treatments. Watdog units treated with fire alone would receive a follow-up underburn to reduce surface fuels created by tree mortality resulting from the initial prescribed burn implementation.

Recreational activities or rangeland grazing would contribute negligible additive effects to implementation of the action alternatives. Human ignitions have been increasing in California (Stephens, in press). Although the Watdog area is relatively remote with few developed recreation opportunities, it is likely that this trend will occur within the analysis area as well if recreational activities such as OHV use, hiking, camping, mining, hunting, and woodcutting increase.

Low or discontinued use of grazing allotments in the Fall River grazing allotment may result in a relatively minor accumulation of fine fuels in the project area in the form of cured grasses and forbs but is not expected to increase overall fire behavior and severity in the Watdog analysis area.

3.5.7 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 irreversible or irretrievable commitments of resources for alternatives B, C, and D. Effects of the action alternatives on fuels and fire behavior are temporary in duration and would not be as severe as those of a wildfire.

3.5.8 Summary of Cumulative Effects

The differences between the cumulative effects all of the action alternatives and the no-action alternative is that the DFPZ treatments proposed in the Watdog Project will provide connectivity with the present activities of the Bald Onion DFPZ to the north, and portions of the South Fork DFPZ to the south, on Mooreville Ridge. This will meet the purpose and need identified for this project by adding to the DFPZ network to reduce the potential for sustained crown fire and to allow fire suppression personnel a safer location from which to take action against a wildfire and meet the mitigation measures identified for public lands in the Plumas County Wildland Fire Mitigation Plan.

Although difficult to assess at this time, the effects of the future Pinchard Creek project will either be negligible or perhaps enhance the activities proposed in the Watdog Project by reducing wildfire behavior before the fire enters a Watdog DFPZ unit.

The combined effect of the action alternatives along with the present actions will begin to move the analysis area from Condition Class 3 towards conditions the desired condition of 2 or 1. Alternative B would produce the greatest change, followed by C and finally D.

3.6 Heritage Resources

3.6.1 Introduction

Archaeological sites, historic buildings and 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 to understand and enjoy.

3.6.1.1 Geographic Scope of the Analysis

The Watdog Project boundary (approximately 6,300 acres) was used as the geographic boundary for the effects analysis because potential effects of project actions on heritage resources would be limited to the areas where treatments would occur. This area is known as the Area of Potential Effects.

Protection of heritage resources encompasses the entire Area of Potential Effects. Resources beyond the Watdog Project boundaries will not be affected, due to no ground disturbing activities on archaeological sites outside the Area of Potential Effects.

Three levels of analyses were completed to understand the significant historic themes and extent of the heritage resources associated with the Watdog 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. The results and relevant rationale for each of these analyses are presented below.

History of the Project Area. The following is a broad historical overview to help us understand the human or cultural mechanisms that have influenced the project area. Ecosystem models based solely on biological and physical elements often disregard the complex interaction between humans and their environment. More than any other phenomenon, cultural landscapes provide us with a unique opportunity to interpret the history of the effects humans have had on the environment. Together, natural and cultural influences have shaped the overall character of the project vicinity.

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

Prehistoric cultural complexes which have been documented for this area of the Sierra Nevada are the Mesilla (1000 + BC – AD 1), Bidwell (AD 1 – AD 800), Sweetwater (AD 800 – AD 1500), Oroville (AD 1500 – AD 1850), and Historic (after 1850) (Markley 1978:24; Kowta 1988).

The Mesilla Complex has been described as being the Butte County foothill variant of the Martis tradition and is believed to have been borne by Hokan speakers from the eastern Sierra and the Great Basin. Diagnostic features of this complex are the milling stone and mano combination, and large shale and basalt leaf-shaped, stemmed, and side-notched projectile points (Kowta 1988:148). At present, little is known regarding the Mesilla life way. It has been postulated the settlement system consisted of semi-permanent winter villages, seasonal campsites and special use locations. Subsistence was probably based on deer hunting and small seed gathering, as evidenced by remaining artifacts (Kowta 1988:97).

The Bidwell Complex appears to be a continuation of the Mesilla Complex with a marked increase and diversification of subsistence activities. Salient features include a mano-milling stone combination (although mortar and pestles were utilized as well), steatite vessels, and small and large basalt projectile points, indicating the introduction of the bow and arrow. Shellfish, salmon, rabbit and deer bones are evident in midden dating from this period (Kowta 1988:149).

It is suggested that during the Sweetwater Complex, a Maiduan-speaking population from the west or south moved into the area inhabited by the Martis / Mesilla and pushed them to the east. Characteristic traits of this period include a large variety of bone artifacts, as well as the use of shell artifacts such as Olivella shell beads. There appears to be an increase in acorn consumption as evidenced by the increase in acorn-grinding equipment such as cobble and slab mortars and flat-ended pestles. The use of bedrock mortars also began at this time. Point forms from the period include a small corner-notched type and a large leaf-shaped form with incipient side-notches (Kowta 1988:150). Although it appears that the Sweetwater Complex coincides with the arrival of a different group of people into the area, substantive evidence must come from a larger inventory of artifacts, in addition to a definitive assemblage of ancestral Maidu, before any firm conclusions can be drawn.

The Oroville Complex was a continuation of the preceding Sweetwater Complex, with an intensification of characteristic trends and traits. For example, there was an increase in reliance on bedrock milling stations and portable mortars. An increase in trade beads, such as the Olivella disks, oblong disc beads, and Haliotis ornaments suggests an increasingly complex economic exchange and trade system. Housepits from this period have also been discovered; both conical bark superstructure and the semi-subterranean forms have been found. Point types include the small Desert Side-Notch, the Cottonwood Triangular, small Gunther Stemmed points, and larger corner-notched and leaf-shaped points reminiscent of the Sweetwater period. The traits of the Oroville Complex continued into the Historic period, which is synonymous with the ethnographic Konkow culture.

Ethnographic Period. The Watdog Project area is in the ethnographic territory of the Northwest or Konkow Maidu. Boundary lines drawn by Dixon (1902:125) and Riddell (1978) through this remote area of the Sierra Nevada differ slightly and are best considered approximate locations. However, due to local topography and hydrologic patterns, it seems likely that the Watdog Project area was more accessible to the Northwestern, or Konkow Maidu, rather than the Nisenan Maidu who lived just to the south of the project area.

The Konkow Maidu are believed to have inhabited this region for at least the last 800 years, but could have arrived as early as 1,200 years before the present. The Konkow inhabited the lower portions of the Feather River region near Oroville and Chico. Their territory ranged from the valley floor and foothills to approximately 4,500 feet above sea level (Riddell 1978:372). Linguistically, the

Konkow are related to the Northeastern or Mountain Maidu, both of which are classified as being in the California Penutian language family. Technologically, the Konkow culture is quite similar to other California foothill groups all along the west side of the Sierra Nevada.

Hunting, fishing, and plant gathering were the primary means of subsistence and required seasonal shifts from snow-free low elevations in winter to higher elevations in the summer months (Riddell 1978; Kroeber 1925). Trading was also an important supply avenue (Davis 1961). The bow and arrow were generally used for hunting, with deer being the principle game. Deer were often killed during large drives where the animals were driven over cliffs or ambushed along migration trails. Elk, ground squirrel, rabbit, and game birds were also hunted. Nets and gigs were used for salmon and eel fishing in the Feather River and its tributaries (Riddell 1978).

The principle plant food collected was the acorn, which was gathered in the early fall and stored in granaries. Pine nuts were another basic food item. Other nut meats collected included hazel, buckeye, and nutmeg. Acorns and some other nuts required extensive processing before eating due to high levels of tannin or prussic acids. Wild mint, manzanita berries, and various roots, seeds, bulbs, and greens were also harvested (Riddell 1978).

Abundant resources within the Feather River watershed provided many of the food and material requirements necessary for the Konkow's survival. The Konkow also enhanced the quantity and quality of desirable species, primarily through the use of fire. Fire was used to keep areas free of brush, manage game, stimulate production of food crops, decrease insects and diseases, and facilitate food gathering.

Extensive trading took place between the Konkow and neighboring cultural groups. During trade they received bows and arrows, obsidian, skins, sugar pine nuts, deer hides, miscellaneous foods, and clam disc and other shell beads. They supplied salmon, salt, obsidian, log rafts, gray pine nuts, and beads of clam and other shell to other groups (Davis 1961:34; Kroeber 1925:399).

Settlements in the foothill and mountain regions of the Konkow were located on ridge tops or terraces due to the steep and often rugged side slopes of the Feather River and its tributaries. However, the Konkow took advantage of the opportunity to settle along rivers when topographic conditions allowed. Village sites consisted of an average of five to eight houses and a population of 35 to 40 people. The number of villages that comprised a "village community" varied, but generally did not exceed 200 people (Riddell 1978; Kroeber 1925).

Historic Period. During the Gold Rush of the late 1840s and early 1850s, miners swept into the Feather River area, discovering rich, gold-bearing rivers, creeks, and ravines. The Watdog Project is situated within the historic Forbestown Mining District, one of the most significant lode or hard rock mining deposits in Butte County. The Forbestown District is in southeast Butte County, about 15 miles northeast of Oroville and east of the junction of the South and Middle Forks of the Feather River. The district encompasses the Feather Falls area, the Brownsville District to the south, and Hurleton, Springtown, and Bidwell Bar to the west. Forbestown was named for Ben F. Forbes, who established a store there in 1850 (DeGeorgey and Nilsson 2003:17).

Gold-quartz mining and stamp mills were built early in the district's history. A 16-stamp quartz mill was erected near Forbestown in 1851 by the Sutter Quartz Company. There is some evidence to

suggest, however, that it was actually erected in 1859–1860 to process ore from the Golden Queen Mine.

Mooretown, a mining and trading center located between the Middle and South Fork of the Feather River, was the closest historic community to the Watdog Project area. Mooretown served as the main trading center for the area from 1888–1913.

Euro-American influence after 1849 greatly affected the environment of the Watdog Project area. Mining, grazing, timber harvesting, and development of the local transportation system have resulted in substantial biological and landscape changes. In comparison to the relatively open, fire resistant stands of timber that existed prior to the Euro-American influence, much of it today consists of dense, even-aged stands of second generation fir or tanoak.

3.6.1.2 Regulatory Framework

Section 101 of the 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*. Passed by Congress three years prior to NEPA, the *National Historic Preservation Act* sets forth a framework for identifying and evaluating historic properties, and assessing effects on these properties. This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the *National Historic Preservation Act* 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 *National Historic Preservation Act* (36 CFR 800.16(l)(1)). Therefore, agencies use the *National Historic Preservation Act* 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 USDA Forest Service, the California State Historic Preservation Office, and the Advisory Council on Historic Preservation to implement the Section 106 process.

3.6.1.3 Analysis Methods

Heritage resource data for the Watdog Project is based on information available in the heritage resource 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. Approximately 2,895 acres in and adjacent to the project area were surveyed for prior projects. A survey of the remaining 3,405 acres of the project area was completed in 2004.

3.6.2 Existing Condition and Environmental Effects

3.6.2.1 Introduction

Cultural properties identified during literature review, inventories, or surveys were assessed to determine potential effects associated with implementation of the project. Results of the analysis are discussed below.

3.6.2.2 Existing Conditions for Heritage Resources

Surveys or inventories resulted in the identification of 45 cultural resource properties within the proposed Watdog Project area. Twenty-nine sites are related to prehistoric use and occupation of the project area. These sites consist of campsites, food processing stations, and tool production stations. Sixteen sites are related to historic use, primarily mining, which took place between 1850 and the 1930s. The sites consist of historic encampments, dams, ditches, mine adits, and cabin flats. Associated artifacts and features represent all aspects of historic mining, from industrial equipment to daily living.

3.6.2.3 Effects of the Watdog Project Alternatives on Heritage Resources

Heritage resources have been considered in all aspects of the Watdog Project, including the four alternatives analyzed in this document as follows:

- **Alternative A** (the no-action alternative), addresses NEPA requirements and the potential effects of no action. Since alternative A is a no-action alternative and there are no ground disturbing activities proposed, there will be no effect to Heritage resources.

- **Alternative B** (the proposed action). Although there are ground disturbing activities proposed, there will be no effect to cultural resources as archaeological sites will be protected using the Standard Resource Protection Measures described below.

- **Alternative C** (40 percent canopy cover in the DFPZs). Although there are ground disturbing activities proposed, there will be no effect to cultural resources as archaeological sites will be protected using Standard Resource Protection Measures.

- **Alternative D** (50 percent canopy cover and 20-inch upper diameter limit). Although there are ground disturbing activities proposed, there will be no effect to cultural resources as archaeological sites will be protected using Standard Resource Protection Measures.

Application of the following Standard Resource Protection Measures will result in the project having “no effect” on heritage resources. The effect of the project on heritage resource sites has been considered in compliance with the Watdog proposed action and Section 106 of the *National Historic Preservation Act*. The following protection measures will be implemented, as appropriate, for all heritage resources that could be affected by project implementation.

- 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 (for example, historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined in coordination with the Forest or District Archaeologist on a case-by-case basis.

- When any changes in proposed activities are necessary to avoid heritage resource sites, for example, 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.

Effects of Past, Present, and Future Actions on Heritage Resources. As indicated in the general history of the Watdog Project area presented in "Section 3.6.1.1: Graphic Scope of the Analysis" in the Watdog FEIS, 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.

Past Actions—Since the landscape is never static, it is often difficult to determine the impact Native Americans had on the land. Current studies on fire ecology suggest that some 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 land use had major impacts on the landscape during the gold rush, the settlement and industry of post gold rush, and the impact of logging and ranching. Evidence of the magnitude of European settlement is found in numerous mining features (e.g., ditches, reservoirs, hydraulic pits, etc.). Photographs of historic town sites provide a glimpse of denuded landscapes almost completely barren of trees. The easy accessible trees were cut to build houses, town sites, mining dams, flumes, provide for adit shoring and were also used as heat sources.

Sawmills were built in the project area during the 1850s. Lumber companies from the east coast bought up millions of acres timbered lands in the 1890s. 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. Few protection measures for archaeological resources were in place, and digging and collecting on archaeological sites frequently occurred. By the early 1980s cultural resources surveys and site protection measures were in place. Today, all archaeological sites are protected from all project activities.

Present Actions—As indicated previously, activity areas within the Watdog Project have been surveyed for archaeological sites. All archaeological sites located during surveys will be protected from project activities.

Some archaeological sites monitored during project survey show damage from illegal looting activity. Looters generally dig holes in places where metal detectors give off a signal, or they dig in areas they think whole bottles may be found. Remnants of this illegal activity can be seen with scattered artifact fragments and numerous shovel holes on archaeological sites.

Future Actions—The Forest Service will continue to protect archaeological sites from project activities in the future. Future impacts to archaeological sites may increase due to increased access to the Forest. The likelihood and intensity is unknown. However, the Watdog Project itself will not impact archaeologist sites, since the sites are protected from project activities.

3.6.3 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.

3.6.4 Summary of Cumulative Effects

No cumulative effects on heritage resources are expected (see section 3.6.2.3 above).

3.7 Hydrology

3.7.1 Introduction

The USDA Forest Service, Plumas National Forest, Feather River Ranger District proposes to construct approximately 24 miles of DFPZs averaging ¼ mile in width to reduce fuel hazards, implement uneven-aged management strategy utilizing group selection treatments to regenerate fire-resilient species, perform associated road system improvement work, and implement a range of watershed improvement activities on approximately 4,000 acres of forested federal land northeast of Lake Oroville and Feather Falls, California. Acres of group selection treatments range from 231 (alternative B) to 151 under alternative C and 105 under alternative D. Alternative A is the no-action alternative. Watershed improvement activities common to all action alternatives are described in chapter 2, section 2.2.2.1, of the Watdog FEIS.

3.7.2 Scope of the Analysis

3.7.2.1 Geographic Scope of the Analysis

The scope of the hydrologic analysis includes 30 subwatersheds ranging in size from 471 acres to 4,478 acres, with a total analysis area of 44,792 acres (table 3-21). Locations of watersheds with respect to treatment units are displayed in map 8 in appendix C. The major rivers in the analysis area include the South Branch Middle Fork Feather River, the Middle Fork Feather River, and the South Fork Feather River. All streams in the analysis area eventually drain into Lake Oroville, the Feather River and the various conveyances of the State Water Project.

3.7.2.2 Time Frame for the Analysis

The hydrologic analysis assessed the effects of this project on water quality and stream channel stability and included activities that have taken place during the past 25 years, other current disturbances, and any future foreseeable watershed activities. The assessment followed the Region 5 Cumulative Watershed Effects (CWE) methodology. Analyzed effects included roads, landings, timber harvest on public and private lands, wildland fire, and grazing. 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 quantities and the presence of highly productive forest soils.

3.7.3 Regulatory Framework

3.7.3.1 Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement and Record of Decision

Table 2 of the 2004 *Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* describes applicable standards and guidelines of the HFQLG Pilot Project area for the life of the Pilot Project (USDA Forest Service 2004). No standards and guidelines specific to riparian areas, hydrology, or water resources are mentioned in table 2. The 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 guidelines.

Table 3-21. Watersheds and subwatersheds of the Watdog analysis area.

Hydrological Unit Code (HUC) 6 Watershed Name	HFQLG Number	Subwatershed		Acres of Near-Stream Sensitive Areas[a]	All Other Acres in Subwatershed	Total Subwatershed Acres	Percent of Land Managed by PNF[b]	Percent of Private Land
		Name	Label					
Fall River	110028	Fall River	1	564	937	1,501	98	2
McCabe Creek	110015	Wagners Valley	2	296	240	536	85	15
McCabe Creek	110015	Frey Creek	3	1,045	1,720	2,765	31	69
Bald Rock Canyon	110029	None	4	299	203	502	100	0
Bald Rock Canyon	110029	Pompus Creek	5	260	340	600	100	0
Pinchard Creek	110038	Big Peak Ravine	6	343	543	886	86	14
Pinchard Creek	110038	Willow Creek	7	330	524	854	82	18
Pinchard Creek	110038	None	8	199	357	555	62	38
Pinchard Creek	110038	None	9	267	418	683	98	2
Pinchard Creek	110038	None	10	228	544	772	100	0
Pinchard Creek	110038	Negro Run Ravine	11	384	690	1,074	97	3
Little Grass Valley Reservoir	110040	None	12	183	306	489	100	0
Little Grass Valley Reservoir	110025	Post Creek	13	269	617	885	64	36
Pinchard Creek	110038	Internal Drainage S Branch Middle Fork Feather River	14	1,230	1,579	2,809	81	19

Table 3-21. Watersheds and subwatersheds of the Watdog analysis area (continued).

Hydrological Unit Code (HUC) 6 Watershed Name	HFQLG Number	Subwatershed		Acres of Near-Stream Sensitive Areas[a]	All Other Acres in Subwatershed	Total Subwatershed Acres	Percent of Land Managed by PNF[b]	Percent of Private Land
		Name	Label					
Pinchard Creek	110038	Internal Drainage S Branch Middle Fork Feather River	15	1,172	1,408	2,580	58	42
Pinchard Creek	110038	Internal Drainage S Branch Middle Fork Feather River	16	328	606	934	86	14
Bear Creek	110118	None	17	378	851	1,230	100	0
Bear Creek	110118	Internal Drainage Middle Fork Feather River	18	909	1,277	2,187	100	0
Bear Creek	110118	Internal Drainage Middle Fork Feather River	19	695	1,122	1,817	100	0
Bear Creek	110049	Stag Creek	20	680	745	1,425	100	0
Bear Creek	110049	Dejonah Creek	21	589	596	1,185	60	40
Bear Creek	110049	Internal Drainage Middle Fork Feather River	22	1,480	1,394	2,874	100	0
Fall River	110026	Internal Drainage Fall River	23	1,445	3,034	4,480	48	52
Fall River	110028	Internal Drainage Fall River	24	861	521	1,382	94	6
Onion Valley Creek	110039	Internal Drainage Dogwood Creek	25	742	919	1,661	100	0
Onion Valley Creek	110039	Internal Drainage	26	894	862	1,756	100	0

Table 3-21. Watersheds and subwatersheds of the Watdog analysis area (continued).

Hydrological Unit Code (HUC) 6 Watershed Name	HFQLG Number	Subwatershed		Acres of Near-Stream Sensitive Areas[a]	All Other Acres in Subwatershed	Total Subwatershed Acres	Percent of Land Managed by PNF[b]	Percent of Private Land
		Name	Label					
		Dogwood Creek						
Pinchard Creek	110037	Lava Creek	27	242	783	1,025	31	69
Pinchard Creek	110037	Internal Drainage Pinchard Creek	28	856	1,502	2,358	53	47
Pinchard Creek	110037	Internal Drainage S Branch Middle Fork Feather River	29	1,030	1,489	2,519	99	1
Pinchard Creek	110037	None	30	168	303	471	55	45

Notes:

Near-stream Sensitive areas include Riparian Habitat Conservation Areas (RHCAs) and Streamside Management Zones (SMZs).

PNF = Plumas National Forest.

See “Section 3.7.1.2: Regulatory Framework” in the FEIS for more information about RHCAs and SMZs.

3.7.3.2 Herger-Feinstein Quincy Library Group Forest Recovery Act

The HFQLG Act direction is to apply the Scientific Analysis Team guidelines for riparian system protection for all resource management activities and all timber harvesting activities that occur in the Pilot Project area during the term of the Pilot Project. The prescribed minimum widths of "interim boundaries" in RHCAs are:

- 300 feet (perennial fish-bearing streams and lakes)
- 150 feet (perennial non-fish bearing streams, ponds, wetlands greater than 1 acre, and lakes)
- 100 feet (intermittent and ephemeral streams, wetlands less than 1 acre, and landslides).

Features used in RHCA width determination (whichever is greatest) are: (1) top of inner gorge, (2) 100-year floodplain, (3) outer edge of riparian vegetation, and (4) a distance equal to one or two tree heights (Feather River Ranger District sivilculturist has determined the average height of a site potential tree to be 150 feet). This means a 150-foot RHCA buffer width is applied to seasonally flowing streams (intermittent or ephemeral) that have a definable channel and evidence of annual scour and deposition. These widths would be applied until a watershed analysis is completed. RHCA management guidelines would apply within the protection area. Scientific Analysis Team guidelines would supersede other direction, unless that direction (e.g., mitigation measures or project design features) would provide greater protection to riparian and fish habitat or would better achieve Riparian Management Objectives (RMO). For more detailed information, refer to appendices A and B of the "Hydrology Report" in the project record and appendix F of this Watdog Project FSEIS.

3.7.3.3 Plumas National Forest Land and Resource Management Plan

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "Forest Plan") has been amended by more recent programmatic documents, including the 2004 SNFPA ROD and the HFQLG Act ROD, but still provides management direction where not amended. As described below, some goals, policies, and guidelines still apply to riparian management (USDA Forest Service 1988).

Forest Plan guidelines are applied to ephemeral channels with no evidence of annual scour and deposition. In this case, Scientific Analysis Team guidelines from the HFQLG Act are not applicable. These ephemeral channels may only flow during large magnitude flow events (such as 2-year or 10-year events), and are generally headwater areas that were altered during past landscape disturbance, including logging and stand establishment activities or mining. Ephemeral channels, which meet the HFQLG Act FEIS definition of ephemeral swales, are abundant on the west side of the forest. Ephemeral swales are not protected under HFQLG guidelines; however, ground-based equipment restrictions are needed to ensure further alteration does not occur. For these types of streams, Streamside Management Zone (SMZ) widths are applied. Within these protections zones, treatment may still occur; however, ground-based equipment is excluded.

The Forest Plan requires the adoption of and adherence to a SMZ plan for any activity within a SMZ. While the Watdog Project is designed to restrict activities in SMZs and RHCAs, there may be limited exceptions. In accordance with the Forest Plan requirement, a "Streamside Management Zone

Plan" has been prepared and is included as appendix B of the "Hydrology Report." The plan refers to this regulatory framework section as it applies to SMZs and RHCAs. It describes in some greater detail the application of Best Management Practices (BMPs) and standards and guidelines to the Watdog Project.

3.7.3.4 California State Water Resources Control Board, Federal Clean Water Act, and Porter-Cologne Water Quality Control Act

The *Porter-Cologne Water Quality Control Act*, which is contained in Division 7 of the California Water Code, establishes the responsibilities and authorities of the State Water Resources Control Board and Regional Water Quality Control Boards. It provides a mandate to balance, to the extent possible, all uses of California's water resources be they domestic, agricultural, or environmental and includes authority and responsibility for regional water quality control and planning (USDA Forest Service PNF 2000).

The *Clean Water Act of 1972*, as amended in 1977 and 1980, establishes goals, policies, and procedures for the maintenance and improvement of the nation's waters. It addresses both point and non-point sources of pollution and establishes or requires programs for the control of both sources of pollution. Section 208 requires area-wide waste treatment management plans and water quality management plans for non-point sources of pollution. The act established specific roles for Federal, State, and local authorities in the regulation, enforcement, planning, control, and management of water pollution. More directly, Section 319 addresses non-point source pollution and also requires development of water quality management plans. The *Clean Water Act* requires the states or the EPA to set standards for surface water quality, mandate sewage treatment, and regulate wastewater discharges into the nation's surface waters. The State Water Resources Control Board assumed responsibility for implementing the *Clean Water Act*. This involved melding state and Federal processes together for activities such as setting water quality standards and issuing discharge permits. The Central Valley Regional Board establishes water quality objectives and programs to implement those objectives by amending the Central Valley Region's Water Quality Control Plan (hereinafter referred to as the "Basin Plan") for the Sacramento and San Joaquin River basins.

Land management activities have been recognized as potential sources of non-point water pollution. By definition, non-point pollution is not controllable through conventional treatment plants; rather, non-point pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water. Sections 208 and 319 of the *Clean Water Act* (Public Law 92-500), as amended, acknowledge land treatment measures as being effective means of controlling non-point sources of water pollution and emphasize their development. Working cooperatively with the State Water Resources Control Board, the Forest Service has developed and documented non-point pollution control measures applicable to National Forest System lands. These measures—termed BMPs—have been certified by the state and approved by the EPA as the most effective means the Forest Service could use to control non-point source pollution. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. BMPs are usually applied as a system of practices rather than as a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. BMPs are basically a

preventive rather than an enforcement system. The applicable BMPs for the Watdog Project are included in appendix B of this FSEIS.

Section 303(d) of the Clean Water Act. Section 303(d) of the *Clean Water Act* requires the identification of water bodies that either: (1) do not meet or are not expected to meet water quality standards, or (2) are considered impaired. The affected water body, and associated pollutant or stressor, is then prioritized in the 303(d) list. It further requires the development of a Total Maximum Daily Load for each listing. The current list, approved by the EPA, is the 2002 303(d) list. The Feather River downstream of Oroville Dam is listed as impaired by Diazinon™, an agricultural pesticide, with a high Total Maximum Daily Load priority. There are no sources of Diazinon™ located upstream of the dam, and no restrictions or Total Maximum Daily Loads apply within the project or hydrologic analysis area.

3.7.3.5 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 protect against quality degradation of water resources and to meet state water quality objectives. The USDA Forest Service is required to protect and enhance existing and potential beneficial uses during water quality planning (California Regional Water Quality Control Board [CRWQCB] 1998). Beneficial uses of surface water bodies, including those that may be affected by activities on the Plumas National Forest are listed in chapter 2 of the Basin Plan (CRWQCB 1998). Existing and potential beneficial uses are defined for Lake Oroville and the North and Middle Forks of the Feather River and their tributaries. Beneficial uses are not defined for the South Fork Feather River, but are assumed to include all of the beneficial uses listed below. Beneficial uses include municipal and domestic water supplies, agricultural supply, hydropower generation, water contact recreation, non-contact water recreation, commercial and sport fishing, warm freshwater habitat, cold freshwater habitat, wildlife habitat, and spawning, reproduction, and/or early development of fish.

Post-project monitoring of BMPs will ensure that the intent of these regulations is achieved, and that state water quality objectives are met. The relevant water quality objectives and BMPs are listed in appendix B of this FSEIS.

3.7.3.6 Analysis Methods

Watershed condition was used as an indicator of the effects of the alternatives on hydrologic resources. This indicator is introduced in section 3.7.4.1. The following definitions will help the reader understand potential direct, indirect, and cumulative effects on watershed condition:

Direct effects on watershed conditions result when activities occur in RHCAs and watercourses. Increased erosion and delivery of sediment directly into stream courses can occur as a result of road maintenance and/or construction, fireline 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 upland watershed areas are disturbed. Examples of indirect effects include soil compaction, removal of vegetation canopy, hillslope destabilization, and/or

detachment and mobilization of sediment related to disturbance from timber harvest or associated activities. Indirect effects of project activities would occur to the channel network in or adjacent to treatment units. The results of indirect effects include increased peak channel flows, alteration of annual flow distribution, increased erosion and sedimentation, stream channel geometry alteration, and degradation or aggradation of channel beds, resulting in detrimental impacts on stream proper function and condition, water quality, and stream and riparian habitat quality.

Cumulative watershed effects include any changes that involve watershed processes and are influenced by multiple land use activities (Reid 1993). Changes that accumulate in time or space are considered CWEs. The definition of a CWE from 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 alter environmental parameters—they modify topography; change the character of soil and vegetation; import or remove water, chemicals, and fauna; and they 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 occur (Reid 1993). Land use can cause on-site CWEs which result directly from on-site changes in environmental parameters or off-site CWEs that are the result of changes in watershed transport processes.

The Forest Service Region 5 CWE Methodology (equivalent roaded acres [ERA] model) was used to assess the effects of project activities on off-site water quality and stream channel stability. The ERA model, measured in acres, serves as an index to measure the impact of past, present, and future land management activities on downstream water quality. More specifically, ERA describes these off-site impacts in terms of 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. Watersheds and their associated stream systems can tolerate given levels of land disturbance, but there is a point when land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the threshold of concern (TOC). At levels above the TOC, water quality may be impaired such that the water is no longer available for established beneficial uses, such as municipal water supplies or irrigation, or no longer provides adequate habitat for fisheries. Stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged. The ERAs of near-stream sensitive areas, and the subwatersheds as a whole, are compared to the TOC and reported as percent disturbed and percent of TOC. For a detailed discussion on the methodology for the ERA model, refer to appendix C of the "Hydrology Report."

Stream channels located within DFPZ treatments units were identified in the field as RHCAs or SMZs. RHCAs are streams with evidence of annual scour, and SMZs are ephemeral channels without annual scour (refer to the "Regulatory Framework" section above or appendix B of the "Hydrology Report" for more explanation of RHCAs and SMZs). Each stream section was identified with a number, and each location was marked using a Global Positioning System. This information was used to map streams with a Geographic Information System (GIS) to create a near-stream sensitive area layer that will be used during layout of treatment units on the ground. Each RHCA in plantation units

received a site visit to determine treatments needed to enhance RHCA conditions (for detailed information on RHCA and SMZ treatments, refer to appendix A of the "Hydrology Report"). The hydrologists conducted surveys in more detail to assess the condition of streams in RHCAs (streams with annual scour) that are located in DFPZ treatments units in order to compare those conditions with the ERA model results. The majority of the DFPZ treatment units either contained no stream channels, or they contained stream channels with no evidence of annual scour (ephemeral swales protected by SMZ guidelines from 1988 Forest Plan). All of the information was gathered during the spring and summer field season of 2004.

Reasonably Foreseeable Future Actions. Known land disturbing activities in the CWE analysis area with a defined proposed action are included in the cumulative effects assessment. A list of foreseeable future activities—including proposed timber harvest—considered in this analysis is included in appendix E of the "Hydrology Report." The analysis prepared for this supplement includes the Hartman Bar and Tamarack Flat Hazard Tree Projects, two recently proposed hazard tree removal projects in the analysis area. The DFPZ treatments for this project are connected to other DFPZ projects currently being implemented, such as Bald Onion and Brush Creek. Other future projects include Pinchard Creek, which could add ground disturbing activities within the CWE analysis area (subwatershed 23).

3.7.3.7 Indicator 1: Watershed Condition

Measure 1 — Cumulative Watershed Effects Analysis. Effects of roads, landings, timber harvesting activities on public and private lands, wildland fire, grazing, on- and off-site water quality, and stream channel stability were assessed for the past 25 years, the present, and the foreseeable future using the Region 5 CWE Methodology. This method utilizes ERAs measured in acres.

Watersheds and their associated stream systems can tolerate given levels of land disturbance, but there is a point when land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the threshold of concern (TOC). ERAs of near-stream sensitive areas and the subwatersheds as a whole are compared to the TOC, and reported as percent disturbed and percent of TOC. Near-stream sensitive areas include all RHCAs identified within the analysis area. If the percent of TOC is 80 through 99 percent, then the watershed condition is considered to be approaching the TOC. If the percent of TOC is 100 percent then the watershed condition is at the TOC, and if it is greater than 100 percent then the watershed condition is over the TOC.

Note: The TOC does not represent an exact level of disturbance at which CWE will occur. Rather, it serves as a "yellow flag" indicator of increased risk of significant adverse cumulative effects occurring within a watershed.

Calculated ERAs in this Hydrology report are different from the "Hydrology Report" written for the Watdog FEIS. Total ERA calculations have been reduced due to another year of recovery on the landscape.

3.7.4 Existing Condition and Environmental Effects

3.7.4.1 Introduction

The subwatersheds that make up the hydrologic analysis area are listed above in table 3-21 and displayed in map 8 in appendix C. The existing condition information on these subwatersheds is based on site visits, historical references, aerial photography, Forest Service corporate data, and private land timber harvest plans. The subwatersheds lie within a mostly forested rural landscape on the western slope of the northernmost Sierra Nevada. The majority of the subwatersheds are managed by the Plumas National Forest. Subwatersheds 3, 23, and 27 are the only watersheds that contain more than 50 percent of private land (69 percent, 52 percent, and 69 percent, respectively).

The productive nature of forest soils in the area and the climate conditions have ensured that forest vegetative cover remains dense and vigorous. The western slope of the northernmost Sierra Nevada, which constitutes the Feather River Ranger District, receives the greatest amounts of mean annual precipitation in the range. The climatic regime is Mediterranean, with precipitation concentrated between November and April, and drought conditions generally prevailing the remainder of the year. The southwesterly aspect of the drainage network favorably intercepts Pacific storm energy and the orographic influence of the rise of the western slope of the Sierra Nevada are the chief factors that account for the precipitation conditions. Mean annual precipitation in the area ranges from around 40 inches at Lake Oroville to approximately 85 inches in the headwaters of Pinchard Creek and Fall River. Because of the great range in analysis area elevation, anywhere from 10 to 90 percent with an average of 50 percent of the annual precipitation falls as snow (California Department of Water Resources 1978). Mean annual runoff exceeds 40 inches per year (California Department of Water Resources 1978), and approximately 70 percent of annual precipitation appears as stream runoff (Taylor 2002). Because of the elevation of the project area, stream flow is typically storm flow-dominated during the fall and early winter and snowmelt-dominated in late winter and early spring. Average monthly runoff peaks occur in May and decline to a monthly low in September. A smaller runoff peak occurs in January. This smaller peak is the result of relatively warm mid-winter storms. Rain-on-snow or rain-on-frozen ground events are not uncommon over the analysis area. Rain-on-snow events have the greatest potential for destructive flooding. The landscape setting and conditions that currently exist within the analysis area, including the physiographic and geologic framework, are described in the Watdog “Soils Report” on file in the project record.

In areas of metasedimentary geology, stream channel networks are dense and generally dendritic in pattern. Metavolcanic and granitic areas generally have fewer miles of stream, and drainage patterns are related to map-scale fracturing and jointing of the bedrock, with trellis and subparallel drainage patterns common. Areas of Tertiary volcanics have the lowest channel density, as groundwater macropore flow appears to contribute a large subsurface component to higher-order streams, and a relative paucity of low-order channels are present on upper watershed slopes. A variety of land uses focused on resource extraction have occurred on the landscape within historic times, with varying impacts on water resources and watershed condition. These influences have sometimes modified the stream condition, resulting in alteration of flow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, and riparian conditions. In site-specific locations, streams are continuing to be degraded, mostly due to poor road locations.

The Watdog CWE analysis area has a high road density, high road density near streams, and high stream crossing density. 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. 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 (USDA Forest Service 1991). Common road problems include rutting, blocked drainages, inadequate implementation of BMPs, and entrenchment of roads. Other hydrologic influences from roads identified in the subwatersheds include:

- **Roads that cross areas with slope gradients greater than 60 percent.** Slope stability problems and excessive sediment production are associated with roads on steep slopes.

- **Inadequately engineered stream crossings.** Hydrologic problems are associated with undersized, improperly located, damaged or failed culverts, including bedload interception, ponding or plugging which can lead to drainage diversion, culvert and fill failure, or channel instability. Inadequate culverts form barriers to fish migration (see Wildlife and Fish BA/BE). Similarly, low-water crossings can affect hydrologic regimes and create fish barriers (USDA 1991).

- **Recreation impacts in RHCAs.** Campgrounds and OHV trails in riparian areas have resulted in soil compaction, stream bank instability, channel incision and widening, sedimentation, riparian and meadow vegetation loss, sanitation problems, and possibly increased stream temperatures. High OHV traffic volumes have been particularly damaging in some areas.

Existing road densities for near-stream sensitive areas range from 0.2 mile to 17.4 miles per square mile with an average of 4.3 miles per square miles. Existing road densities of the subwatersheds range from 0.3 mile to 19.8 miles per square mile with an average of 4.9 miles per square mile. The desired condition for road density is 2 miles per square mile (see “Section 3.13: Wildlife and Fish” for further information).

The existing condition of meadows in the analysis area ranges from good to adversely affected depending on meadow location and past restoration activities that have been accomplished. Adversely affected meadows in the analysis area include stream destabilization, invasion by conifers caused by lack of natural fire regime or disturbance from past logging practices, soil erosion from roads, season-long cattle grazing, OHV use, and past timber harvests.

History of Disturbance in the Watersheds. Timber harvesting and road construction are the primary recent land disturbing activities in the watersheds. Historic gold mining, unmanaged timber harvest, grazing of both cattle and sheep, and an increase in fire frequency and magnitude all effected changes on the landscape prior to U.S. Forest Service management of the area. Decrease in canopy cover of mature timber and replacement with brushfields as a combined consequence of these activities may have altered hydrologic response and accelerated erosion and sedimentation during this period.

A period of hydrologic recovery ensued following National Forest proclamation in the early 1900s and accompanying resource management and fire suppression. Extensive logging and road-building began in the 1950s and 1960s, on both National Forest System and private lands in the watershed area. Road location and logging practices of the 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 substantial private timber harvest continues today. Most logging activities have occurred on the gently to moderately sloping ground that occupies broad ridge top areas in the watersheds. Most of the very steeply sloping areas have not been harvested. The steep canyon slopes of the Middle Fork Feather River are largely included in the Feather Falls Scenic Area and the Middle Fork Feather River Wild and Scenic River and are subject to special management prescriptions (Plumas National Forest LRMP) precluding intensive timber harvest. These areas are also included in off base and deferred areas in the *HFQLG Forest Recovery Act* (FRA), and are not available for group selection or DFPZ treatments.

Fire suppression and reduced vegetation management have resulted in extensive fuel accumulations, which the Watdog vegetation management 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 within approximately one mile of the DFPZ units is described in the Watdog "Fire and Fuels Report."

3.7.4.2 Indicator 1: Watershed Condition

Existing Condition. For the near-stream sensitive areas, there are three subwatersheds approaching the TOC and four above the TOC under the existing condition (table 3-22). Possible reasons for this are: (1) stream protection zones were based on Forest Plan SMZ guidelines, which provide smaller buffers that current Scientific Analysis Team (SAT) guidelines, so more land area received treatment than under current RHCA guidelines, (2) private land has smaller stream protection zones than public lands, and (3) road development in the near stream areas.

For the subwatersheds as a whole, there is one subwatershed (23) approaching TOC and none are over the TOC (table 3-22). In this subwatershed, private timber harvesting activities contribute 61 percent to the total ERA score, compared to 37 percent from roads and 2 percent from Forest Service timber harvesting activities.

A general field assessment of stream condition was performed, and the results were compared to model results. Based on this field assessment, there is evidence that stream and riparian conditions in the analysis area have been disturbed by past logging activities, mining, and roads. Many streams are recovering or have recovered from these past activities. Some streams are still actively degrading, typically due to mining activities, poor road locations, and poor stream crossing designs. These streams have unstable bare banks, channel widening, and headcuts. The results of the model also indicate roads and the high road density are major influences on watershed condition. As described under the "Effects of the Alternatives" sections below, road decommissioning, streambank stabilization, and fish passage improvements proposed as part of Watdog will improve the existing condition in site-specific areas.

Table 3-22. Existing condition ERA compared to TOC by subwatershed.

Subwatershed			TOC:		Total ERA in:		Percent Disturbed in:		Percent of TOC in:	
Label	Acres in Near-Stream Sensitive Areas	Total Acres	Total Subwatershed	Near-Stream Sensitive Areas	Near-Stream Sensitive Area	Total Area	Near-Stream Sensitive Area	Total Area	Near-Stream Sensitive Area	Total Area
1	563	1,501	6	12	19	72	3	5	58	40
2	296	536	6	12	0	1	0	0	2	2
3	1,045	2,765	6	12	36	184	3	7	58	55
4	299	502	6	12	6	11	2	2	36	18
5	260	600	6	12	0	7	0	1	3	9
6	343	886	6	12	14	30	4	3	66	28
7	330	854	6	12	16	39	5	5	80	38
8	199	555	6	12	10	34	5	6	82	51
9	265	683	6	12	4	19	2	3	26	23
10	228	772	6	12	6	38	3	5	47	41
11	384	1,074	6	12	12	45	3	4	52	35
12	183	489	6	12	8	22	5	5	77	38
13	269	885	6	12	8	30	3	3	47	28
14	1,230	2,809	6	12	41	80	3	3	56	24
15	1,172	2,580	6	12	50	137	4	5	70	44
16	328	934	6	12	8	36	2	4	38	32
17	378	1,230	6	12	1	6	0	0	4	4
18	909	2,187	6	12	0	2	0	0	0	1
19	695	1,817	6	12	11	36	2	2	25	17
20	680	1,425	6	12	18	37	3	3	43	22
21	589	1,185	6	12	14	33	2	3	38	23
22	1,480	2,874	6	12	1	7	0	0	2	2
23*	1,445	4,479	6	12	122	448	8	10	141	83
24	861	1,382	6	12	3	10	0	1	6	6
25	742	1,660	6	12	19	51	3	3	43	25
26	894	1,756	6	12	5	17	1	1	9	8
27	242	1,025	6	12	16	84	7	8	112	68
28	856	2,358	6	12	63	170	7	7	123	60
29	1,030	2,519	6	12	19	74	2	3	31	25
30	169	471	6	12	12	35	7	7	116	62

Note:

* Subwatershed above or near TOC is highlighted.

3.7.4.3 General Effects – Measure 1: CWE Analysis

Risks to Beneficial Uses. The application of BMPs and management mitigation measures, including riparian buffers, would reduce the risks to beneficial uses of water from project activities. As shown in table 3-22, subwatershed 23 is currently approaching the TOC. Dependent on the timing of implementation, the Watdog action alternatives, combined with future foreseeable private land and U.S. Forest Service timber harvest activities, would increase the level of disturbance in that watershed. In theory, all listed beneficial uses of the Middle Fork, North Fork, and South Fork Feather Rivers could be at some risk from water quality degradation in all subwatersheds in the CWE analysis area. In practice, however, primary water quality effects would likely result from non-point source pollution and land clearing related to timber harvest and other land disturbances. These effects would relate to the following categories of state water quality objectives as defined in the Basin Plan:

- **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.

- **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.

If cumulative effects to the subwatersheds were to occur, they could include increases in 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 non-contact 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 would slightly shorten the expected usable lifespan of the reservoir. The greatest risk would likely be to beneficial uses associated with habitat. The majority of the risk from CWE is associated with the existing condition of a highly disturbed landscape, and the future foreseeable disturbance of that landscape from private timber operations. As described below, additional disturbance from the Watdog Project proposed activities would contribute only a minor percentage of the total risk.

Potential Cumulative Effects. If a CWE were to occur, the most likely effect would be increased chronic sedimentation from increases in water yield and peak flow during high-intensity rain events. Peak flow changes, in particular, may cause increased sedimentation, changes in bedload transport, altered flow regimes, channel incision, undercuts and unstable banks, and channel widening (Reid 1993). If a CWE were to occur from the Watdog Project, it would most likely occur within low-gradient, third-order or greater reaches of the channel network and/or at major confluences.

The identified CWEs from proposed activities would be mitigated during project planning, design, and implementation through:

- Adoption of unit-by-unit Forest Plan standards and guidelines to protect water quality
- Use of applicable BMPs
- Inventory, funding, and completion of land restoration activities throughout the watershed.

It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective non-point source conservation measures (BMPs), would provide protection of the entire watershed. Control of sedimentation through implementation of BMPs would minimize the potential for project-related sediment delivery to the immediate channel and channels downstream.

Impacts on water quality in the analysis area could potentially occur under the following circumstances:

- 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.
- Removal of vegetative matter and ground cover resulting from a wildfire.

3.7.4.4 Effects of Alternative A

Direct Effects for Measure 1: CWE Analysis. Under the no-action alternative, DFPZ treatments, group selection, transportation improvements, wildlife restoration, and watershed restoration would not occur; hence there would be no direct effects to the channel network from the Watdog Project.

Vegetation density and accumulation of fuels would continue to increase under alternative A. With those changes, the potential for stand-replacing fire and associated effects on near-stream sensitive areas would remain similar or increase compared to the existing condition. Fire adjacent to channels would adversely affect the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation, and the resulting effects on stream and riparian habitats and water quality, would likely increase following a stand-replacing fire (Neary et al. 2005).

Under the no-action alternative, there would be no beneficial changes in stream and meadow conditions because transportation improvements and watershed restoration would not occur. Sediment would continue to directly deposit into affected water bodies and riparian areas, and conditions would continue to degrade. Fish barriers would remain and continue to obstruct potential aquatic habitat.

Indirect and Cumulative Effects for Measure 1: CWE Analysis. Under the no-action alternative, DFPZ treatments, group selection, individual tree selection, transportation improvements, wildlife restoration, 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 remain similar or increase compared to the existing condition. As described in the Watdog Project "Fire and Fuels Report," the analysis area is at high risk of severe wildfire. ERA

values following a stand-replacing fire 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 function and condition of streams and the quantity and quality of aquatic habitat might remain compromised for decades to centuries (Neary et al. 2005).

Group selection 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.

3.7.4.5 Effects of Alternative B – Proposed Action

Direct Effects for Measure 1: CWE Analysis. Under the proposed action, there is potential for direct effects on hydrologic function from prescribed vegetation management activities, transportation improvements, wildlife restoration, and watershed restoration. It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective non-point source conservation measures (BMPs), would provide protection of the entire watershed. Proper application of BMPs described in Appendix B of the FSEIS would result in minimal potential of sedimentation to the immediate channel and channels further downstream.

In the proposed DFPZ treatment units, RHCAs in plantations would be treated to improve riparian habitat conditions (see appendix A of the "Hydrology Report"). In RHCAs, no-tractor equipment zones would be marked on the ground, based upon SMZ guidelines contained in the 1988 Plumas National Forest LRMP and field surveys. In harvest units, equipment outside the exclusion zone may reach a maximum of 18 feet into the no-tractor equipment zone along RHCAs to remove trees. Trees in streambank areas would be retained to ensure continued bank stability. SMZ designations for ephemeral swales would be marked on the ground; these are also considered no-tractor equipment zones. Equipment outside the exclusion zone could reach a maximum of 18 feet into the no-tractor zone. Limiting equipment "reach" to a maximum of 18 feet insures trees along streambanks would not be removed. In underburn units, fires would not be ignited in RHCAs but may be allowed to creep into them.

No direct effects from group selection would occur because these treatment units would not overlap RHCAs and SMZs.

There is the potential for short-term direct effects (e.g., increased sedimentation) on hydrologic function from transportation system improvements and watershed restoration activities, especially from in- or near-stream activities like culvert improvement, streambank stabilization, meadow restoration, and fish barrier removal. Overall hydrologic function would improve as a result of these activities. Decommissioning of roads in RHCAs has the potential to cause short-term direct effects, but would result in long-term improvements to stream and meadow conditions. A net reduction in direct effects would occur after the completion of restoration activities.

Indirect Effects for Measure 1: Cumulative Watershed Effects Analysis. Implementation of proposed vegetation management activities would result in the potential for indirect effects on hydrologic function. It is assumed that protection of headwaters and tributaries to larger watersheds through implementation of SAT and SMZ guidelines, along with implementation of effective non-point source conservation measures (BMPs), would provide protection of the entire watershed from project effects. Control of sedimentation through implementation of BMPs should minimize potential sedimentation to the immediate channel and channels downstream. As result, the risk of indirect watershed effects on streams from proposed DFPZ treatments would be low.

Even though intensive mechanical treatment would occur during group selection treatments, proposed group selection units are mostly situated in upland positions away from channels, and full RHCA protection would apply. Consequently, the risk of indirect watershed effects on streams would be low.

There is potential for indirect effects (e.g., increased sedimentation) on hydrologic function from transportation system improvements (especially from reconstruction and decommissioning), wildlife habitat improvements, and watershed restoration activities. These improvements, however, would benefit the hydrologic function and condition of the subwatersheds, as there would be a net reduction in sediment being mobilized and reaching the stream through road drainage improvement, and BMP implementation and restoration of the habitat connectivity of stream systems. Also, through proposed road decommissioning, a net reduction in the ERA would be achieved.

Cumulative Effects for Measure 1: CWE Analysis. The results of the CWE model for the proposed action include the sum of ERA values for the existing condition, reasonable foreseeable future activities, and for the proposed action. A comparison of the ERA to the TOC for alternative B is included in table 3-23.

With implementation of activities proposed under alternative B, ERA values for subwatershed near-stream sensitive areas can experience a slight increase, decrease (due to proposed road obliterations), or remain the same. All subwatershed near-stream sensitive areas that approach or exceed the TOC under the existing condition would remain near or above TOC with the proposed action. ERA values would exceed TOC for near-stream sensitive areas in subwatersheds 23, 27, 28, and 30 (table 3-23). All of these subwatersheds exceed TOC for near-stream sensitive areas under the existing condition.

For subwatersheds as a whole, only Subwatershed 23 is approaching the TOC at 95 percent of TOC. In subwatershed 23, past activities on the Plumas National Forest, combined with the proposed Watdog Project activities, contribute 14 percent of the total ERA. Private land activities contribute 53 percent of the ERA score for this watershed, and roads contribute 31 percent of the score.

Table 3-23. Alternative B: Proposed Action ERA compared to the TOC by subwatershed.

Subwatershed Label	Total ERA		Percent Disturbed		Percent of TOC	
	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total
1	20	93	4	6	59	52
2	0	2	0	0	2	3
3	39	209	4	8	62	63
4	6	17	2	3	36	28
5	0	5	0	1	3	7
6	14	40	4	4	67	37
7	16	45	5	5	80	44
8	10	37	5	7	83	56
9	5	32	2	5	31	39
10	8	58	4	8	61	63
11	14	58	4	5	59	45
12	11	35	6	7	98	59
13	8	48	3	5	47	45
14	42	104	3	4	57	31
15	50	138	4	5	71	45
16	8	47	2	5	40	42
17	1	7	0	1	4	5
18	0	8	0	0	0	3
19	10	39	1	2	24	18
20	16	50	2	4	40	29
21	14	35	2	3	38	25
22	1	10	0	0	2	3
23*	122	510	8	11	141	95
24	3	8	0	1	5	5
25	19	60	3	4	42	30
26	5	21	1	1	9	10
27	16	89	7	9	112	72
28	64	205	7	9	124	72
29	19	75	2	3	31	25
30	12	41	7	9	123	73

Note:

* Highlighted rows represent subwatersheds above or near TOC.

As stated in the "Fire and Fuels Report," the proposed DFPZ treatments would be effective if a wildland fire at or below the 90th percentile weather conditions were to occur. An effective DFPZ would not eliminate the possibility of high-severity wildfire affecting some watersheds, particularly where there is heavy fuel loading on steep canyon slopes. The DFPZ would, however, 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 Watdog Project.

Group selection treatments are designed to promote the HFQLG desired condition of uneven-aged, multistoried, fire-resilient stands, while maintaining a healthy forest. Over time, implementation of these 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 this alternative, these stand structure improvements would occur, and in the long term, possible benefits to aquatic and riparian systems associated with the fire resiliency of these stand improvements would also occur. Possible short-term increases in runoff and erosion related to these treatments could 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 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, improve aquatic and riparian habitat, improve the availability of aquatic habitat conditions that facilitate the passage and migration of fish, amphibians, and invertebrates from restoration of habitat connectivity. Short-term sediment increases that may result from these restoration activities would be offset by ecological benefits and enhanced beneficial uses.

The proposed road decommissioning and closure under alternative B would reduce road miles and road density (see table 11 in the "Hydrology Report"). Twenty subwatersheds would experience a decrease in road density if alternative B is selected.

3.7.4.6 Effects of Alternative C

Direct Effects for Measure 1: CWE Analysis. Direct effects of alternative C would be the same as direct effects of alternative B.

Indirect Effects for Measure 1: CWE Analysis. Indirect effects of alternative C would be similar to indirect effects of alternative B. There is a reduction of group selection treatment areas under alternative C; therefore, there is slightly less potential for indirect effects from this alternative compared to alternative B. However, there would be no benefits from group selection treatments in these areas.

Cumulative Effects for Measure 1: CWE Analysis. Minor reductions in total ERA scores are indicated for alternative C as compared to alternative B. Table 3-24 compares the total ERA score, percent disturbed, and percent of TOC for alternative C. Subwatershed has a reduced ERA score and is approaching the TOC and at 94 percent..

3.7.4.7 Effects of Alternative D

Direct Effects for Measure 1: CWE Analysis. Direct effects of alternative D would be less than alternative B because some DFPZ treatment units changed from harvest to mastication, fewer acres of group selection are proposed, and no new road building would occur. However, the differences between the two alternatives are relatively minor, and the DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (see "Section 3.2: Fire and Fuels"). The effects of a severe wildfire are discussed under alternative A.

Table 3-24. CWE results for alternative C.

Subwatershed Label	Total ERA		Percent Disturbed		Percent of TOC	
	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total
1	20	93	4	6	60	52
2	0	2	0	0	2	3
3	39	209	4	8	62	63
4	6	17	2	3	36	28
5	0	5	0	1	3	7
6	14	38	4	4	67	36
7	16	45	5	5	80	44
8	10	36	5	6	83	54
9	5	31	2	4	31	37
10	8	58	4	8	61	63
11	14	59	4	5	59	46
12	11	35	6	7	98	59
13	8	47	3	5	47	44
14	42	100	3	4	57	30
15	50	138	4	5	71	45
16	8	46	2	5	40	41
17	1	7	0	1	4	5
18	0	8	0	0	0	3
19	10	39	1	2	24	18
20	16	59	2	4	40	35
21	14	35	2	3	38	25
22	1	9	0	0	2	3
23*	122	505	8	11	141	94
24	3	8	0	1	5	5
25	19	60	3	4	42	30
26	5	21	1	1	9	10
27	16	88	7	9	112	72
28	64	204	7	9	124	72
29	19	75	2	3	31	25
30	12	41	7	9	123	73

Note:

* Highlighted rows represent subwatersheds above or near TOC.

Indirect Effects for Measure 1: CWE Analysis. Indirect effects of alternative D would be less than alternatives B and C because fewer acres of group selection treatment areas are proposed, some DFPZ treatment units changed from harvest to mastication, and no new road building would occur. However, the DFPZ constructed in alternative D would not be as effective as the one constructed under alternatives B and C (see Watdog "Fire and Fuels Report"). In addition, because fewer acres of group selection are proposed, stand structure improvements under this alternative would occur over a smaller area (see alternative B discussion above). The effects of a severe wildfire are disused under the effects of alternative A section above.

Cumulative Effects for Measure 1: CWE Analysis. There is a slight reduction in total ERA scores for alternative D compared to alternatives B and C. Table 3-25 contains the total ERA score, percent disturbed, and percent of TOC for alternative D. When compared to alternative B, subwatershed 23 has a reduction in total ERA score and is approaching the TOC at 91 percent of TOC. However, the differences in ERA scores between the action alternatives are relatively minor, and the DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (see Section 3.2: "Fire and Fuels"). The Watdog project is expected to have short-term effects on watershed condition, but provide long term benefits to watershed condition by reducing the risk of a high intensity wildfire The effects of a severe wildfire are disused under the effects of alternative A section above.

Table 3-25. CWE results for alternative D. Highlighted rows represent subwatersheds above or near TOC.

Subwatershed Label	Total ERA		Percent Disturbed		Percent of TOC	
	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total	Near-Stream Sensitive Area	Total
1	20	92	4	6	60	51
2	0	2	0	0	2	3
3	39	209	4	8	62	63
4	6	17	2	3	36	28
5	0	5	0	1	3	7
6	14	36	4	4	67	33
7	16	44	5	5	80	43
8	10	35	5	6	83	52
9	5	25	2	4	31	30
10	8	49	4	6	61	54
11	14	51	4	5	59	40
12	11	32	6	7	98	55
13	8	44	3	5	47	42
14	42	98	3	3	57	29
15	50	138	4	5	71	44
16	8	46	2	5	40	41
17	1	6	0	0	4	4
18	0	5	0	0	0	2
19	10	38	1	2	24	17
20	16	46	2	3	40	27
21	14	34	2	3	38	24
22	1	8	0	0	2	2
23*	122	491	8	11	141	91
24	3	11	0	1	6	6
25	18	54	2	3	41	27
26	5	20	1	1	9	10
27	16	87	7	9	112	71
28	64	201	7	9	124	71
29	19	75	2	3	31	25
30	12	41	7	9	123	73

Note:

* Highlighted rows represent subwatersheds above or near TOC.

3.7.5 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. There would be no project-related direct, indirect, or cumulative effects under alternative A (the no-action alternative), therefore there would be no irreversible commitments of riparian or water resources. It is not projected that alternatives B, C, or D would cause irreversible commitments of riparian or water resources, because project-related effects would be short term.

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 right-of-way or road. There would be no project-related direct, indirect, or cumulative effects under alternative A (the no-action alternative), therefore there would be no irretrievable commitments of riparian or water resources. While there would be short-term effects to hydrologic response in the affected watersheds under alternatives B, C, or D it is not projected it would cause irretrievable commitments of riparian or water resources.

3.7.6 Summary of Cumulative Effects

A comparison of ERA scores in relation to the TOC for each alternative is included in table 3-26. Under alternative A, the no-action alternative, subwatershed 23 is approaching the TOC at 83 percent. Treatments would not occur under alternative A and there would be no project-related increase in ERA values or the risk of CWE. However, vegetation density and accumulation of fuels would continue, and the chances of stand-replacing fire that might adversely affect upland areas would remain similar or increase compared to the existing condition. Stand-replacing fire is considered to be a significant risk under the existing condition. Also there would be no benefits to stand improvements for group selection treatments, transportation improvements, and restoration projects.

For all action alternatives, all of the subwatersheds are under the threshold of concern when ERA values are considered over the total subwatershed areas. There is very little difference in percent of TOC (a maximum of 22 percent increase in percent of TOC and a minimum of 1) when alternatives B, C, and D are compared to the existing condition. In subwatersheds 5 and 24 there is a decrease in percent of TOC (1 to 2 percent) from proposed road decommissioning in alternatives B, C, and D. Under alternatives B, C, and D Subwatershed 23 is approaching the TOC (at 95, 94, and 91 percent of TOC). However, because fewer acres of group selection are proposed under alternatives C and D, stand structure improvements under these alternatives would occur over a smaller area than alternative B. In addition, Alternative D would not construct as effective of a DFPZ as alternatives B and C (see “Fire and Fuel” Section of Chapter 3.

Table 3-26. CWE results for all alternatives.

Subwatershed Label	Percent of Threshold For Each Alternative (Near-Stream Sensitive Area)				Percent of Threshold For Each Alternative (Total Subwatershed Area)			
	Alternative							
	A	B	C	D	A	B	C	D
1	58	59	60	60	40	52	52	51
2	2	2	2	2	2	3	3	3
3	58	62	62	62	55	63	63	63
4	36	36	36	36	18	28	28	28
5	3	3	3	3	9	7	7	7
6	66	67	67	67	28	37	36	33
7	80	80	80	80	38	44	44	43
8	82	83	83	83	51	56	54	52
9	26	31	31	31	23	39	37	30
10	47	61	61	61	41	63	63	54
11	52	59	59	59	35	45	46	40
12	77	98	98	98	38	59	59	55
13	47	47	47	47	28	45	44	42
14	56	57	57	57	24	31	30	29
15	70	71	71	71	44	45	45	44
16	38	40	40	40	32	42	41	41
17	4	4	4	4	4	5	5	4
18	0	0	0	0	1	3	3	2
19	25	24	24	24	17	18	18	17
20	43	40	40	40	22	29	35	27
21	38	38	38	38	23	25	25	24
22	2	2	2	2	2	3	3	2
23*	141	141	141	141	83	95	94	91
24	6	5	5	6	6	5	5	6
25	43	42	42	41	25	30	30	27
26	9	9	9	9	8	10	10	10
27	112	112	112	112	68	72	72	71
28	123	124	124	124	60	72	72	71
29	31	31	31	31	25	25	25	25
30	116	123	123	123	62	73	73	73

Note:

* Highlighted row represents subwatershed above or near TOC.

3.8 Rangeland

3.8.1 Introduction

The Watdog Project is entirely located within the boundaries of the 72,700 acres of the Fall River Livestock Grazing Allotment. There is a Forest Service Term Grazing Permit issued for 200 cow/calf pairs from June 1 to October 25. The Forest Service permit also allows for 200 additional pairs on 24,000 acres of private lands within the allotment for which the permittee holds grazing privileges.

3.8.1.1 Scope of the Analysis

The analysis area for the rangeland resource would be the entire 72,700 acres of the Fall River allotment. Only 48,700 of those acres are National Forest System lands. The allotment is generally located between the Middle Fork and the South Fork of the Feather River. The allotment is operated under season-long (June 1 through October 25) grazing with no formal subunits. Cattle enter the allotment in the lower elevations and are allowed to drift up to higher elevations as the season progresses. There are no fences or other improvements to control livestock movements.

3.8.1.2 Regulatory Framework

Livestock grazing on public lands is authorized through laws enacted by Congress. Policy, direction and regulation are found in agency handbooks and manuals maintained at both the national and regional levels. Authorization of grazing permits is directed by the Plumas National Forest LRMP following completion of site-specific analysis.

Forest-wide grazing standards and guidelines are found on p. 55–56 of the SNFPA 2004 ROD. Standards and guidelines specific to grazing in riparian areas are found on p. 63 and 65–66 of the SNFPA ROD. Several of the grazing standards are summarized in table 3-27.

For lands contained within RHCAs, another set of grazing standards and guidelines apply. Grazing Management-1 and Grazing Management-2 are found on p. L-14 of appendix L, HFQLG FEIS.

Livestock use of the allotment is monitored through observations taken at approximately five key areas representative of specific limiting conditions. When a use standard is reached at one of the key areas, the livestock must be moved to another portion of the allotment or removed from the allotment.

Table 3-27. Livestock Utilization standards and guidelines, Sierra Nevada Forest Plan Amendment 2004 ROD.

#50	Percent Browse of Hardwood Seedlings and Regeneration	No more than 20 Percent of Annual Growth
#103	Percent Streambank Alteration	Less than 20 percent of stream reach
#120	Stubble Height	Minimum 6 inches for meadows in early seral stages or 4 inches in late seral stages
#121	Riparian Shrub Use (livestock browse)	No more than 20 percent of annual leader growth and seedlings

An Environmental Assessment and Decision Notice was prepared and signed in 1981 to authorize the current livestock use on the Fall River allotment and issue a Term Grazing Permit. An Allotment Management Plan was also prepared in 1981 and has not been updated since. Analysis and planning for revision of rangeland allotment management plans on the Feather River District is currently scheduled to begin in 2009. Livestock grazing on the Fall River allotment will most likely stay at the current levels under similar management.

3.8.1.3 Analysis Methods

There is no current rangeland analysis available for the Fall River allotment. A Vegetation Frequency Transect was established in 2003 at Tamarack Flat to assess vegetation trend. Readings taken at that time indicated rangeland vegetation and soil conditions are in a mid- to late-seral status. Trend data will not be available until the frequency transect is re-read in 2008. The only other monitoring and data available for the allotment are yearly utilization data collected at representative key areas. A summary of the last five years of utilization monitoring shows that livestock grazing has consistently been within the utilization standards and guidelines established by the SNFPA ROD.

3.8.2 Existing Condition and Environmental Effects

3.8.2.1 Introduction

This section describes the existing condition and environmental effects of alternatives A, B, and C on rangeland resources in the Watdog Project area. Following the discussion of existing conditions, the direct, indirect, and cumulative effects of each alternative are described with regards to rangeland.

3.8.2.2 Rangeland Resources

Existing Condition. The Watdog Project is entirely located within the boundaries of the 72,700 acre Fall River Livestock Grazing Allotment. There is a Forest Service Term Grazing Permit issued for 200 cow/calf pairs from June 1 to October 25. The Forest Service permit also allows for 200 additional pairs on 24,000 acres of private lands within the allotment for which the permittee holds grazing privileges. A summary of the last five years of utilization monitoring in the Fall River allotment shows that livestock grazing has consistently been within the utilization standards and guidelines established by the SNFPA ROD.

Effects of Alternative A. The no-action alternative (alternative A) will not change current conditions for rangeland resources in the Watdog Project area. There will continue to be a risk of large and intense wildfire. In the event of a large fire, livestock grazing would be prohibited for one to three years until new vegetation is established and soils are better stabilized. This would impact the overall operation of the livestock permittee as alternate pastures for the cattle would be needed until cattle could return to the National Forest Service allotment. No cumulative effects on rangeland resources are expected as a result of the no-action alternative.

Effects of Alternatives B, C, and D. Group selection harvest and DFPZ construction, including thinning and underburning, would open additional acres to livestock movements and create transitory grazing opportunities. All action alternatives call for approximately 2,800 acres of prescribed burning

and construction of approximately 4,000 acres of DFPZ. Alternative B calls for approximately 231 acres of group selection harvest, followed by alternative C (151 acres) and alternative D (105 acres).

None of the action alternatives are expected to significantly alter grazing use or livestock management on the allotment. Alternative D calls for fewer acres of group selection harvest and therefore would open fewer acres to livestock movements or new grazing opportunities than alternatives B or C.

Recently burned areas can attract livestock because the emerging vegetation is often more palatable. This would result in better livestock distribution on the allotment. Acres of underburning are the same for alternatives B and C, and both alternatives are expected to have similar effects on livestock distribution.

Areas underburned as part of the proposed action would need to be visited after burning to determine if livestock grazing needs to be deferred. In most cases, livestock grazing is allowed immediately following the burn. However, if the prescribed fire does not burn as expected, livestock grazing may need to be deferred according to SAT guidelines for grazing management.

SAT guidelines are found in appendix L of the HFQLG FEIS. If the DFPZ prescribed burn is severe, the allotment would need to rest a season or two and alternate pastures would need to be utilized. If the prescribed burn fire behavior is abnormal, grazing would be deferred until after seed set or limited to 35 percent use of preferred species until after seed set.

If successfully implemented, effects of the proposed streambank stabilization and meadow restoration would be beneficial to rangeland resources in that healthy sites are less susceptible to disturbance and are usually more productive. However, proposed meadow restoration and streambank stabilization may result in locally bare ground and young emergent vegetation. Livestock use of these areas would be difficult to prevent without fencing. Depending on the location of these treatments, the type of treatment prescribed, and the timing of the treatment, some type of temporary livestock exclosure may be needed to insure success. Temporarily restricting access to these few acres will not impact overall use on the allotment. No cumulative effects on rangeland resources are expected as a result of the alternatives.

3.8.3 Irreversible, Irretrievable Effects

No irreversible or irretrievable effects on rangelands are expected.

3.8.4 Summary of Cumulative Effects

There is minimum grazing pressure on the Watdog Project area. In general, cattle are located on private lands. No cumulative effects on rangeland resources are expected.

3.9 Recreation, Visuals, Lands, and Minerals

3.9.1 Introduction

Recreation, lands, and mineral operations are historically important activities in the vicinity of Watson Ridge, Hartman Bar Ridge, and Lumpkin Ridge, which include the Watdog Project area in the Fall River and South Branch Middle Fork Feather River watersheds. 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, and camp on the Plumas National Forest. Most of the recreational use in the project area is dispersed activities such as hunting, picnicking, camping, fishing, wood cutting, hiking, backpacking, horseback riding, driving for pleasure, OHV use, snowmobiling, cross country skiing, and observing nature. Within the project area, there are no known NOIs or Plans of Operations on file for mineral operations within the last five years, and there are no known Special Use Authorization for any non-federal land uses.

The Plumas National Forest's 1988 LRMP projected increases in recreation demand for all Recreational Opportunity Spectrum (ROS) classes in the next fifty years. ROS classes have been assessed for the project area and are defined in the LRMP.

Approximately 95 percent of the project area is in a roaded modified setting where the sight and sound of people are moderate. Roads, landings, and debris are evident. Included in this ROS is the Feather Falls Scenic area where motorized land vehicle travel is confined to existing roads and trails, except for those designated closed. Use of motorized vehicles off of existing roads and trails is prohibited; however, motorized over-the-snow travel is permitted.

Approximately 5 percent of the project area, near Pinchard Creek, is in 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.

Motorized use by OHVs is increasing and is not limited to roads and trails. In areas where access can be obtained, such as open ridges, firelines, and open country, OHV use off of roads and trails is increasing rapidly. The Plumas National Forest is currently undergoing an OHV Route Inventory and Designation (RI&D) process. Roads proposed for decommissioning or closure in this project will not be closed until this process has been completed 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 egregious and irretrievable impacts to the resource.

3.9.2 Analysis Methods

In this section, the effects of the alternatives will be analyzed in relation to three indicators: (1) ROS land classes, (2) visual quality as measured by the Visual Quality Objective (VQO) system, and (3) other

recreation features such as trails. Because no NOIs, Plans of Operations, or Special Use Authorizations have been issued for the project area in the last five years or proposed for the foreseeable future, neither lands nor minerals will be analyzed in detail in this document.

3.9.2.1 Geographic Boundary for the Analysis

The analysis area for recreation, lands, and minerals is the 6,000 acre Watdog Project area. Proposed vegetation and transportation management activities could affect opportunities and use for recreation, lands, and minerals, as well as visual quality within the project area. The proposed actions would have little effect on recreation, lands, or minerals outside the project area.

3.9.2.2 Time Frame for the Analysis

The time frame for this analysis was based on known past actions as described earlier in this chapter and anticipating approximately five years into the future.

3.9.2.3 Regulatory Framework

The 1988 LRMP established goals, policies, and objectives 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/lands/ minerals in the Watdog 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.
- Maintain high visual quality on lands committed to other uses or readily apparent from recreation developments, major travel routes, and other high use areas.
- 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.
- 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.

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 presents a vocabulary for managing scenery and 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. Ecosystems provide the environmental context for this scenery management system. 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 goals and objectives, 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.

3.9.2.4 Analysis Methods

ROS classes, the Visual Management System, and VQOs within the Watdog Project area were evaluated for changes resulting from implementation of the three action alternatives analyzed in this document.

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.

3.9.3 Existing Condition and Environmental Effects

3.9.3.1 Introduction

The LRMP characterized the ecological and social conditions in the Watdog Project area and provided a context for future forest management decisions in the area.

Motorized recreation is an important use in the Fall River and South Branch Middle Fork Feather River watersheds. OHV, including over snow vehicle, use has increased dramatically over the last decade both locally and nationally, and increased need is expected in the future. Trails and roads in the watersheds generally meet current recreation needs, although an OHV RI&D process is in progress to identify OHV routes and areas to be established by forest order. Maintaining and improving current dispersed camping, hunting, fishing, and other recreational opportunities is a moderate priority for the Forest.

The Forest has been inventoried and divided into five ROS classes: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, and Rural. The Watdog Project area was inventoried as Roaded Natural during the forest planning process in the late 1980s.

The Roaded Natural class as described in the USDA Forest Service ROS User's Guide has been divided into two subclasses, Roaded Natural and Roaded Modified.

- 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.

- 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.

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.

- **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.

- **Maximum Modification** – Activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Winter snow sports such as cross country skiing and snowmobiling are increasing in popularity and occur within the project area. Routes in the project area in the vicinity of Camel Peak, Tamarack Flat, and Black Rock Creek are groomed for snowmobile use. Other recreational features include but are not limited to photography, mushrooming, and collection of basket weaving material.

The Watdog Project area is located in the back country, far from areas of developed recreation or roads that require increased scenic integrity. Ground based logging systems would be used to construct DFPZs and to conduct timber harvest in group selection units. There are no group selection units within the boundaries of the Feather Falls Scenic area.

3.9.3.2 Recreation Opportunity Spectrum and Visual Quality Objectives

Existing Condition. The majority of the project area (approximately 95 percent) is classified under Recreation Opportunity Spectrum (ROS) as Roaded Modified. Approximately 5 percent of the project area near Pinchard Creek is in the Roaded Natural class. A VQO of Modification is assigned to approximately 90 percent of the project area, while the remaining area is almost equally divided between Maximum Modification and Retention. The Retention area is within the boundaries of the Feather Falls Scenic area. The current VQOs are met across the project area.

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 Watdog

Project area. The current VQOs of Retention, Modification, and Maximum 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.

Effects of the Action Alternatives. Proposed DFPZ treatments and group selection harvest are consistent with the Retention, Modification, and Maximum Modification VQOs assigned to the treatment units. Proposed DFPZ treatments within the Feather Falls Scenic area would be consistent with the Retention VQO assigned to the landscape as they are not expected to be evident to the casual forest visitor. Following implementation of alternatives B, C, or D, there would be no change in VQOs from existing conditions. Group selection units are not proposed in the Feather Falls Scenic area, so no effects on the Retention VQO from group selection harvest is expected. A modest increase in dispersed recreational use may occur. However, use by recreationists and other land users in this part of the forest is low because of the remote location.

A listing of past, present, and foreseeable future action considered in the cumulative effects analysis is provided earlier in this chapter. 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—not just the actions listed in table 3-1—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 recreational/lands/minerals opportunities and use of the Watdog Project area,
- Proposed actions for alternatives B, C, and D are consistent with and would not affect the VQO assigned to treatment units, and
- 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.

3.9.3.3 Other Recreational Uses (Trails)

Existing Condition. Historically, 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 trails were built to accommodate pack and saddle stock and were primary access routes into the Middle Fork of the Feather River. Trailheads for two hiking trails (Hartman Bar National Recreation Trail and Hanson's Bar Trail) and less than one mile of their trail system are located within the Watdog Project area.

Approximately 10 miles of existing road within the project area are used as summer OHV trails. The Plumas National Forest is currently conducting an OHV RI&D process. This process will eventually designate specific roads, trails, or areas where OHV use is authorized. Roads or trails that are analyzed for decommissioning or closing by this project will be evaluated through the OHV RI&D prior to implementation.

Approximately 9 miles of over snow vehicle routes are located in the vicinity of the project area. The snow routes are part of the snowgrooming program conducted in the Black Rock Creek, Tamarack Flat, and Camel Peak areas.

Effects of Alternative A. The no-action alternative (alternative A) would not initiate human-caused changes to the existing scenic conditions of the Watdog 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 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.

Effects of the Action Alternatives. Alternatives B, C and D would not change the number of miles of summer trails (hiking and OHV) 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 units. The harvest activity will open up vistas for public viewing.

There are approximately 9 miles of snowmobile routes in the project area that are part of the La Porte snowgrooming program in the Black Rock Creek, Tamarack Flat, and Camel Peak areas. Several group selection units 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 Watdog 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 9 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 would reduce the level of OHV access slightly. However, specific road closures/decommissioning would be identified through the OHV RI&D process, so site-specific effects on OHV access are difficult to predict at this point. See “Section 3.11: Transportation System” in the FEIS for more information about temporary road construction and roads proposed for closure and decommissioning.

A listing of past, present, and foreseeable future action considered in the cumulative effects analysis is provided earlier in this chapter. 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—not just the actions listed in table 3-1—those that have affected recreational opportunities and might contribute to cumulative effects.

Cumulative effects of the action alternatives on 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 trails in the Watdog Project area,
- Proposed actions for alternatives B, C, and D may temporarily restrict access to hiking and OHV trails or temporarily affect the visual character of the trails and trailheads, and
- There are no present or foreseeable future land and mineral use projects in the project area that are expected to adversely affect access or use of existing trail systems.

3.9.4 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, lands, or minerals.

3.9.5 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 to no cumulative effects associated with alternative A beyond the modest increase in use anticipated by the LRMP, especially recreation for the remote Watdog area.

As explained above, there are few expected cumulative effects on visual resources or recreational opportunities under alternatives B, C, and D. Past, present, and foreseeable future actions either have not contributed or are not expected to contribute adverse impacts on visual resources and recreational opportunities in the Watdog Project area that could add to effects of the Watdog alternatives. All VQOs currently assigned to the project area would be met following vegetation and transportation management treatments. Alternatives B, C, and D would not exclude any of the existing recreational uses, but could temporarily restrict recreational access during harvesting activities. Road closure or decommissioning proposed for alternative B, D, and D 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 Route Inventory and Development 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 unacceptable resource damage, to the extent that a delay in their closure would result in egregious and irretrievable impacts to the resource, following the OHV RI&D process. Proposed transportation management activities are discussed in more detail in “Section 3.11: Transportation System” of the FEIS.

3.10 Soils

3.10.1 Introduction

The purpose of this section is to analyze the direct, indirect, and cumulative effects of the Watdog Project on the soil resource, specifically 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). Soil productivity is analyzed by measuring soil cover, soil porosity, and organic matter (see Section "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. Below is a summary of expected cumulative effects for each alternative. For more detailed information on direct, indirect, and cumulative effects refer to the "Existing Condition and Environmental Effects" Section. .A more comprehensive description of the regulatory framework, analysis methods, and other elements of the analysis can be found in the "Soils Report" in the project file.

3.10.2 Analysis Methods

3.10.2.1 Geographic Scope of the Analysis for Effects to Soil Properties

The scope of the analysis for direct, indirect, and cumulative effects to soil properties for all proposed actions and activities is limited to the proposed treatment units. Changes to soil productivity do not occur outside of the proposed treatment units. Refer to the "Watdog Project Map" on file in the project record for proposed treatment unit locations.

3.10.2.2 Time Frame for the 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 time frame for the soils analysis must extend until the resource has recovered from the impact of the proposed activities. The persistence of soil effects into the future can vary widely. For example, ground cover may recover within one to two years following a treatment. Soil compaction, however, may last for decades.

3.10.2.3 Field Data Collection

A representative sample of proposed treatment units were resurveyed in summer of 2006. The sampling strategy took into account the level and similarity of known past management activities, soil map unit occurrence and soil types, 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 as proposed treatment units surveyed. In the "Existing Condition" section of the Watdog "Soils Report" on file in the project record is a table explaining which units have similar conditions.

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. Transect 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 a more detailed discussion of field methods, refer to the Watdog "Soils Report" in the project record. The proposed treatment units for alternative B are displayed in appendix C, map 2 in this Watdog FSEIS.

The following criteria were utilized to stratify which proposed treatment units have similar existing conditions.

***Level of Ground Disturbance*:**

Surveys were conducted on high priority proposed treatment units. High priority proposed treatment units included thinning and group selection 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 silvicultralist determined the maximum area available for group selection treatments. Within this larger area multiple 1-2 acre 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.

Hand cut, hand cut and pile burn and underburning were selected treatment methods in areas of steep slopes, treatment units that are mostly composed of Riparian Habitat Conservation Areas (RHCAs are stream buffers used to protect streams during land management activities), and areas of black oak and meadow habitat improvement areas. Typically these areas do not have known past management activities in the last twenty-five years and there is a thick duff and litter layer (soil cover) and high fuel loading conditions. Under the existing condition proposed underburning treatment units exceed the Forest Plan standards and guides for effective soil cover (see the "Existing Condition" Section). 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 Watdog projects it is expected that the post-project conditions in Watdog 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 the "Existing Condition and Environmental Effects" Section.

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 included as part of a timber stand. Proposed road decommissioning and restoration activities were considered a long-term [these usually have short-term sediment effects with long-term

benefits] improvement to soil productivity and are discussed in the " Condition and Environmental Effects" Section.

***Known Past Management Activities*:**

Surveys were conducted in proposed treatment units with known and unknown past land management activities. An emphasis was placed on proposed treatment 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 activities was based on information gathered for the hydrology cumulative watershed effects assessment (for more information see the "Hydrology" Section). 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. Refer to Table 2 of the Watdog "Soils Report" for a list of past management activities.

Known Soils Types:

All surveys were conducted within known soil map units and soil type (refer to Table 2 of the Watdog "Soils Report").s. Based on a Geographic Information System (GIS) analysis, there are twenty-seven soil map units that were identified within the soil effects analysis area (see the "Existing Condition and Environmental Effects" Section). 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. Map units 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.

***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 treatments units that were determined to have similar past management activity effects.

Proposed treatment units that were surveyed with the similarities mentioned above do have similar existing conditions (see the "Existing Condition and Environmental Effects" Section). The proposed treatment units 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 compared to the surveyed units.

3.10.3 Regulatory Framework

3.10.3.1 National Forest Management Act

The *National Forest Management Act of 1976* (see appendix G of this Watdog Project FSEIS for the findings) mandates that land management plans be prepared for each National Forest (see the Plumas National Forest LRMP discussion), and that guidelines be specified that:

- 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

- Insure that timber will be harvested from National Forest System lands only where soil, slope, or other watershed conditions will not be irreversibly damaged.

3.10.3.2 Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement and Record of Decision

Table 2 of the 2004 *Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement* describes applicable standards and guidelines of the HFQLG Pilot Project area for the life of the Pilot Project (USDA Forest Service 2004). 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…Consider the effects of follow-up prescribed fire in achieving desired retention levels of down wood."

3.10.3.3 Plumas National Forest Land and Resource Management Plan

The 1988 Plumas National Forest LRMP (commonly referred to as the "Forest Plan") specifies standards and guidelines for the maintenance and improvement of soil resources (USDA Forest Service 1988). Although standards and guides used in the analysis are defined below, these standards and guidelines are described in detail in the Watdog "Soils Report" on file in the project record.

- During project activities, to minimize excessive loss of organic matter and limit soil disturbance according to the Erosion Hazard Rating (EHR) as follows: (1) EHR 4-8: Conduct normal activities, (2) EHR 9-10: Minimize or modify use of soil-disturbing activities, and (3) EHR 11-13: Severely limit soil-disturbing activities.

- Determine adequate amounts of effective ground cover in planned treatment areas using the following as a guide: (1) Low EHR (4-5): 40 percent minimum effective ground cover, (2) Moderate EHR (6-8): 50 percent minimum effective ground cover, (3) High EHR (9-10): 60 percent minimum effective ground cover, and (4) very high EHR (11-13): 70 percent minimum effective ground cover.

- 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.

3.10.4 Management Guidance

3.10.4.1 National Soil Management Handbook

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. More detailed descriptions of all definitions and guidance contained in the handbook are included in the Watdog "Soils Report" on file in the project record.

3.10.4.2 Region Five Soil Management Handbook

The Forest Service Region 5 Soil Management Handbook establishes regional soil quality analysis guidelines with thresholds and indicators to describe soil condition. 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 specified roads and developed campgrounds. The handbook supplement establishes consistent analysis standards across the Region. These analysis guidelines provide threshold values that indicate when changes in soil properties and soil conditions would likely result in significant change or impairment of the soil productivity potential, hydrologic function, or buffering capacity of the soil. Detrimental soil disturbance is the resulting condition when thresholds are exceeded. These detrimental disturbances do not necessarily imply significant impairments of soil productivity or irreversible damage of soil conditions. 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. Detrimental soil disturbance indicators include soil productivity, soil hydrologic function, and soil buffering capacity. Below is a summary of these indicators and threshold values. More detailed descriptions of all definitions and guidance contained in the handbook are included in the Watdog "Soils Report" on file in the project record.

1. Soil porosity should be at least 90 percent of total porosity found under natural conditions. A ten percent reduction in total soil porosity corresponds to a threshold for soil bulk density that indicates detrimental soil compaction.

2. 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.

3. 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.

4. Soil organic matter is used as an indicator of soil displacement effects on nutrient and soil moisture supply. Use the kinds and amounts of organic matter identified below. These may be supplemented with local analyses.

a. Fine organic matter includes plant litter, duff, and woody material less than 3 inches in diameter, and 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. 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. Determine minimum organic layer thickness and distribution locally and base it on amounts sufficient to persist through winter season storms and summer season oxidation. 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. If the soil and potential natural plant community are not capable of producing fine organic matter over 50 percent of the area, adjust minimum amounts to reflect potential soil and vegetation capability.

b. Large woody material is at least 5 well distributed logs per acre representing the range of decomposition classes. 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. Adjust the minimum logs per acre to account for ecological type (FSH 2090.11) potential and specific site needs as data becomes available. To help meet fuel management objectives, minimum logs can be adjusted to take advantage of short-term large woody material contributions in snag recruitment areas. 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. Other surface organic matter (3–20 inches in diameter), or amounts of fine organic matter and large woody material in excess of amounts described in detail above need not be retained. 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.

5. To avoid accelerated surface runoff, insure infiltration and permeability are not reduced to ratings of six or eight as defined in Region 5 Erosion Hazard Rating system.

6. 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 mitigation measures to avoid detrimental soil disturbance. Detailed descriptions of all recommended mitigation measures contained in the handbook have been incorporated into project design features and mitigation measures for all action alternatives and are included in appendix B of this FSEIS and the Watdog “Soils Report” on file in the project record.

3.10.4.3 Management Indicators and Measurements

The soil effects analysis is based on the soil quality analysis guidelines as described in the R5 Soils Management Handbook (refer to the "Management Guidance" Section). Indicators analyzed include soil productivity, soil hydrologic function, and soil buffering capacity. The following describes a summary of the indicators and measurements. For more detailed descriptions refer to the Watdog "Soils Report" on file in the project record.

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). The important measures of soil productivity include soil cover, soil porosity, and organic matter.

Measure 1: Soil Cover – An effective soil cover consists of low-growing vegetation (grasses, forbs, and prostrate shrubs), plant and tree litter (fine organic matter), and surface rock fragments (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 Erosion Hazard Rating (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 "Regulatory Framework" Section). 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 (CSSC) Erosion Hazard Rating Computation Form (CSSC 1989). The form is based on four components: soil erodibility, runoff production, runoff energy, and soil cover.

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 ten 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 or inaccessible.

Measure 3: 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 R5 Soil Management Handbook provides recommend measures and thresholds for maintaining 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 "Management Guidance" Section above). 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 Watdog Forest Inventory and Analysis (FIA) and soil field surveys.

Indicator 2: Soil Hydrologic Function. Soil hydrologic function is the inherent capacity of a soil 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. 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 Erosion Hazard Rating (EHR) system was used to estimate soil hydrologic function.

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). The soil buffering capacity of soils within the project area is not known. Direct, indirect, and cumulative effect were not assessed, because no materials would be added to soil that would alter reaction classes, buffering or exchange capacity. It is not expected that soil buffering capacity would be changed by management activities within the Watdog Project area.

3.10.5 Existing Condition and Environmental Effects

3.10.5.1 Physical Framework

Physiography. The Watdog Project area lies within the Sierra Nevada geologic and geomorphic province. The Feather River watershed, which comprises the majority of the Plumas National Forest and wholly contains the project area, is the northernmost major river drainage of the west slope of the Sierra Nevada. The topography of the Plumas-Feather River region is relatively subdued in comparison to the higher, more rugged relief of the range further south. Peaks in the area do not exceed maximum elevations of 7,000 to 8,000 feet. The western slope of the Sierra Nevada in this region is characterized by broad, rolling highlands incised by the steep canyons of the North, Middle and South Forks of the Feather River. Steep, inner gorge type topography characterizes the major river canyons, with slopes that frequently range from 60 percent to 100 percent or steeper gradients. The treatment units of the

proposed project lie within elevations ranging from about 3,000 feet to over 6,000 feet. The units are generally situated in ridgetop or upland positions with gently to moderately sloping topography.

Soil Types and Map Units. The Plumas National Forest Soil Survey was utilized to determine which soil map units occur in the soil effects analysis as a starting point for locating areas need for soil transect surveys. A Geographic Information System (GIS) analysis was performed to determine which soil map units occurred in the Watdog Project area. The majority of the Watdog Project is composed of the Gibsonville-Waca family complex (24 percent). The typical soil types in this map unit are loam and sandy loam and are highly erosive and prone to mass wasting. Eighteen percent of the Watdog Project area is located within the Waca-Woodseye families complex. The soils in this map unit are typically sandy loam and gravelly loam and are prone to surface erosion. Ten percent of the Watdog Project area lies within the Hurlbut-Chaix families complex. Typical soil types in this map unit are gravelly loam and sandy loam and are prone to surface erosion. Seven percent of the Watdog Project area falls within the Aiken family, which typically has a soil type of gravely loam and clay loam. This soil map unit is highly susceptible to detrimental compaction when mechanical ground based operations occur during wet periods. Another 7 percent of the Watdog Project area is composed of the McCarthy-Ledmount families complex. The soils in this map unit are typically composed of gravelly loam and sandy loam. The Uvi-Smokey families complex composes seven percent of the Watdog Project area. The soils in this map unit are typically gravelly loam or sandy loam and a prone to surface erosion. There are several other soil map units that have a small percentage of occurrences within the Watdog Project area. For more information refer to the Watdog “Soils Report” on file in the project record.

3.10.5.2 Existing Condition of Project Area and Need for Proposed Treatments

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. The purpose of the DFPZ treatments is to create fuel breaks by breaking up the fuel strata (the vertical and horizontal continuity of both live and dead vegetation that affects the way fuels burn) primarily along ridge tops. Treatments would reduce the risk of large and intense wildfire and enhance firefighting capabilities by providing improved access for suppression crews and increasing the amount of fireline the crew can establish in a given time period. For more information refer to the Watdog “Vegetation Section” and the “Fire and Fuels Section” in Chapter 3. The purpose of group selection treatments is to regenerate fire-resilient species using an uneven-aged management strategy. These treatments provide seral stage diversity by adding patches of the youngest seral stages to portions of larger CWHR class (stage) 4 and 5 stands. The purpose of individual tree selection treatments is to reduce overstocking and prevent the spread of insect and disease. By removing the diseased and suppressed trees immediately around group selections, the stand would become more vigorous. The desired condition is having 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 a dense stand the opportunity to grow and provide greater floral biodiversity.

The purpose of treatment in black oak stands is to reduce competing vegetation by hand thinning treatments. Due to past management activities, in many parts of the project area, black oak remains only as scattered remnants in mixed conifer forests. Oak seedlings, particularly those stressed by competing

vegetation, grow slowly and many often die before developing characteristics of value to wildlife. Crowding also causes stands to become more flammable. This is a concern because black oaks are vulnerable to crown fires, which kill oaks of all ages. Black oak stands provide food, as well as nest sites for species such as the California spotted owl and its prey, and the northern flying squirrel.

Proposed transportation system improvements provide access for completion of timber harvest and fuel reduction activities and contribute to watershed restoration, meadow enhancement, fish passage improvement, and streambank stabilization. Watershed restoration projects are designed to improve aquatic habitat connectivity, restore stream and meadow hydrologic function, and improve aquatic and riparian habitat quality.

For more detailed information on proposed treatments by alternative refer to the "Vegetation Section" and the "Fire and Fuels Section" located in Chapter 3.

3.10.5.3 Existing Condition and Effects for Indicator 1: Soil Productivity

Table 2 in the Watdog "Soils Report" provides a listing of soil map unit numbers, survey status, similar characteristics between units, and known past management activities for all proposed treatment units proposed under this project.

3.10.5.4 Existing Condition and Environmental Effects for Soil Productivity Measure 1: Soil Cover

Existing Condition. The existing condition of proposed treatment units and calculated EHR ratings are listed in Watdog, Table 3 of the "Soils Report." All of the proposed treatment units have an EHR rating with a numerical value at or below 8, meaning that normal activities can be conducted, according to Forest Plan guidelines.

Under the existing condition all of the proposed treatment units meet or exceed Forest Plan standards and guides for percent effective soil cover (Table 3 of the Watdog "Soils Report"). Proposed treatment unit 44 has an effective soil cover of 43 percent and is near the 40 percent minimum effective soil cover Forest Plan standard and guide. This treatment unit is a younger plantation. A duff and litter layer with a depth of at least a half of an inch has not yet developed. Proposed treatment units 39, 43, and 46 have similar conditions to proposed treatment unit 44. Additional loss of soil cover in these four units is not a concern under the proposed action. Mastication is the proposed treatment, and this type of treatment would increase soil cover by mulching the existing dense vegetation and allow for the accelerated development of larger trees that would produce effective soil cover in the future.

3.10.5.5 Effects of Alternative A on 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 Watdog 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 types in this area would be much 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, affected stands that burned at high severity would likely not meet the Forest Plan standards and guidelines for effective soil cover.

The benefits from proposed fuel reduction, group selection treatments, watershed restoration, 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.

3.10.5.6 Effects of Alternative B on Soil Cover

Direct and Indirect Effects. Direct and indirect effects on this measure include partial removal of an effective soil cover. It is difficult to predict precise treatment effects on forest floor materials; however general trends are well established. Group selection and thinning 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 materials at numerous small, isolated sites that would total a small percentage of stand area. 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.

A reduction in forest floor cover would increase the risk of surface soil erosion temporarily in affected areas. The removal of forest material is most likely to occur in areas where moist soil cover is removed such as locations containing landings, skid roads, temporary roads, and equipment tracks. The amount and type of erosion depends on the character of the area. For example, patches of forest floor material across a large area would be more effective at intercepting surface water than large areas devoid of cover. 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 management mitigation measures 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 purpose and need in chapter 1, 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, the soil cover would be maintained with the use of standards, guidelines, mitigation measures, and BMPs (appendix E). 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) and group selection 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 units surveyed meet or exceed Forest Plan standards and guides for percent effective soil cover. Proposed treatment unit 44 has an effective soil cover of 43 percent and is near the 40 percent minimum effective soil cover Forest Plan standard and guide. This treatment unit is a younger plantation, and a duff and litter layer with a thickness of at least half of an inch has not developed yet. Proposed treatment units 39, 43, and 46 have similar conditions and are also proposed for mastication treatments under the proposed action. There is enough brush cover in these units to meet or exceed standards and guidelines post-treatment. Appendix E 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 and group selection treatments proposed in alternative B are expected to temporarily reduce forest effective soil cover from the existing condition. Under the existing condition all proposed group selection and thinning 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 2005). While no statistical analysis has been performed on this data, general trends and expected ranges of effects are established. Since 2001 pre- and post-treatment soil monitoring has been conducted across the HFQLG Pilot Project in group selection and thinning treatment units. In 2004 data on soil cover was collected for post treatment in nine thinning treatment units. On average soil cover decreased from 90 to 81 percent, a 9 percent total reduction (Westmoreland and McComb 2004). In 2005 data on soil cover was collected for post treatment effects in 11 group selection treatments units and 20 thinning treatment units. On an average soil cover decreased from 91 to 64 percent, a 27 percent total reduction (Westmoreland and McComb 2005). In 2006 data on soil cover was collected for post treatment effects in 11 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 measured during the monitoring study are within Forest Plan standards and guides.

Reductions in soil cover following implementation of group selection and thinning 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 and group selection treatment units (Table 6 of the Watdog 'Soils Report" on file in the project record)

3.10.5.7 Effects of Alternative C on Soil Cover

Direct, Indirect, and Cumulative Effects. Direct, indirect, and cumulative effects of soil cover under Alternative C are expected to be the same or similar compared to Alternative B (see Section "Effects of Alternative B on Soil Cover"). Under Alternative C there are 80 acres less of group selection treatments proposed within the DFPZ (for more detailed information refer to the "Watdog Silviculture Report" on file in the project record). DFPZ treatments (mastication, thinning, and prescribed burning) and group selection treatments outside of the DFPZ network would still occur under this alterative. The benefits of group selection treatments would not occur in the DFPZ in this alternative.

3.10.5.8 Effects of Alternative D on Soil Cover

Direct, Indirect, and Cumulative Effects. There is a reduction of proposed thinning treatment unit acres within the DFPZ. The following thinning treatment units from alternative B are now mastication treatment units under alternative D: 45, 56, 51, 65, 73, 76, 78, 83, 85, 88, 90, 98, 101, 105, 107, and 109 (for more detailed information refer to "Section 3.12: Vegetation"). The DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (for more information refer to "Section 3.5: Fire and Fuels"). The effects to Soil Productivity of a severe wildfire on soil resources are discussed under alternative A (section 3.10.4.4). Also there is a reduction in proposed group selection treatment acres for a total of 105 acres (for more detailed information refer to "Section 3.12: Vegetation"). The benefits of group selection treatments would not occur in the DFPZ in this alternative. Proposed group selection treatment areas are designed to promote the HFQLG Act desired condition of all-age fire-resilient stands, while maintaining a healthy forest.

A reduction in soil cover is expected in proposed thinning and prescribed burning treatments units, and an increase in soil cover is expected in mastication treatment units. Decreases or increases of soil cover in proposed DFPZ treatments under alternative D are expected to be similar to decreases or increases of soil cover from proposed DFPZ activities under alternative B (section 3.10.4.5). However, a greater increase in soil cover is expected in more treatments due to the change of treatment prescriptions from thinning to mastication. Increase in soil cover would cause additional fuel loading to the already high fuel loading conditions present in these changed prescription treatment units. All proposed treatment units are expected to exceed Forest Plan standards and guides for effective soil cover.

3.10.5.9 Existing Condition and Effects for Soil Productivity Measure 2: Soil Porosity

Existing Condition. Detrimental soil compaction was determined at each sample point along transects. Table 4 of the Watdog "Soils Report" displays the existing condition of detrimental soil compaction determined in proposed treatment. No detrimental compaction was indicated in 38 percent (17 out of 45) of the proposed treatments surveyed. The majority of the Watdog Project Area has had past land management activities, and locations of landings, skid trails, and temporary roads are still visible on the landscape. 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 occur throughout the majority of the Watdog 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 are detrimentally compacted and have not fully recovered since the stand was last entered. In some cases recovery has not occurred because recreational uses such as camping on landings or off-highway vehicle traffic (ATV's, four wheeled drive vehicles, etc.) on the 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% 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 R5 Soil Management Handbook defines a ten 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 an areal extent threshold for detrimental compaction of activity areas.

3.10.5.10 Effects of Alternative A on Soil Porosity

Direct, Indirect, and Cumulative Effects. Under the no-action alterative, no new soil compaction or displacement would occur as a consequence of activities proposed in the Watdog Project. 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 treatments, 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 (Clark 1994).

3.10.5.11 Effects of Alternative B on Soil Porosity

Direct and Indirect Effects. Direct and indirect effects on this measure occur 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 treatments units since landings and skid trail are not re-used or created. Appendix E lists equipment specifications and soil wetness conditions, 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 Operation Period (LOP) would be applied to the entire Watdog 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 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 the Regulatory Framework section and Appendix A. 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 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 compaction that adversely affects long term soil productivity.

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 Watdog Project). The monitoring method calls for the observer to determine whether or not (yes or no) the sample point meets or exceeds the recommend threshold stated in the R5 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 pre-project data indicate that legacy detrimental compaction exists 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 compaction (Westmoreland and McComb 2006). Within these 25 treatment units, the areal extent of detrimental compaction increased between 2 and 40 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 areas (1 to 2 acre treatment area) and seven thinning treatment units that had subsoiling after project completion. Of the group treatment units, one treatment unit had the landing subsoiled, six treatment units were completely subsoiled and replanted, and 2 treatment units the skid trail system was subsoiled. In the units completely subsoiled, compaction only increased an average of five percent. In the two treatment units with the skid trail system subsoiled, overall the detrimental compaction level increased from 14 to 19 percent. In the thinning treatment units

the skid trails were subsoiled and detrimental compaction had an average decrease of seven percent. 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 actually had greater biomass productivity than uncompacted plots; on soils characterized as Loamy, severe 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, when productivity is measured 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 (a steel drum roller, typically used for construction of high standard roads and highways was used), 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 Watdog soil analysis area legacy detrimental compaction was observed in the majority of the proposed treatment units surveyed. It is expected that the Watdog 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). Project design mitigations have been included to decrease the level of detrimental soil compaction that would occur as a result of proposed treatments, including the LOP for soil moisture.

Mitigations: To reduce the increase of detrimental compaction, a Limited Operation Period (LOP) would be applied to the entire Watdog 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 E). 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 damage. 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. In addition Brent Roath (Region 5 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, for these soils. 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 these soils, 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 watershed specialist are available for consultation.

3.10.5.12 Effects of Alternative C on Soil Porosity

Direct, Indirect, and Cumulative Effects. Direct, indirect, and cumulative effects of soil porosity under Alternative C are expected to be the same or similar compared to Alternative B (see Section 7.2.1). Under Alternative C there are 80 acres less of group selection treatments proposed within the DFPZ (for more detailed information refer to the "Vegetation" Section of Chapter 3. DFPZ treatments (mastication, thinning, and prescribed burning) and group selection treatments outside of the DFPZ network would still occur under this alterative. The benefits of group selection treatments would not occur in the DFPZ in this alternative.

3.10.5.13 Effects of Alternative D on Soil Porosity

Direct, Indirect, and Cumulative Effects. There is a reduction of proposed thinning treatment unit acres within the DFPZ. The following thinning treatment units from alternative B would be mastication treatment units under alternative D: 45, 56, 51, 65, 73, 76, 78, 83, 85, 88, 90, 98, 101, 105, 107, and 109 (for more detailed information refer to "Section 3.12: Vegetation"). The DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (for more information refer to "Section 3.5: Fire and Fuels"). The effects to Soil Productivity of a severe wildfire on soil resources are discussed under alternative A (section 3.10.4.4). Also there is a reduction in proposed group selection treatment acres to a total of 105 acres (for more detailed information refer to "Section 3.12: Vegetation"). The benefits of group selection treatments would not occur in the DFPZ in this alternative. Proposed group selection treatment areas are designed to promote the HFQLG *Forest Recovery Act* desired condition of all-age fire-resilient stands, while maintaining a healthy forest.

Effects of this alternative are expected to be similar to alternative B (see Section "Effects of Alternative B on Soil Porosity"). A decrease in soil porosity is expected in thinning and group selection treatments units. Since there is a reduction of total thinning and group selection treatment acres, a reduction in soil porosity is expected to be less under alterative D compared to alternative B. Changes in soil porosity are unlikely to occur in proposed mastication and prescribed burning treatment units.

3.10.5.14 Existing Conditions and Effects for Soil Productivity Measure 3: Organic Matter

Existing Condition. Percent of fine organic matter and the amount of large woody debris per acre was calculated based on measurements from field surveys. Down wood standards and guides for 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…Consider the effects of follow-up prescribed fire in achieving desired retention levels of down wood." The R5 Soil Management Handbook recommends large woody material is present at a rate of at least 5 well distributed logs per acre. It further recommends that large woody material presence may be reduced to meet fuel management objectives in strategic fuel treatment areas, such as fuel breaks. Table 5 of the Watdog "Soils Report" (on file in the project record) displays the existing condition of fine organic matter and large woody debris.

Under the existing condition fine organic matter meets or exceeds the recommend threshold in the majority of the proposed treatment units surveyed. However, proposed treatments units 18, 30, 50, 61, and 84 are below threshold under the existing condition. The reason for this is these proposed treatment units are plantations that have a high brush cover component, but underneath the brush the ground is bare.

Large woody debris material meets or exceeds the recommend threshold in the majority of the proposed treatment units surveyed under the existing condition. However, proposed treatment units 9, 24, 44, 51, 57, 58, 61, 67, and 74 are below the recommend threshold under the existing condition. Table 3-29 explains why these proposed treatment units are below threshold.

Table 3-29. Treatment units with low amounts of large woody debris per acre.

Proposed Treatment Unit Number	Proposed Treatment Units Not Surveyed with Similar Conditions	Total Large Woody Debris per Acre (number of individuals)	Reason for Treatment Unit Below Standards
9	—	1	Plantation (see paragraph below)
24	—	2	Plantation (see paragraph below)
44	43	0	Plantation (see paragraph below)
51	—	2	Average tree size greater than 24 inches dbh
57	216	0	Average tree size 12–24 inches dbh
58	—	2	Average tree size 12–24 inches dbh
61	—	4	Plantation (see paragraph below)
67	—	3	Plantation (see paragraph below)
74	75	4	Plantation (see paragraph below)

Plantations in the Watdog Project area range in age from approximately 15 to 30 years old. Most of the plantations were established from previous clearcuts or wildfires. Previous management activities were performed under different snag and down log requirements than the Region 5 Soil Management Handbook recommend threshold values. Trees in the plantations have not yet reached suitable diameters or heights for the development of large woody material (desired logs are at least 20 inches in diameter (minimum of 12 inches in diameter) and 10 feet long).

Continued management of plantations as part of the Watdog 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, 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.

3.10.5.15 Effects of Alternative A on Organic Matter

Direct, Indirect, and Cumulative Effects. Accumulation of organic matter would continue at current rates, and not be affected by harvest or prescribed fire. 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 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. The effects of fire have 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 be detrimental effects to soil condition.

The benefits from proposed fuel reduction, group selection treatments, watershed restoration, and black-oak stand enhancement would not occur. In the event of a future wildfire effective soil organic matter would be reduced in larger quantities than expected with the proposed project.

3.10.5.16 Effects of Alternative B on 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 organic matter. The R5 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 R5 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 in diameter. 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.

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 the report determined 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 received post monitoring. The 2005 monitoring data suggests large woody material decreases from an average of 10 logs per acre to 2 logs per acre. (Westmoreland and McComb 2005), usually due to follow-up fuels treatments. 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 the proposed treatment units are 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 treatments units under the existing condition that are below the R5 recommended threshold for large woody material, and several proposed treatment units could be below the recommended threshold post treatment. The R5 guidelines allow for the adjustment of this threshold when fuel management treatments are needed. It has been determined that the Watdog Project is needed for fuel managements and the utilization of both mechanical and fire treatment methods is documented as the most effective treatment to modify potential fire behavior and severity (see Section 3.5.6.2 of DEIS).

Recently there have been new research presentations by PSW on the importance of large woody material to soil nutrients (personnel 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. Contract Provision CT6.7, presented as a mitigation for wildlife concerns in Appendix E of the DEIS, requires that “logs not meeting utilization standards shall be used to meet the LRMP as amended requirements. Logs should be evenly distributed within the units (stands) to the extent possible (refer to Watdog “Wildlife Biological Evaluation/Biological Assessment for more information). The cumulative quantity of fine organic matter was estimated in total removal of soil cover, see Section 7.1.1.1. Soil cover is expected to meet Forest Plan standards and guides 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.

3.10.5.17 Effects of Alternative C on Organic Matter

Direct, Indirect, Cumulative Effects. Direct, indirect, and cumulative effects of organic matter under Alternative C are expected to be the same or similar compared to Alternative B (see Section “Effects of Alternative B on Organic Matter”). Under Alternative C there are 80 acres less of group selection treatments proposed within the DFPZ (for more detailed information refer to the “Vegetation” Section Chapter 3). DFPZ treatments (mastication, thinning, and prescribed burning) and group selection treatments outside of the DFPZ network would still occur under this alterative. The benefits of group selection treatments would not occur in the DFPZ in this alternative..

3.10.5.18 Effects of Alternative D on Organic Matter

Direct, Indirect, and Cumulative Effects. There is a reduction of proposed thinning treatment unit acres within the DFPZ. Several treatment units from alternative B would be mastication treatment units under alternative D (for more detailed information refer to "Section 3.12: Vegetation"). The DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (for more information refer to "Section 3.5: Fire and Fuels"). The effects to Soil Productivity of a severe wildfire on soil resources are discussed under alternative A (section 3.10.4.4). Also there is a reduction in proposed group selection treatments treatment acres to a total of 105 acres (for more detailed information refer to "Section 3.12: Vegetation"). The benefits of group selection treatments as pertain to creating an uneven-age class distribution of fire resilient tree species would not occur in the DFPZ in this alternative.

Effects of this alternative are expected to be the similar to alternative B. A reduction in organic matter is expected in proposed thinning and prescribed burning treatments units, and an increase in organic matter is expected in mastication treatment units. A reduction in the number of group selection treatment acres correspondingly leads to less organic matter loss from mechanical thinning than would occur in alternative B.

3.10.5.19 Existing Condition and Environmental Effects for Indicator 2: Soil Hydrologic Function

Existing Condition. The majority of soil map units in the project area have water movement in soil ratings (infiltration and permeability) less than six. However there are several soil map units that have a slow infiltration rate under natural conditions. These soil map units are: 101, 102, 128, 136, 137, 139, 144, 177, 179, 180, 200, 213, 214, 215, 225, 226, and 245. These soil conditions indicate a higher level of risk of accelerated runoff if sufficient level of effective soil cover are not present.

Under the existing condition all proposed treatment units meet or exceed Forest Plan standards and guides for effective soil cover. In the majority of the proposed treatment units 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 location, 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.

3.10.5.20 Effects of Alternative A on Soil Hydrologic Function

Direct, Indirect, and Cumulative Effects. Under the no-action alternative, 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, group selection treatments, watershed restoration, and black-oak stand enhancement would not occur.

3.10.5.21 Effects of Alternatives B, C, and D on 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 Erosion Hazard Rating (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 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.

3.10.5.22 Existing Condition and Environmental Effects for Indicator 3: Soil Buffering Capacity

Existing Condition. 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 known additions to the soil of chemicals or materials that could significantly alter soil buffering capacity have occurred within the project area. No large wildfires have occurred within most of the Watdog project area; fire can produce pulse nitrogen inputs into the soil, which are short-lived and generally considered beneficial to nutrient supply for vegetation.

3.10.5.23 Effects of Alternatives B, C, and D on Soil Buffering Capacity

It is not expected that soil buffering capacity within the Watdog 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.

3.10.6 Irreversible, Irretrievable Effects

There are no irreversible or irretrievable effects associated with alternatives A, B, C, D. Disturbances to soil productivity would recover through natural process. To minimize impacts from alternatives B, C, and D, standards, guides, mitigation measures, and BMPs listed in the Watdog “Soils Report” (on file in the project record) would be used.

3.10.7 Summary of Cumulative Effects

3.10.7.1 Cumulative Effects of Alternative A

- In all proposed treatment units effective soil cover exceeds Forest Plan standards and guides (See Section 6.2.1 "Existing Condition – Measure 1: Soil Cover"). Under Alterative 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 detriment that fuel loading conditions are high within the Watdog 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 (see Section 6.2.2 "Existing Condition – Measure 2: Soil Porosity"). Under Alternative A, no new detrimental compaction would occur to further effect soil productivity and soil hydrologic function.

- 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 (see Section 6.2.3 "Existing Condition – Measure 3 Organic Matter"). Under Alternative A fine organic matter would not be removed and 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 Watdog 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 detriment that fuel loading conditions are high within the Watdog 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-term and long-term adverse effects (Neary et al. 2005). If a high intensity fire were to ignite in the untreated DFPZ, then it could result in 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, 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.

3.10.7.2 Cumulative Effects of Alternative B

Under the proposed action:

- • Short term reductions in soil cover are expected within proposed thinning and 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. Under the existing condition proposed treatment unit 44 has a low effective soil cover at 43 percent. This treatment unit is a younger plantation, and duff and litter layer with a thickness of at least half of an inch has not developed yet. Proposed treatment 39, 43, and 46 have similar conditions to proposed treatment unit 44. Mastication is the proposed treatment, and this type of treatment would increase soil cover by mulching the existing dense vegetation and allow for the accelerated development of larger trees that would produce soil cover in the future.

- • Legacy detrimental compaction (decrease in soil porosity) was observed in the majority of the proposed treatment units surveyed. Changes in soil porosity are not expected to occur in proposed prescribed burning treatment units. Within the Watdog soil analysis area legacy detrimental compaction was observed in the majority of the proposed treatment units surveyed. It is expected that proposed thinning and group selection treatments in the Watdog 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 (see Section 6.2.1.2). To reduce the risk of detrimental compaction affecting long-term soil productivity, a Limited Operation Period (LOP) would be applied to the entire Watdog 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 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. 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, see Section 7.1.1.1. Soil cover is expected to meet Forest Plan standards and guides 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 (see Section

6.2.3 "Existing Condition – Measure 3: Soil Organic Matter"). A reduction of large woody material is expected in treatments units with a follow up prescribed burning. The Region 5 guidelines allow for the adjustment of this threshold when fuel management treatments are needed. It has been determined that the Watdog Project is needed for fuel management (see the Watdog "Fire and Fuels Report" for further information). 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 guides (refer to Watdog "Wildlife Biological Evaluation/Biological Assessment" for more information). The cumulative quantity of fine organic matter was estimated in total removal of soil cover, see Section 7.1.1.1. Soil cover is expected to meet Forest Plan standards and guides 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 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 Watdog 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 increase soil cover and organic matter. Through time these changes would reduce surface erosion and greatly benefit long term soil productivity.

- • Black oak enhancement would remove competing vegetation to allow for the recruitment of black oak, and reduce the high fuel loading conditions. Meadow habitat improvement projects remove conifer encroachment and improve hydrologic function. Treatments in these areas are hand thinning, which do not cause decreases in soil cover, soil organic matter, or soil porosity. These treatments would not adversely affect the soil resource.

3.10.7.3 Cumulative Effects of Alternative C

Effects of proposed treatments under Alternative C are expected to be the same or similar (to a lesser extent) compared to alternative B. There is a reduction in group selection treatments proposed within the DFPZ for this alternative. Proposed group selection acres are reduced from 231 to 151 acres (for more detailed information refer to the "Vegetation" Section in Chapter 3). DFPZ treatments (mastication, thinning, and prescribed burning) and group selection treatments outside of the DFPZ network would still occur under this alterative. The benefits of group selection treatments would not occur in the DFPZ in this alternative. Proposed group selection treatment areas are designed to promote the HFQLG Act desired condition of all-aged fire-resilient stands, while maintaining a healthy forest.

3.10.7.4 Cumulative Effects of Alternative D

Effects of this alternative are expected to be the same or similar (to a lesser extent) compared to alternative B. Several proposed treatment units change in prescription from thinning under alternative B to mastication under Alternative D. The following thinning treatment units are now mastication treatment units: 45, 56, 51, 65, 73, 76, 78, 83, 85, 88, 90, 98, 101, 105, 107, and 109 (for more detailed information refer to "Section 3.12: Vegetation"). The DFPZ constructed under this alternative is not expected to be as effective as that constructed under alternatives B or C (for more information refer to the "Section 3.5: Fire and Fuels"). The effects to Soil Productivity of a severe wildfire on soil resources are discussed under alternative A. Also there is a reduction in proposed group selection treatments treatment acres to a total of 105 acres (for more detailed information refer to "Section 3.12: Vegetation." The benefits of group selection treatments would not occur in the DFPZ in this alternative. Proposed group selection treatment areas are designed to promote the HFQLG Act desired condition of all-age fire-resilient stands, while maintaining a healthy forest.

3.11 Transportation System

3.11.1 Introduction

3.11.1.1 Scope of the Analysis

The analysis area for the transportation system is the Watdog Project area. Road system improvement work associated with proposed vegetation management activities would have little effect on the existing transportation system outside the project area.

3.11.1.2 Regulatory Framework

The purpose of the Forest Service road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and meet resource management and public access needs. Under the current regulatory framework, the desired conditions for roads to be retained and improved (for example, for road construction, reconstruction, or relocation) include:

- accommodation of the 100-year flood at stream crossings, including stream flow, 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.

Roads in RHCAs 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 reduce and fragment wildlife habitat, but roads can 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.

3.11.1.3 Analysis Methods

The transportation system for the Watdog Project area was evaluated through an interdisciplinary 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 is needed to bring existing system roads into compliance with current maintenance standards and to provide access to the DFPZ and group selection treatment areas. Reconstruction and road maintenance is also necessary to reduce erosion and sedimentation, and to provide for public safety.
- Decommissioning of roads 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 on wildlife.
- Culvert replacement, removal, or upgrade is needed to improve stream connectivity.
- Temporary road construction is needed to access group selection and DFPZ units where existing road access is absent.
- New system road construction is needed to provide access to one treatment area where existing road access is poor.
- Harvest landing construction and reconstruction is needed to facilitate removal of wood products.

The Plumas National Forest is currently undergoing an OHV RI&D analysis. Roads proposed for decommissioning or closure in this project will not be closed until this 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.
3. Routes that are creating unacceptable resource damage, to the extent that a delay in their closure would result in egregious and irretrievable impacts to the resource.

3.11.2 Existing Condition and Environmental Effects

3.11.2.1 Introduction

This section begins with a description of the existing condition of the transportation system in the Watdog Project area, followed by a discussion of the effects of alternatives A, B, and C on that system.

3.11.2.2 Transportation System

Existing Condition. There are approximately 243 miles of existing system roads within the roads assessment analysis area (the Fall River and South Branch Middle Fork Feather River watersheds). Of those, there are 2.4 miles of Level 1 roads, 102.4 miles of Level 2 roads, 92.9 miles of Level 3 roads, and 45.4 miles of Level 4 and 5 roads (table 3-30). In addition to the existing system roads, there are numerous non-system roads, abandoned roads, and skid trails.

Table 3-30. Miles of road by maintenance level, Watdog Roads Analysis area.

Maintenance Level	Description of Maintenance Level	Miles within Project Area
1	Intermittent service	2.4
2	Open for limited traffic passage	102.4
3	Open and maintained for safe travel by prudent driver in passenger car	92.9
4 and 5	Moderate to high degree of user comfort and convenience at moderate travel speeds	45.4

The project area has a fully developed arterial and collector road system. There are approximately 65 miles of road in the Watdog Project area. Average road density in the project area is 6.6 miles per square mile. Two major arterial routes access the project area: Lumpkin Ridge Road (FS 22N27) on the east, and Hartman Bar Road (FS 22N94) on the west. The Plumas National Forest has entered into cooperative road cost share agreements with Sierra Pacific Industries, a major private landholder in the area. These agreements are made in an effort to share the cost of Forest road construction, reconstruction, and maintenance.

Effects of Alternative A. There would be no new construction or reconstruction of roads. Normal routine maintenance would occur based on current maintenance levels. Actions proposed to bring existing Forest Service roads, currently out of compliance, into compliance with current maintenance standards would not occur. No non-system roads or abandoned skid trails would be obliterated. There would be no new direct impact to road surfaces due to log haul activity. There would be no increase in hazards to driver safety due to logging traffic.

Effects of Alternatives B and C. In most cases, the existing system of roads and skid trails would be used for access to treatment units and for product removal. Transportation system improvement work is proposed as follows and is identified in this FSEIS on maps 5 and 6 in appendix C and listed in appendix D.

- Approximately 4.5 miles of existing system road and 0.1 mile of non-system road would be closed with barriers upon project completion.
- Approximately 9 miles of existing system road and 3.9 miles of non-system road would be decommissioned during project implementation.
- Approximately 1.2 miles of new system road would be constructed and closed upon project completion.
- Approximately 1.8 miles of existing road would be removed from the system.
- Approximately 0.5 mile of temporary roads would be constructed. Temporary roads would be decommissioned after use.
- Existing harvest landings within group selection units and DFPZs would be reconstructed, and new ones would be constructed.

Reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed. Roads would be reconstructed as follows.

- Approximately 17.1 miles of road would be reconstructed and left open upon project completion. This includes 11.8 miles of existing system roads and 5.3 miles of existing non-system road. The 5.3 miles of non-system road would be reconstructed and added to the Forest Service road system prior to project use.

- Approximately 0.7 mile of system road would be reconstructed prior to project use and closed upon project completion.

Road work proposed as part of these alternatives would provide needed access to both DFPZ and group selection units. After completion of the Watdog Project, improved roads would continue to provide access for fire suppression and fuels management activities. 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.

The Plumas National Forest is currently undergoing an OHV RI&D analysis. Roads proposed for decommissioning or closure in this project will not be closed until this 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.

3. Routes that are creating unacceptable resource damage, to the extent that a delay in their closure would result in egregious and irretrievable impacts to the resource.

Effects of Alternative D. Road work proposed under alternative D would be the same as described above except:

- Road 22N44Y (0.4 mile) would not be proposed for reconstruction because it is not needed to access any DFPZ or group selection treatment units. This road would, however, be closed upon project completion.

- No new system road construction would be needed to access proposed treatment units.

3.11.3 Irreversible, Irretrievable Effects

No irreversible commitments of resources will occur for any alternative. However, under alternatives B and C, construction of 1.2 miles of new road on approximately 3.2 acres is considered an irretrievable effect because of the loss of timber production in the road corridor.

3.11.4 Summary of Cumulative Effects

The Plumas National Forest is currently undergoing an OHV RI&D analysis that will eventually restrict OHV use to specific routes and areas. No roads proposed for decommissioning in this project are part of the route inventory process.

A net reduction of approximately 4.7 miles of system roads and 3.7 miles of non-system roads would occur after the transportation work is completed. For all alternatives, proposed road decommissioning is expected to reduce road density in the project area from 6.6 miles per square mile to 5.3 miles per square mile.

3.12 Vegetation

3.12.1 Introduction

The Forest Service proposes to construct DFPZs to reduce fuel hazards, regenerate fire-resilient tree species using an uneven-aged management strategy (group selection treatments), and perform associated road system improvement work on approximately 4,000 acres of forested federal land northeast of Lake Oroville and Feather Falls, California. The project would be part of the HFQLG Pilot Project authorized in federal law.

3.12.2 Scope of the Analysis

3.12.2.1 Geographic Boundary for the Analysis

Vegetation management activities have localized effects on vegetation attributes such as canopy cover, tree density, and tree size that are generally confined to the treated area. Therefore, the direct, indirect, and cumulative effects analyses of vegetation resources are geographically bounded to the Watdog Project area (map 9 in appendix C).

However, the Plumas National Forest LRMP, appendix E requires that seral stages by habitat types (i.e., grass, brush, hardwoods, and conifers) be tracked and monitored by management areas. Seral stage diversity can be described as the horizontal arrangement of different age groups of vegetation across the landscape. A management area is a contiguous unit of land with varying physical and biological character and management needs established by the 1988 LRMP. The desired conditions for maintaining various seral stages by vegetation type, size class, and canopy cover (i.e., CWHR) does not include lands from private property. Therefore, harvest or thinning projects on private property were not considered for seral stage diversity analysis. Since the Watdog Project occurs within the Feather Falls (#10), Pinchard (#12), and Lost Creek (#13) Management Areas, seral stage diversity analysis is geographically bounded to these three management areas (map 12 in appendix C).

3.12.2.2 Time Frame Boundary

The time frame for vegetation cumulative effects is approximately 20 to 25 years. The western slope of the Sierra Nevada in the Plumas National Forest has a high rate of vegetation establishment and growth due to high annual precipitation and highly productive forest soils. Within this time frame, 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 time frame 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).

3.12.2.3 Regulatory Framework

The *National Forest Management Act* of 1976 provides specific management requirements that need to be addressed when implementing timber harvest activities on National Forest System lands. The regulations include specific guidelines designed to insure that timber will be harvested from National Forest System lands only where:

- There is assurance that such lands can be adequately restocked within five years after harvest;
- Soil, slope, or other watershed conditions will not be irreversibly damaged;
- 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; and
- 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 (16 U.S.C. 1604 (g)(3)(E)).

National Forest Management Act findings for the Watdog Project are discussed in appendix G of this FSEIS and in section 5 of the Watdog Project "Silviculture Report" (on file at the Feather River Ranger District).

The Watdog Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest LRMP, as amended by the HFQLG FEIS ROD of 1999 and the SNFPA ROD of 2004. Standards and guidelines for fuels and vegetation management activities for the Watdog Project area are shown in table 2 of the 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.

3.12.2.4 Analysis Methods

DFPZ Areas. In order to ensure that silvicultural prescriptions are consistent with the amended LRMP, field inventories were conducted to measure attributes of existing vegetation. Data were used to determine site quality, timber volume, basal area, number of trees per acre, tree growth, species present and tree condition. The extent of each inventory was based on the degree to which proposed activities would reduce canopy closure or basal area. Extensive inventories were conducted only in units proposed for thinning, where proposed activities would be designed to bring canopy cover and basal area closer to LRMP standards and guidelines. Detailed vegetation inventories were not conducted within units proposed for underburn, mastication, or other non-harvest treatments.

Thinning units were inventoried using the current Forest Inventory and Analysis User's Guide for the Pacific Southwest Region. The Forest Inventory and Analysis system is used to collect data from a series of random points located within a number of stands with a possible need for treatment. Each sample point consists of five nested plots: (1) A variable radius prism plot to gather data on large (greater than 4.9 inches dbh) live trees, (2) a 1/100 acre fixed radius plot for live saplings and seedlings, (3) a 1/2-acre fixed radius plot for understory vegetation (brush species), (4) a 1/4-acre rectangular plot for large (greater than 19.9 inches dbh) snags, and (5) a 1/8-acre plot for small snags and large down logs. The following data is recorded for each live tree sampled in variable radius prism plots: species, diameter, crown position, live crown ratio, mistletoe infestation, and defect. In each stand, height and age measurements are recorded.

In the four other plots, information was collected regarding the number of seedlings present, the amount and height of understory brush, and the size and condition of standing snags and large down

logs. The field data is loaded into the Forest Inventory and Analysis program and is used as a database to generate various reports. Reports generated for each Watdog treatment unit included numbers of trees per acre, volume per acre, basal area per acre, and so forth.

The Forest Inventory and Analysis data was also loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development. This model was used to predict stand development after alternative treatments.

Additional analyses included aerial photo interpretation and VESTRA timber type coverages in geographic information system. VESTRA is vegetation type mapping based on year 2000 aerial photographs and is conducted by VESTRA Resources Incorporated. These were used to determine timber strata, size class and densities. The geographic information system coverages were also used to determine land classification and allocation.

The topography, slope, and access of a unit were used to determine the most appropriate harvest system. For all treatment units in the Watdog Project, only ground-based harvest systems would be used. Silvicultural prescriptions were based on a desired future stand condition and utilized 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 3-31 displays acres available for group selection harvest within the Watdog Project area and watersheds on an annual 10-year and 20-year re-entry interval. Another environmental analysis would be completed before re-entry in ten or twenty years.

As shown in table 3-31, there are approximately 2,380 acres available for group selection in the Watdog 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 2,380 acres. Group selection harvest would not be located in:

- HFQLG offbase and deferred areas;
- Spotted owl and northern goshawk PACs;
- Spotted owl habitat areas;
- RHCAs;
- LSOG size ranks 4 and 5;
- Rocky outcrops;
- Shrub fields;
- Recreation sites; and
- Historic properties.

Table 3-31. Determination of group selection acres within Watdog Project area and watersheds based on HFQLG Act annual expectations (0.57 percent of pilot project acreage).

Watersheds – Watdog Project		Total Acres	Annual Treatment[a] (acres)	10-Year Re-entry[b] (acres)	20-Year Re-entry[c] (acres)
Acres of National Forest lands in Watersheds	Fall River	9,657			
	South Branch MFFR	16,929			
Total acres in project watersheds		26,586	152	1,515	3,031
Possible Acres Available for Group Selection	CWHR Size Class 5 stand acres in DFPZ	678	4	39	77
	CWHR Size Class 4 stand acres in DFPZ	1,342	8	77	153
	Stand acres outside DFPZ	360	2	21	41
Total possible available acres		2,380	14	136	271
Acres Unavailable for Group Selection	Forested, steep slopes	593	NA	NA	NA
	Plantations	872	NA	NA	NA
	Brushy, sparse timber	19	NA	NA	NA
	Rocky, poor access, steep	94	NA	NA	NA
	Feather Falls Scenic area	423	NA	NA	NA
Total unavailable acres		2,001	NA	NA	NA

Notes:

a. Calculated by multiplying 26,586 (total watershed acres) × 0.0057 (accomplishment yearly expectation rate).

b. Calculated by multiplying 2,380 (total possible available acres) × 0.0057 × 10 (years of the treatment cycle).

c. Same as for the 10-year cycle except using 20 years.

The SNFPA ROD (2004) includes additional requirements that may affect the number of groups implemented as a part of this project. Standards and guidelines in table 2 that specify maintaining a minimum 40 percent canopy cover for CWHR Size Class 5M, 5D, and 6 stands within DFPZs would have the greatest effect on group layout.

Supplemental criteria that may be considered during the layout of group selection units include:

- 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 concentrations where possible; and
- Avoid placing groups in areas that contain more than 20 trees per acre of 30-inch dbh trees.

3.12.3 Existing Condition and Environmental Effects

3.12.3.1 Introduction

Eight environmental measures or indicators were analyzed in this section: species composition, forest health, canopy cover, stand structure and tree size, basal area and tree density, hardwoods, competing vegetation, and harvest volume. There is a description of the existing condition for each indicator, followed by a summary of the direct, indirect, and cumulative effects of the alternatives.

For alternatives B, C, and D (also called the action alternatives) effects are discussed in terms of the prescriptions proposed for each treatment type. Prescriptions with similar effects are grouped together for the purposes of this analysis. Group selection treatment units would be treated by harvest, site preparation, reforestation, and release. All four prescriptions are grouped together for this effects analysis due to the similarity of effects.

Prescriptions for DFPZ treatments are broken down into three groups for this effects analysis:

- Mechanical thinning and biomass removal
- Mastication and grapple pulling and piling
- Underburning and pile burning

Detailed descriptions of the prescriptions for the various treatment types are found in chapter 2 of this document.

3.12.3.2 Species Composition

Existing Condition. Elevation in the project area ranges from 3,200 feet near Jackson Ranch to 6,000 feet near Table Mountain and Dogwood Peak. Table 3-32 displays the elevation ranges for each geographic area in the Watdog Project area. Elevations for each unit are displayed in appendix A (table A-5) of the Watdog Project "Silviculture Report" (available upon request).

Elevation affects the forest types that are present. Forest types in the westside of the analysis area range from montane hardwood and Sierran mixed conifers-ponderosa pine at lower elevations, to Sierran mixed conifer-white fir at mid-elevations, and true firs at higher elevations (table 3-33). Forest types in the eastside of the analysis area include Sierran mixed conifer-white fir at mid-elevations to true firs types at higher elevations.

Table 3-32. Elevation ranges for westside and eastside geographic areas within the Watdog Project area.

Westside Geographic Area	Elevation Range (feet)	Eastside Geographic Area	Elevation Range (feet)
Jackson Ranch	3,200–3,800	Camel Peak –Tamarack Flat	5,200–5,600
Watson Ridge	3,000–4,100	Lumpkin Ridge	5,300–5,900
Mountain Spring House Ridge	4,100–4,600	Table Mountain – Dogwood Peak	5,600–6,100
Hartman Bar Ridge	4,400–4,600		

Table 3-33. Description of forest types found in the Watdog Project area.

Forest Type	Predominate Species	Other Species Present
Mixed conifer – ponderosa pine	Ponderosa pine (*Pinus ponderosa*)	Incense cedar (*Calocedrus decurrens*), Douglas-fir (*Pseudotsuga menziesii*), and sugar pine (*Pinus lambertiana*)
Mixed conifer -white fir	White fir (*Abies concolor*)	Incense cedar, Douglas-fir, sugar pine, and Jeffrey pine (*Pinus jeffreyi*)
True fir	White fir and red fir (*Abies magnifica*)	Incense cedar and scattered Douglas-fir, sugar pine, and Jeffrey pines. Lodgepole pine (*Pinus contorta*) can be found in wetter locations. There are some wet meadows

Due to past harvesting, there are fewer large (greater than 30 inches dbh), high value pines such as ponderosa, sugar and Jeffrey. Mortality of sugar pine and western white pine from white pine blister rust (*Cronartium ribicola*) has also contributed to reduced numbers of these species, especially the smaller trees. Past disturbance has favored germination of new shrub and conifer seedlings and, along with fire exclusion, a higher density of small, mostly shade-tolerant trees (red fir and white fir) in the understory.

The typical mixed conifer type includes shade-tolerant species like incense cedar, red fir, and white fir that can germinate and grow in the shade of the overstory trees. Without any disturbance, these shade-tolerant species can develop into multiple layers of vegetation or ladder fuels. When low severity fires are allowed to burn through these stands at frequent intervals (every 5 to 15 years), shade-tolerant vegetation can be kept below the lower reaches of the overstory foliage, preventing the development of a fuel ladder.

Effects of Alternative A. Historically, stands in the Watdog Project area had a higher component of shade-intolerant species such as ponderosa, Jeffrey, and sugar pine in the overstory. Maintaining the existing stand structure would favor shade-tolerant species such as white fir, red fir, and incense cedar. There would be little opportunity for the naturally dominant pine species to reestablish and regenerate themselves.

3.12.3.3 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—White fir, red fir, and incense cedar would be the primary species removed, but some ponderosa pine and a very limited number of sugar pine and Douglas-fir may also be removed. Preference for residual trees would be based on the relative shade intolerance of the species. Ponderosa pine would be given primary preference, followed by Jeffrey pine, sugar pine, Douglas-fir, black oak, incense-cedar, and true fir.

Mastication and Grapple Piling—Thinning proposed under alternatives B, C, and D would favor the retention of under-represented conifers (for example, sugar pine, Douglas-fir, white fir, and incense cedar) as well as oaks in those plantations dominated by ponderosa and Jeffery pine. Thinning would also favor retention of the most vigorous individuals, rather than simply achieve desired spacing. This would result in less homogenous stands of trees than currently exist.

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Underburning is non-selective and, compared to mechanical treatments, it is not as likely that favored species would be retained. Implementation of alternatives B, C, and D may not change the percent composition of pine species in underburn units. Localized torching from underburning would provide some small openings in the overstory where shade intolerant species may become established and grow, depending upon the opening size.

Group Selection Treatments.

Harvesting, Site preparation, Reforestation, and Release—Group selections within the true fir type may be naturally regenerated. In all other forest types a combination of natural and artificial regeneration would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. At higher elevations, ponderosa pine, Jeffery pine, and rust-resistant sugar pine would be planted. At lower elevations Douglas-fir would be added to the mixture.

The openings created by group selection would mimic fine-scale disturbances such as small fires, localized insect damage, windthrow, and snow events. This would allow sunlight to reach the forest floor, creating favorable conditions for the establishment and growth of planted shade-intolerant, fire-adapted species. Some natural regeneration from seeds of surrounding firs, pines, and cedars, and shrub species, is also expected to occur in these openings.

After planting, proposed release treatments (grubbing and mastication) in group selection openings would favor pine retention. Without post-planting release treatments, shade-tolerant firs and cedars would be expected to out-compete pine seedlings along group selection edges, under residual trees, and in other low-light areas within patches (for example, south slopes, York et al. 2003, 2004).

Although there has been little research on seedling survival within group selections in the northern Sierra Nevada forests, a few experiments have been completed on the Plumas National Forest. For example, McDonald and Abbott (1994) found that growth of ponderosa pine in 30, 60, and 90 foot radius (approximately 0.1–0.6 acres) group selection units were poor (for example, many seedlings only 5 inches tall at 9 years old), even though ponderosa pine seed cast and seedling germination was extremely high. They show that edge tree competition—both above ground for light and below ground for nutrients and water—limit growth for species like ponderosa pine that are unable to adapt to low light levels. York et al. (2004) found significant increases in seedling/sapling height as opening size increased; effects of opening size on seedling/sapling height leveled off after 0.6 hectares (approximately 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, because the SNFPA FEIS (table 2) established the retention of trees greater than 30 inches dbh, there will be residual trees within Watdog group selection units.

3.12.3.4 Forest Health

Existing Condition. Insects and disease have contributed to vegetation composition in the analysis area. Insects will remain at endemic levels as long as precipitation levels are near or above normal. However, when precipitation is below normal for several consecutive years, trees become moisture-

stressed and susceptible to insect attacks. As past logging history indicates, there have been numerous salvage sales over the years that generally coincide with drought conditions or, in one case, a Tussock moth infestation. Maintaining trees in good health and vigor will reduce the risk of high levels of mortality during low water supply years.

Insect top kill and whole tree mortality are found throughout the analysis area. This damage is related to attacks by the fir engraver beetle (*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 *Dencroctonus jeffreyi* in Jeffrey pine.

Although diseased trees are found throughout the project area, they are most common in overcrowded stands. Overcrowded stands containing a large percentage of white and red firs almost always contain some amount of annosum root disease (*Heterobasidium annosum*), which decays tree roots. When the roots die faster than they can regenerate, the tree will fall over 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 more of these resistant species.

White pine blister rust (*Cronartium ribicola*) 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 occur in all tree sizes. This disease has killed some younger trees and older infected trees show reduced growth and vigor.

Dwarf mistletoe (*Arceuthobium* spp.) is also present in these forest types. Tree growth and vigor is reduced on infected trees with moderate to high mistletoe ratings.

3.12.3.5 Effects of Alternative A

Problems with disease (for example, dwarf mistletoe, stem and root rot, blister rusts), insects (for example, bark beetles), and damage (for example, broken tops, basal wounds) have been observed in ponderosa pine, sugar pine, incense cedar, and white fir trees in stands within the Watdog analysis area.

As stand growth and vigor continues to decline, these areas are at a high risk for insect and disease infestations. As Ferrell (SNEP, Vol. II, Chap. 45, p. 1177–1192) summarizes: “Currently, Sierra Nevada forests have high levels of mortality caused by bark beetles infesting trees stressed by drought, fire, overly dense stands, and pathogens. Fuel loads and fire hazard are high…Mitigative restoration requires thinning overly dense stands, primarily by controlled burning in parks and wilderness areas, combined with mechanical thinning and other selective tree-cutting practices elsewhere.”

Mistletoe-infested trees in the overstory would continue to infect understory trees and adjacent stands. The rate of spread of mistletoe would be more rapid through a multistory stand with many horizontal layers of foliage than through a single-storied stand (Parmeter, Jr. 1978; Hadfield and Russell 1978). Stand health would continue to decline in overstocked aggregations of trees within moderately stocked and densely stocked stands, eventually resulting in individual tree mortality. Mortality would increase the fuel loading.

3.12.3.6 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—Effects of alternatives B and C are expected to be the same. For alternative D, susceptibility to bark beetle infestations would be low to moderate due to higher tree densities. Thinning from below would remove poor vigor, diseased, and damaged trees. In addition, thinning some of the suppressed, intermediate, and co-dominant tree classes would help to maintain the growth and vigor of co-dominant and dominant (older, mature, larger trees) conifers to be retained longer in the overstory. Stand health would be maintained or improved and individual tree mortality would be reduced. The overstocked stands or aggregations within stands would be thinned, reducing stress due to inter-tree competition. 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).

Mastication and Grapple Piling—Effects of alternatives B, C, and D are expected to be the same. The removal of competing conifers and brush through mastication and grapple piling would result in better individual tree growth and vigor of remaining conifers. There is also an opportunity to selectively remove mistletoe infected trees, which would limit the spread of mistletoe to adjacent, uninfected trees.

Thinning (mastication) would reduce the risk of bark beetle mortality in each stand. When periodic droughts and their associated bark beetle epidemics occur, there is a low probability of extensive pine mortality in the thinned stands. Maintaining good stand growth and vigor would reduce the risk of beetle populations increasing and attacking adjacent stands. Because the conifer stands are currently in the most vigorous growth period of their lifespan, stand densities will again approach undesirable densities within 10–15 years after treatment.

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Prescribed burning is non selective and may not remove diseased or mistletoe infected trees. Within the DFPZ, mistletoe trees in the overstory would continue to infect the understory trees and adjacent stands.

Group Selection Treatments—Harvesting, site preparation, reforestation, and release. Effects of alternatives B, C, and D are expected to be the same. Most of the dying, damaged, insect ridden and diseased trees up to 30 inches dbh would be removed in the group selection harvests. If some of the residual overstory trees are infected with mistletoe, then other species types can be planted in the understory, since mistletoes are host (tree species) specific.

3.12.3.7 Stand Attributes

Existing Condition. This section describes the existing condition for the following indicators:

Canopy Cover (section 3.12.2.5), Stand Structure and Tree Size (section 3.12.2.6), and density (section 3.12.2.7) all found in the Watdog FEIS.

Table 3-34 displays the stand attributes of canopy cover, average tree size or quadratic mean diameter, basal area, and trees per acre for the various treatment groups (CWHR Size Class 4 and 5 thinning units, masticate/prune, masticate only, and underburn). Stand structure is a description of the distribution of tree size-classes (that is, saplings, poles, small trees, etc.) within a stand. Understory and overstory are additional terms that are used in referring to stand structure. The distribution of the various size classes or "stories" determines if a stand is classified as an even-aged, uneven-aged (all-aged), or multistory stand. Quadratic mean diameter is the diameter of a tree of mean basal area within 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 within the stand. Quadratic mean diameters for the various treatment groups are relatively low, indicating a high proportion of smaller tree size classes.

Table 3-35 displays the stand structure for the CWHR Size Class 4 and 5 natural stands for the thinning treatment group. Mastication and underburning units are not shown since neither treatment will effect much change on overstory stand structure.

The number of trees per acre in the CWHR Size Class 5 natural stands ranges from 564 to 1,605 per acre with an average of 953 trees per acre. CWHR Size Class 4 stands have an average of 786 trees per acre.

Most of the trees in CWHR Size Class 4 and 5 stands are in the smaller diameter groups (less than 11 inches dbh). The percent of trees greater than 30 inches dbh account for only a small fraction of the total number of trees: seven trees per acre for CWHR Size Class 4 stands and eight trees per acre for CWHR Size Class 5 stands.

Table 3-34. Stand attributes by treatment group.

Treatment Group	Percent Canopy			Quadratic Mean Diameter	Basal Area	Trees per Acre
	Lower Limit	Upper Limit	Average			
CWHR* 5 -Thin	49	71	61.2	6.8	223	953
CWHR Size Class 4 - Thin	49	80	64.3	8.9	275	786
Masticate/Prune	22	60	44.1	5.1	81	592
Masticate	26	56	44.6	5.7	122	788
Underburn	44	85	59.0	9.0	216	561

Note:

* CWHR (California wildlife habitat relationships) is 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.

Table 3-35. Stand structure (canopy cover and trees per acre) by size class.

	Treatment Group	Sapling 0–6 inches	Poles 6–11 inches	Small Trees 11–20 inches	Medium Trees 20–30 inches	Large Trees Greater than 30 inches	Total
		(diameter at breast height)					
Canopy cover percent	CWHR 5	24.0	15.6	17.7	14.2	14.8	61.2
	CWHR 4	19.7	16.7	27.7	17.2	11.8	64.4
Trees per acre	CWHR 5	795.5	81.0	50.9	17.5	8.1	953.0
	CWHR 4	605.3	68.5	78.9	26.5	7.2	786.4

Basal area for CWHR Size Class 5 stands ranges from 164 to 285 squared feet per acre with an average of 223 feet squared per acre. Basal area for CWHR Size Class 4 stands is slightly higher at 275 feet squared per acre. Average stand tree age in CWHR Size Class 4 and 5 stands varies but natural stands are approximately 75 to 150 years old with older trees in clumps or scattered individually. Canopy cover is dense for CWHR Size Class 5 stands, ranging from 49 to 75 percent with an average of 61 percent. Canopy cover in CWHR Size Class 4 stands averages 62 percent. Within both CWHR Size Class 4 and 5 stands, there are small aggregations or clumps of trees with denser canopy cover.

For both CWHR Size Class 4 and 5 stands, the high number of trees in the smaller diameter groups and the dense canopy indicates high fuel ladder potential and interlocking crowns capable of sustaining crown fires.

There are 872 acres of pine plantations within the proposed DFPZ. Of those, roughly two-thirds (584 acres) are younger plantations that were established 12 to 17 years ago. The remaining 288 acres are older plantations established approximately 30 to 35 years ago. During the regeneration harvests that established these plantations, pine and other mixed conifer species were planted. This helped restore some of the pine species diversity. The plantations also contribute to horizontal diversity, or the horizontal arrangement of different age groups of vegetation across the landscape. Currently, plantations within the Watdog Project area range from 300 to 1,200 trees per acre with 6 to 12 foot spacing between trees. Without precommercial thinning, plantations at such high densities are more susceptible to bark beetle attack, increased mortality from inter-tree competition, and increased high fire hazard risk potential.

More specific information about stand attributes of natural stands and plantations is contained in the Watdog "Silviculture Report."

On a landscape scale, table 3-36 shows existing vegetation type, size class distribution, and canopy cover distribution for the Fall River and South Branch Middle Fork River watersheds (Fall River and South Branch Middle Fork Feather River Landscape Assessment, 2005). Over 70 percent of the acres in each watershed are in the moderate to dense canopy cover classes, which indicates multiple canopy layers and interlocking crowns.

Table 3-36. Forest vegetation data for the Fall River and South Branch Middle Fork Feather River watersheds.

	Forest Vegetation Data	South Branch Middle Fork Feather River (acres)*	Fall River (acres)*
	Total Watershed Acres	**16,929**	**9,657**
Vegetation type diversity	Barren	43	104
	Water	0	0
	Annual Grassland	8	21
	Shrub Types (mixed chaparral, montane chaparral)	186	127
	Montane hardwoods	1,102	1,710
	Pine (eastside and ponderosa pine)	61	262
	Sierran mixed conifer (including Douglas-fir)	14,138	6,468
	True Fir (white fir and red fir)	1,392	967
Size Class Distribution	Miscellaneous (barren, water, grassland, shrubs)	250	664
	Seedling (less than 1 inch dbh)	740	119
	Sapling (1–6 inches dbh)	1,390	860
	Pole (6–11 inches dbh)	7,873	5,200
	Small Tree (11–24 inches dbh)	6,242	2,811
	Large Tree (greater than 24 inches dbh)	433	3
Canopy Closure Distribution	NA (0–9%) (barren, water, grassland, shrubs)	189	224
	Sparse (10–24%)	1,445	866
	Open (25–39%)	2,272	1,174
	Moderate (40–59%)	5,127	3,648
	Dense (60–100%)	7,897	3,745

Note:

* Acreage is for National Forest System land only and does not include private property.
* Table entries come from the 2005 Fall River/South Branch Landscape Assessments.

The Fall River and South Branch Middle Fork River Landscape Assessment pointed out several differences between existing condition and desired condition for age group and size classes. As shown in table 3-36, existing conditions for the large tree class is under-represented, the seedling and small tree classes are slightly above desired, and the pole size class is over-represented. The proposed fuel treatments and group selection harvests of the Watdog Project would move some of these classes toward desired conditions. Implementation of the HFQLG group selection harvests over 175 years would move the current tree size classes towards the desired size class distribution.

3.12.3.8 Canopy Cover

Effects of Alternative A. With fire exclusion, an understory of fir and cedar has developed beneath the overstory, creating a multistory stand with moderate to dense canopy closure currently ranging from 49 to 80 percent in CWHR Size Class 4 and 5 stands (table 3-34). The canopy closure for the plantations (masticate group) and other stands (underburn group) range from 22 to 85 percent. Without treatment, the canopy closure in these stands, especially in the plantations, would continue to increase, shading out brush and smaller trees, which would die and increase the ladder fuels and fire hazard.

3.12.3.9 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—The most effective strategies for reducing crown fire occurrence and severity are to: (1) reduce surface fuels, (2) increase height to live crown, (3) reduce canopy bulk density, and (4) reduce continuity or density of the forest canopy (Graham et al. 2004: Peterson et al. 2005).

Treatment of DFPZs should result in a fairly open stand, dominated by larger, fire-tolerant tree species. Post-treatment canopy closure generally should not exceed 40 percent, although adjustments in stand density based on local conditions may be appropriate (Weatherspoon and Skinner 1996).

Canopy cover in CWHR Size Class 5 stands in the project area (678 acres) currently ranges from 49 to 75 percent, with an average of 61 percent. Canopy cover in CWHR Size Class 4 stands is quite similar, ranging from 49 to 80 percent and averaging 62 percent.

For alternative B, post-treatment canopy cover would average 41 percent in CWHR Size Class 5 stands and 37 percent in CWHR Size Class 4 stands (Watdog Project "Silviculture Report," appendix A, tables A-10 and A-12). Effects of alternatives C are expected to be the same as alternative B, except for CWHR Size Class 4 stands where a 40 percent canopy cover is desired after thinning for each stand (Watdog Project "Silviculture Report," appendix A, table A-13–16). Effects of alternative D are expected to be the same as alternative B, except for the CWHR 4 and 5 stands where a 50 percent canopy cover is desired after thinning for each stand (Watdog Project "Silviculture Report," appendix A, tables A-11 and A-14). All alternatives meet the canopy requirements listed in table 2 of the SNFPA ROD for CWHR Size Class 4 and 5 stands.

Mastication and Grapple Piling—Mastication would change the canopy cover of the plantations with interlocking and overlapping crowns to a more open condition with gaps between tree crowns. For all action alternatives, canopy cover would average approximately 30 percent.

Effects of alternatives B and C on density are expected to be the same. Plantations would be thinned to approximately 70 to 135 trees per acre, or 18 to 25 foot spacing between trees depending upon the size of trees.

Underburning and Pile Burning—Prescribed burning would remove most of the understory vegetation and some overstory trees through localized torching. Depending on prescribed burning conditions (low-intensity versus high-intensity), localized torching would be low and change to canopy cover would be minimal. All action alternatives are expected to have the same effects.

Group Selection Treatments.

Harvesting, Site Preparation, Reforestation, and Release—The residual canopy cover of trees greater than 30 inches dbh ranges from 1 to 38 percent for all stands. CWHR Size Class 4 and 5 stands have an average of 12 and 15 percent canopy cover, respectively.

3.12.3.10 Stand Structure and Tree Size

Effects of Alternative A. Under alternative A, trees in the suppressed and intermediate crown classes would continue to provide ladder fuels into the overstory crown canopy. Currently, all treatment groups have relatively low quadratic mean diameters, meaning that there is a high proportion of smaller tree size classes (table 3-37). Existing conditions across the project area, including multiple size classes, low quadratic mean diameter, and dense canopy, indicate high fuel ladder potential and interlocking crowns capable of sustaining crown fires (tables 3-37 and 3-38). Tables A-15 and A-16 in appendix A of the Watdog Project "Silviculture Report" display the stand structure for each stand. The series of photographs and associated tables in attachments A, B, C and D in Appendix G of the Watdog Project Silviculture Report illustrate the potential fuel ladder from the bases of the larger trees to the overstory tree canopy and that the saplings and pole size trees make up the fuel ladder. Fuel ladders carry fire from the ground to the tops of the larger trees.

Table 3-37. Existing condition and desired condition for tree size class distribution for Fall River and South Branch Middle Fork Feather River watersheds.

Size Class	Approximate Age Group	Desired Size Class Distribution*	Existing Size Class Distribution	
			South Branch MFFR	Fall River
Seedling, Sapling (less than 6 inches dbh)	0–20	10%	14%	17%
Pole (6–11 inches dbh)	20–40	10%	47%	54%
Small – Medium Tree (11–24 inches dbh)	40–100	30%	37%	29%
Medium - Large Tree (greater than 24 inches dbh)	100–200	50%	3%	0%

Note:

* Based on HFQLG desired condition for uneven-aged management with a regulation period of approximately 175 years.

* Table entries come from the 2005 Fall River/South Branch Landscape Assessment.

Table 3-38. Canopy cover summary by treatment group for each alternative.

Treatment Group	Alternative A Lower Limit Canopy Cover	Alternative A Upper Limit Canopy Cover	Alternatives (average percent canopy cover)			
			A	B	C	D
CWHR Size Class 5 -Thin	49	71	61.2	41.3	41.3	47.4
CWHR Size Class 4 - Thin	49	80	64.3	37.1	42.5	49.5
Masticate/Prune	22	60	44.1	27.8	27.8	27.8
Masticate	26	56	44.6	29.9	29.9	29.9
Underburn	44	85	59.0	53.2	53.2	53.2

3.12.3.11 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—Under all action alternatives, thinning would occur from below to remove ladder and canopy fuels. This would increase ground-to-crown height, spacing between trees, and spacing between tree crowns. Removal of suppressed, intermediate, and some co-dominant trees with crowns beneath and adjacent to healthy larger trees would be emphasized. It is estimated from preliminary cruise data that the number of trees 20 to 30 inches dbh that would be removed due to poor crowns, defects, disease, insect damage, or because their crowns are beneath those of larger sized trees (greater than 30 inches dbh) would range from 2.5 to 4.1 trees per acre for CWHR Size Class 5 and 4 stands, respectively (Watdog Project "Silviculture Report," appendix A, tables A-33 and A-34).

Tables 3-39 and 3-40 and Figures 3-3, 3-4, and 3-5 displays existing stand structure attributes (average canopy cover percent and trees per acre by tree size class) for CWHR Size Class 4 and 5 stands in the project area. The trees per acre values in the table for the medium trees (20–30 inches dbh) are estimated from the Forest Vegetation Simulator model, and in parentheses, the values adjusted from the preliminary cruise data. One of the limitations of the Forest Vegetation Simulator growth model is that it is a distance independent model where the spatial arrangement or locations of trees are not modeled. Therefore, when a thinning from below prescription is applied, the models starts thinning sequentially from the smallest trees to higher dbh classes until the canopy cover, basal area, or tree size requirements have been met. The model cannot simulate removing a 22-inch dbh tree that is underneath the canopy of a larger (i.e., 40 inches dbh) tree. Therefore, the marking guidelines allow adjustments to spacing based on tree size and variation within spacing guidelines to increase crown separation and allow retention of the healthiest, largest trees (Watdog Project "Silviculture Report," "Appendix D: Silviculture Prescription and Marking Guidelines"). Canopy cover in the smaller tree size classes (saplings, poles, and small trees) would be reduced substantially after thinning, reducing the fuel ladder and canopy fuels.

Effects of alternative C are expected to be the same as alternative B, except that there will be slightly more canopy cover in the sapling and pole size classes for the CWHR Size Class 4 stands. Tables A-15 through A-19 in appendix A of the Watdog Project "Silviculture Report" display the canopy cover and trees per acre by size class for each treatment unit. Fuel ladder potential would be slightly higher than alternative B, as tree crowns would be spaced farther apart. Alternative D would have the highest fuel ladder potential of all the action alternatives.

The 2004 SNFPA ROD requires that projects be designed to retain, where available, at least five percent of total treatment area in lower layers comprised of trees 6 to 24 inches dbh. For the Watdog Project, this requirement can be met in all treated stands, as displayed in the table 3-40. Tables A-15 through A-19 of the Watdog Project "Silviculture Report" displays the canopy cover and trees per acre by size class for each treatment unit.

Table 3-39. Canopy cover by tree size class for CWHR Size Class 4 and 5 stands.

	Alternative	Canopy Cover Percent by Tree Size Class					
		Sapling	Poles	Small Trees	Medium Trees	Large Trees	
		0–6 inches dbh	6–11 inches dbh	11–20 inches dbh	20–30 inches dbh	Greater than 30 inches dbh	Total Cover
CWHR Size Class 4							
Before Treatment	A	19.7	16.7	27.7	17.2	11.8	64.4
After Treatment	B	0.1	0.3	15.8	16.8	11.8	38.7
	C	0.3	1.2	19.4	16.9	11.8	42.5
	D	0.0	6.9	22.8	17.2	11.8	48.6
CWHR Size Class 5							
Before Treatment	A	24.0	15.6	17.7	14.2	14.8	61.2
After Treatment	B	0.9	4.3	12.8	14.2	14.8	40.0
	C	0.9	4.3	12.8	14.2	14.8	40.0
	D	0.9	10.2	17.3	14.2	14.8	46.5

Table 3-40. Trees per acre by size class for CWHR Size Class 4 and 5 stands.

	Alternative	Trees per acre by Size Class					
		Sapling	Poles	Small Trees	Medium Trees	Large Trees	
		0–6 inches dbh	6–11 inches dbh	11–20 inches dbh	20–30 inches dbh	Greater than 30 inches dbh	Total Trees per acre
CWHR Size Class 4							
Before Treatment	A	605.3	68.5	78.9	26.5	7.2	786.4
After Treatment	B	0.6	0.9	35.8	25.6 (21.5)	7.2	70.0
	C	1.8	5.1	49.2	25.8 (21.7)	7.2	89.1
	D	0.0	29.0	63.2	26.5	7.2	125.8
CWHR Size Class 5							
Before Treatment	A	795.5	81.0	50.9	17.5	8.1	953.0
After Treatment	B	10.1	21.0	36.0	17.5 (15.1)	8.1	92.7
	C	10.1	21.0	36.0	17.5 (15.1)	8.1	92.7
	D	10.1	54.2	50.2	17.5	8.1	140.1

Note: The values for the medium trees are estimated from the Forest Vegetation Simulator. All values in the table are a result of the vegetation simulator, however, values in parentheses have been adjusted from preliminary cruise data.

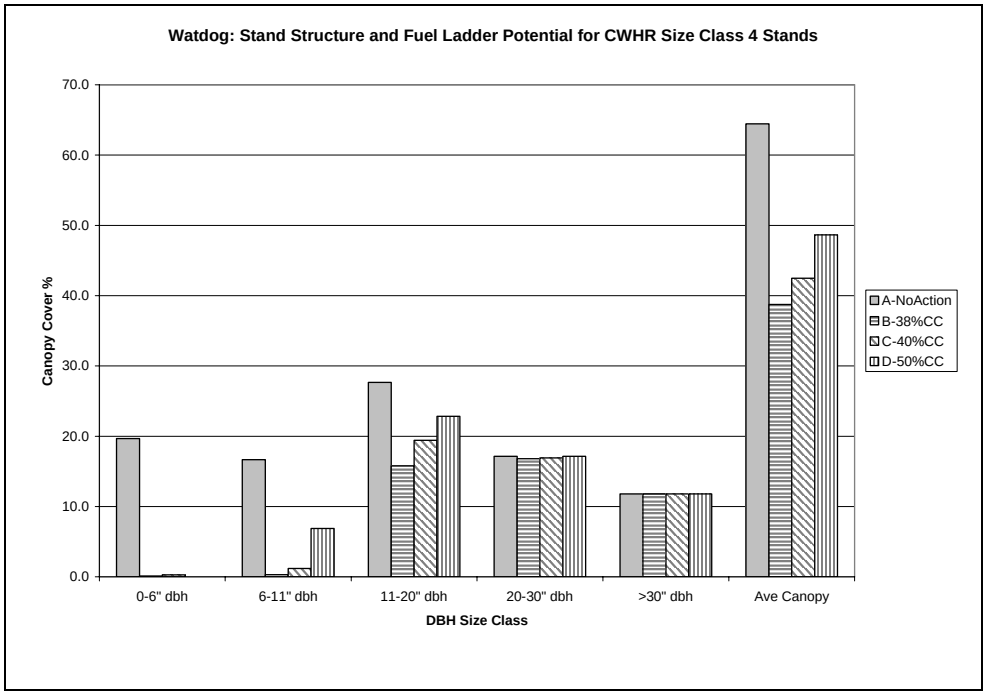


Figure 3-3. Stand structure and fuel ladder potential for CWHR 4 stands

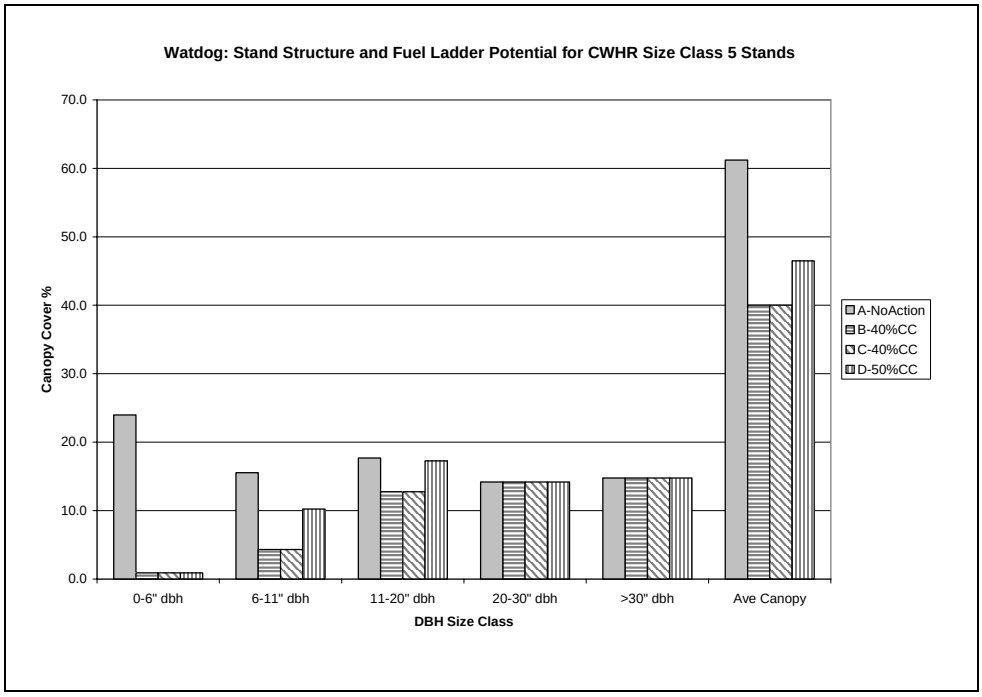
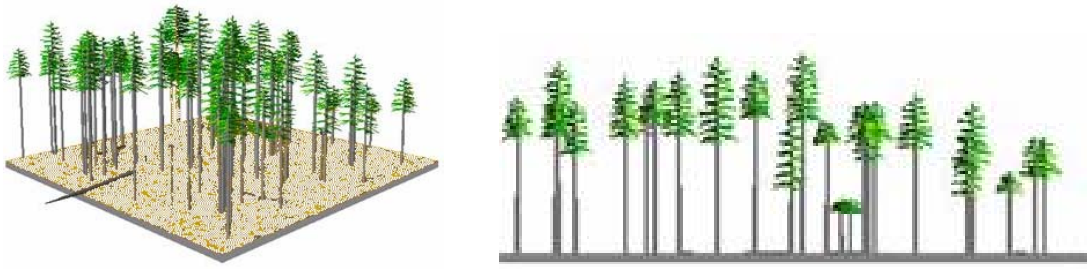


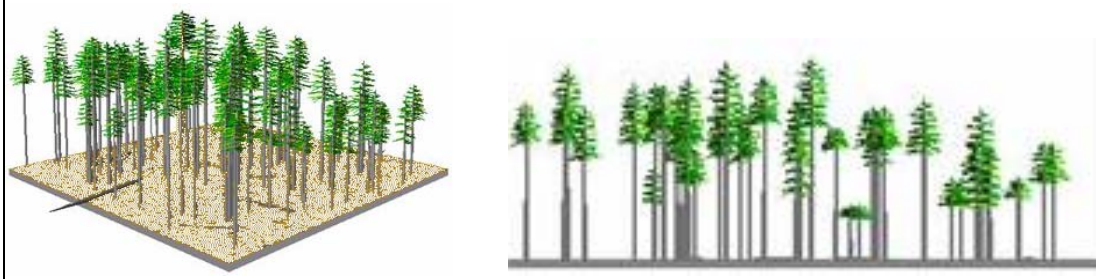
Figure 3-4. Stand structure and fuel ladder potential for CWHR 5 stands

Alternative A. No Action (Existing Condition: 58% Average Canopy Cover)

Alternative B. Proposed Action (Simulated 32% Canopy Cover) *Note: Canopy cover across treatment units ranges from 25% to 58%. Average canopy cover in DFPZs is approximately 39%.*



Alternative C. (40% Canopy Cover)



Alternative D. (50% Canopy Cover / 20 inch dbh limit)

Figure 3-5. Comparison of stand structure by alternative using stand visualization simulator (SVS)

Some trees greater than 30 inches dbh would be removed for operability during new road construction (1.25 miles), new temporary road construction (0.5 mile), new landing construction (50 landings) and existing landing reconstruction (62 landings). Approximately 50 acres would be affected by these activities and about 400 trees (less than two percent) greater than 30 inches dbh would be removed (Watdog Project "Silviculture Report," appendix A, table A-32). The potential number of large trees greater than 30 inches dbh that would be affected within the Watdog Project area due to hazard tree removal would be less than 2.0 percent (Table 3 of the Watdog Hazard Tree Cumulative Effects Supplement to the Watdog Project Silviculture Report). Overall, less than 3.4 percent of the large trees greater than 30 inches dbh within the Watdog Project area would be affected.

All action alternatives would increase the quadratic mean diameter for each treatment group (table 3-41. This indicates that there is a higher proportion of medium to large size trees in the stand, which would reduce the ladder fuels and fire hazard. Tree growth and vigor would also improve (see Forest Health Indicator).

Table 3-41. Quadratic mean diameter for each treatment group.

	Quadratic Mean Diameter (inches dbh)			
Treatment Group	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
CWHR Size Class 5 - Thin	6.8	20.3	20.3	16.9
CWHR Size Class 4 - Thin	8.9	22.2	20.9	19.5
Masticate/Prune	5.1	8.6	8.6	8.6
Masticate	5.7	12.0	12.0	12.0
Underburn	9.0	17.4	17.4	17.4

The most substantial change in quadratic mean diameter would be seen in the CWHR Size Class 4 and 5 stands. Under alternative B, the quadratic mean diameter for CWHR Size Class 4 and 5 would increase considerably from 7–9 inches dbh to 20–22 inches dbh. Quadratic mean diameter would also increase under alternatives C and D. However, neither alternative would bring about as substantial a change as alternative B.

Mastication and Grapple Piling—All action alternatives are expected to have the same effects. Mechanical mastication would change the structure (by reducing ladder fuels), density, and size of fuels in the stand, but would not necessarily change the total fuel loading. The quadratic mean diameters or tree size of the residual stand would increase (table 3-41). Hand pruning lower limbs of trees on 319 acres of plantations would increase the crown base height and reduce the long-term fire potential. However, the limbs from the pruned trees would be lopped and scattered away from the residual trees. In the short term, this would result in a high-risk fire potential until the slash decomposes and is crushed by heavy snow loads.

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Prescribed burning would change stand structure by burning the understory vegetation and the suppressed and intermediate tree sizes. However, larger vegetation that is not consumed by the prescribed burn would be left standing after treatment. Some stands would still experience some stress

after treatment due to competition with brush species that were not consumed in the underburn treatments.

3.12.3.12 Group Selection Treatments

Harvesting, Site Preparation, Reforestation, and Release—Group selection treatments would create small patches of young regeneration, changing the stand structure within and near the treatment unit. Trees greater than 30 inches dbh within group selection openings, as well as all trees bordering group selection openings, are expected to respond to the reduced competition by increasing growth. This would cause further diversification of canopy layers through the development of large dominant, overstory trees. York et al. (2004) found a 30 percent increase in growth in trees along group selection borders compared to trees growing within the group selection matrix.

Alternative B calls for 231 acres of group selection harvest. Implementation of group selection treatments would create two distinct structures: (1) the overstory, comprised of residual trees greater than 30 inches dbh, and (2) planted and natural conifer seedlings. Effects of alternative C are expected to be the same as alternative B, except that in order to maintain 40 percent canopy cover the group acres were reduced to 151 acres. For alternative D, group acres would be reduced to 105 acres to maintain 50 percent canopy cover.

3.12.3.13 Density (Basal Area and Trees per Acre)

Effects of Alternative A. Table 3-42 displays basal area and trees per acre for the various treatment groups in the DFPZ. Alternative A represents the existing condition. The high number of trees per acre across all treatment groups indicates overstocked conditions. Trees per acre range from 71 to 165 in well stocked, second-growth, 100 to 150 year old mixed conifer stands (Dunning and Reineke 1933). However, desired trees per acre within DFPZ units would be lower in order to ensure effectiveness of the treatments. For plantations, the target for the second decade would be between 100 to 150 well distributed trees per acre with shrub cover being maintained at about 10 to 20 percent (SNFPA, FEIS, volume 1, chapter 2, p. 57).

Stands and aggregations within stands that are currently overstocked, or understocked areas with dense brush cover, would continue to experience stress due to high levels of inter-tree or brush competition (see Watdog FEIS, "Section 3.12.2.3: Forest Health"). Basal area standards in table 2 of the SNFPA ROD only apply to treatment group CWHR Size Class 4 and 5 stands.

Table 3-42. Basal area (square feet/acre) and trees per acre within proposed DFPZ.

Treatment Group	Alternative A		Alternative B		Alternative C		Alternative D	
	Basal Area	Trees Per Acre	Basal Area	Trees Per Acre	Basal Area	Trees Per Acre	Basal Area	Trees Per Acre
CWHR Size Class 5—Thin	223	953	177	93	177	93	201	140
CWHR Size Class 4—Thin	275	786	187	70	206	89	234	126
Masticate/Prune	81	592	59	134	59	134	59	134
Masticate	122	788	111	134	111	134	111	134
Underburn	216	561	212	164	212	164	212	164

3.12.3.14 Effects of Alternatives B, C, and D

DFPZ treatments

Mechanical Thinning and Biomass Removal—Thinning the understory would reduce the stocking density of trees in suppressed and intermediate crown classes and decrease ladder fuels growing underneath the overstory crown canopy (see Stand Structure Indicator). Reducing tree density would improve tree growth and vigor, reduce susceptibility to drought and bark beetle attack (see Forest Health Indicator), and reduce fire hazard (see "Section 3.5: Fire and Fuels").

As shown in table 3-43, all alternatives retain at least 30 percent of the existing basal area for CWHR Size Class 4 stands and 40 percent of existing basal area for CWHR Size Class 5 stands as required by the 2004 SNFPA ROD. Alternative B would retain approximately 68 percent of the existing basal area (187 square feet) in CWHR Size Class 4 stands, compared to 74 percent under alternative C and 85 percent under alternative D. In CWHR Size Class 5 stands, alternative B would retain approximately 79 percent of the existing basal area (177 square feet), compared to 74 percent under alternative C and 90 percent under alternative D.

Table 3-43. Basal area retention in CWHR Size Class 4 and 5 stands.

	Alternative B	Alternative C	Alternative D
CWHR Size Class 4 Stands			
Post-Treatment Basal Area	187 sq ft	206 sq ft	234 sq ft
Existing Basal Area Retained	68%	74%	85%
CWHR Size Class 5 Stands			
Post-Treatment Basal Area	177 sq ft	177 sq ft	201 sq ft
Existing Basal Area Retained	79%	79%	90%

Mastication and Grapple Piling—Effects of alternatives B, C, and D are expected to be the same. Plantations would be thinned to approximately 70 to 135 trees per acre, or 18 to 25 foot spacing between trees depending upon the size of trees. Reducing tree density would improve tree growth and vigor, reduce susceptibility to drought and bark beetle attack (see Forest Health Indicator), and reduce fire hazard (see Fire and Fuels indicator).

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Prescribed burning would change the basal area and trees per acre by consuming or killing the suppressed (seedlings, saplings), intermediate (poles, small trees) and some co-dominant (small and medium trees) size classes.

Group Selection Treatments

Harvesting, Site Preparation, Reforestation, and Release—Across the Watdog treatment units, the number of residual trees per acre greater than 30 inches dbh ranges from 1 to 18. CWHR Size

Class 4 stands average seven trees per acre and CWHR Size Class 5 average eight trees per acre (table 3-40). Group selection openings would be planted with shade intolerant species, generally on 10 to 12 foot spacing or 300 to 435 trees per acre.

3.12.3.15 Harvest Volume

Existing Condition. There is no existing condition for this indicator. See *Group Selection Layout* in "Section 3.11.1.3: Analysis Methods."

3.12.3.16 Effects of Alternative A

No timber products (that is, firewood, biomass chips, or sawlogs) would be provided to the local economy.

3.12.3.17 Effects of Alternatives B, C, and D

DFPZ Treatments.

Thinning and Biomass Removal—DFPZ thinning under alternative B would provide approximately 10.3 mmbf of sawlogs and 33,000 tons of biomass to the local community (Watdog Project "Silviculture Report," appendix A, table A-25). Under alternative C, sawlog and biomass volume would be reduced to about 8.8 mmbf and 33,000 tons, respectively, due to lower harvest volumes in CWHR Size Class 4 stands. Maintaining 50 percent canopy cover in CWHR Size Class 4 and 5 stands under alternative D would reduce sawlog and biomass volume to 1.6 mmbf and 15,000 tons, respectively.

Mastication and Grapple Piling—No sawlogs or biomass would be generated from mastication, grapple pulling, hand cutting, pruning, and piling treatments in alternatives B, C or D.

Underburning and Pile Burning—No sawlogs or biomass would be generated from underburning or pile burning treatments in alternatives B, C, or D.

Group Selection Treatments.

Harvesting, Site Preparation, Reforestation, and Release—Under alternative B, approximately 6 mmbf of sawlogs would be generated through the harvest of 231 acres of group selection units. Alternative C would harvest 151 acres of group selection units and generate approximately 3.9 mmbf of sawlogs. Harvest of 105 acres of groups under alternative D would generate approximately 2.7 mmbf of sawlogs.

3.12.3.18 Hardwoods

Existing Condition. Hardwoods in the Watdog Project area include:

- California black oak (*Quercus kelloggii*) on drier, lower elevation sites;
- tanoak (*Lithocarpus densiflorus*) at lower elevations on the westside of the project area;

- alder (*Alnus* sp.) in or near wet areas;
- quaking aspen (*Populus tremuloides*), dogwood (*Cornus* sp.) and maple (*Acer* sp.) scattered in the understory in moister areas.

Due to past land use and management practices, California black oak stands are not as numerous or as extensive as they were prior to Euro-American settlement. Individual oaks and oak communities profoundly affect the variety and abundance of wildlife. While food for many organisms is a primary resource produced by oaks, of greater overall significance is the fact that oaks contain nooks, crannies, perches, and passages where animals live, breed, and rest. The physical structure of oak communities determines the availability of shelter, nesting sites, and corridors for travel. Approximately 40 acres of black oak enhancement (removal of conifers less than 30 inches dbh) are planned as part of this project. Table 3-44 displays the average trees per acre and the total number of black oak and tanoak within the Watdog Project area. More discussion of the effects of the alternatives on oaks is found in "Section 3.13: Wildlife and Fish." The Watdog Project "Silviculture Report," appendix A, tables A-7 and A-8, provides a summary of trees per acre by dbh class for black oak and tanoak.

Table 3-44. Total trees per acre of black oak and tanoak in the Watdog Project area.

	Black oak		Tanoak	
dbh Size Class	Average trees per acre	Total trees per acre	Average trees per acre	Total trees per acre
0–12 inches	56.9	135,422	42.0	99,960
12–15 inches	1.0	2,380	0.6	1,428
15–20 inches	0.2	476	0.3	714
20–30 inches	0.4	952	0.0	0
Greater than 30 inches	0.2	476	0.0	0

3.12.3.19 Effects of Alternative A

California black oak is shade-tolerant in early life, but as the oak tree ages, it becomes more shade intolerant. If overtopped, the oak either dies outright or dies back successively each year. With continued overtopping, death is inevitable (Burns and Honkala 1990a). Black oaks cannot grow through a stand of conifers, but can grow through brush.

Under alternative A, conifers would continue to encroach upon and overtop black oaks. Black oaks would continue to decline unless openings are created by disturbances, such as wildfire, blowdown, insect devastation, or logging (McDonald and Tappeiner 2002). However, oaks and other hardwoods could also be killed by wildfire. Because of oak's ability to sprout, it would be retained in the stand, although not at the same extent as before the wildfire.

3.12.3.20 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—Alternatives B, C, and D include approximately 40 acres of black oak stand enhancement. Treatments would involve removal of encroaching conifers less than 30 inches dbh or, in dense stands of scrub oak, the removal of suppressed oaks in order to reduce competition and improve growth of remaining oaks. 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 15 inches dbh. Smaller oaks may be retained if determined necessary for future recruitment. More specific information about proposed black oak enhancement is contained in the BA/BE and summarized in "Section 3.13: Wildlife and Fish."

Mastication and Grapple Piling—In alternatives B, C, and D, hardwoods within plantations would be favored for retention in order to increase species diversity. Riparian vegetation, such as alders, aspen, cottonwoods, dogwoods, maples, and willows, would also be favored for retention during mastication and hand thinning treatments.

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Oaks and other hardwoods could be killed by prescribed fire. However, because of their ability to sprout, they would not be eliminated from the stand. Prescribed burning would not be introduced directly into riparian areas adjacent to streams, springs, and seeps. From past experience on the Feather River Ranger District, prescribed fires generally burn themselves out when they enter wet drainages. Therefore, impacts on riparian vegetation from prescribed burning should be minimal.

Group Selection Treatments.

Harvesting, Site Preparation, Reforestation, and Release—While oak shade favors natural regeneration of conifers, it can retard their later growth and development. Ponderosa pine is relatively intolerant of the lower light levels available under residual hardwoods and conifers (Burns and Honkala 1990). In addition, with competition from established oak roots, pine growth is slow and seedlings are frequently damaged by the pine reproduction weevil (Tappeiner and McDonald 1979).

McDonald (1976) demonstrated a reduction in ponderosa pine seedling height growth near residual trees in a seed-tree cut. (Inhibitory effects extended 40 feet from the seed tree, although greatest effects were seen within 20 feet.) He found that density of seed trees and distance from seed trees directly influenced seedling height growth. Competition with residual trees, including naturally regenerating shade-tolerant species, such as fir and incense cedar, could result in mortality of some pine seedlings.

For group selection harvest, all trees up to 30 inches dbh—including hardwoods—would be removed to minimize the amount of shade from residual trees. Black oak trees would not be removed for fuel reduction purposes, but for pine regeneration purposes. The following table show the estimated number of California black oak in the Watdog Project area and within group selection unit boundaries. The potential numbers of oaks by size class that may be affected by group selection harvest is displayed in table 3-45. As shown, slightly fewer black oaks would be affected by group selection harvests under alternative C and D versus that of alternative B. Under alternative B, an estimated 393 out of a total number of 4,284 black oak trees in the project area greater than 12 inches may be removed from the 231 acres of group selection units (approximately 1.7 oaks per acre). The 393 black oak trees that may be

removed within the group selection areas account for 9.2 percent of total number of large black oak trees that are within the project area. According to the Watdog Cruise Report, no black oaks greater than 12 inches dbh were marked for removal within the DFPZ. Therefore, approximately 90.8 percent or 3,891 of the large black oak trees within the DFPZ portion of the project area would not be harvested.

Table 3-45. Estimated number of black oaks in Watdog Project area and potential number of black oak within group selection units that may be affected by group selection harvest.

Size Class	Total Number of Black Oaks in Project Area	Average Black Oak trees per acre Within Groups	Total Number of Black Oaks in Groups			Percent of Total Black Oaks in Project Area		
			Alternative					
			B	C	D	B	C	D
0–12 inches	135,422	57.0	13,167	8,607	5,985	9.7%	6.4%	4.4%
12–15 inches	2,380	0.7	162	106	74	6.8%	4.4%	3.1%
15–20 inches	476	0.6	139	91	63	29.1%	19%	13.2%
20–30 inches	952	0.4	92	60	42	9.7%	6.3%	4.4%
Greater than 30 inches	476	0.0	0	0	0	0.0%	0.0%	0.0%

Project implementation would result in a short-term reduction in number of large diameter oak trees. However, this short-term reduction may not be a considered a negative impact to wildlife in the long term (see "Section 3.13: Wildlife and Fish"). The incidence of heart rot increases in black oak stands over 80 years old. However, acorn production also increases after age 80. Therefore, in order to maintain continuous mast production, at least two age classes (0–80 years and 80–120+ years) should be maintained (Tappeiner and McDonald 1979). Small group selection cuts, such as those proposed under the Watdog Project, may also be beneficial to oak sprouting. In a study on the Feather River Ranger District's Challenge Experimental Forest, black oak, tanoak, and Pacific madrone all had more sprouts per stump in a clearcut than a shelterwood harvest (Plumb and McDonald 1981; McDonald and Tappeiner 2002). In addition, the proposed group selection harvests would create early seral stages of hardwoods, which would meet 2004 SNFPA objectives of maintaining a diversity of structural and seral stage conditions and would provide recruitment of young hardwoods.

3.12.3.21 Competing Vegetation

Existing Condition. The major shrub species in the project area are whitethorn (*Ceanothus cordulatus*), deerbrush (*Ceanothus intergerrimus*), snowbrush (*Ceanothus velutinus*), white leaf manzanita (*Arctostaphylos viscida*), greenleaf manzanita (*Arctostaphylos patula*), pinemat manzanita (*Arctostaphylos nevadensis*), huckleberry oak (*Quercus vaccinifolia*), bush chinquapin (*Castanopsis sempervirens*), bitter cherry (*Prunus emarginata*) and gooseberry (*Ribes* sp.).

Table 3-46 shows percent cover and average height for shrubs, herbs, and grasses. Units were grouped according to proposed treatments (for example, thinning, mastication, burning). As shown, shrub cover is moderate to high across the treatment groups, ranging from 25 percent in natural CWHR Size Class 4 stands to 66 percent in plantations and natural stands with shrubs. Moderate to high shrub

cover contributes to the fuel ladder and fire hazard potential within the stand. Average shrub height ranges from 3 feet in natural stands to 4 feet in plantations.

Table 3-46. Percent cover and average height of shrubs, grasses, and herbs.

Proposed Treatment	Stand Grouping	Shrubs		Herbs		Grasses	
		Percent Cover	Average Height (feet)	Percent Cover	Average Height (feet)	Percent Cover	Average Height (feet)
Thinning	CWHR Size Class 5 stands	38	3.4	12	0.9	3	1.0
	CWHR Size Class 4 stands	24	2.8	8	1.1	4	1.0
Underburn or pile burn	Prior Underburn stands	30	4.1	13	1.3	5	1.0
	Steep areas	33	3.5	7	1.5	2	1.3
Mastication	Natural stand with shrubs	66	3.0	10	1.4	7	1.1
	Plantations	66	3.9	16	1.3	6	0.7

Herbs and grasses are more desirable as ground cover in fuel breaks than woody shrubs, because of lower fuel height, ease of fireline construction, and reduced total heat output compared to woody shrubs (Green and Schimke 1971). During the second decade after treatments, shrub cover in plantations would be maintained between 10–20 percent (SNFPA, FEIS, volume 1, chapter 2, p. 57). The Watdog "Silviculture Report," appendix A, table A-9 contains the competing vegetation cover and average height for each stand.

Effects of Alternative A. Without disturbance, the trend toward older age classes of shrubs would continue. Older brush is more fire prone than younger age classes because more branches die and the dead-to-green branch ratio increases.

3.12.3.22 Effects of Alternatives B, C, and D

DFPZ Treatments.

Mechanical Thinning and Biomass Removal—Thinning or modifying canopy fuels may lead to increased surface fire and spread rate due to increased wind speed, drier and hotter conditions, and increased grass and shrub cover. However, once the surface, ladder, and canopy fuels are treated, potential for a sustained crown fire would decrease (Graham et al. 2004; Scott 2003; Peterson et al. 2005).

Implementation of alternative B, C, or D would result in an improved mix of age classes and seral stages in competing vegetation. Grasses, forbs, and other herbaceous species would be the first to reestablish on the site and could retard or minimize the reinvasion or sprouting of woody shrubs or

brush species. However, younger, more recently established brush would be preferred because the lower dead to green branch ratio makes young brush less fire-prone than older brush.

Under alternative C, all CWHR Size Class 4 stands would be thinned to a 40 percent canopy cover. Alternative D would thin CWHR Size Class 4 and 5 stands to 50 percent canopy cover. Crown closure in these stands would provide enough shade to retard or minimize germination or sprouting of brush. Alternative D would have the least amount of brush regrowth.

Mastication and Grapple Piling—Effects of alternatives B, C, and D are expected to be the same. Excess brush and small trees up to 9.9 inches dbh would be masticated (ground or chipped) and left as mulch on the soil. For example, converting 20 tons per acre of understory biomass into small pieces would produce a uniform layer of mulch about one inch deep across the stand (USDA, RMRS-RN-20-1; Sep 2004). This masticated material would provide ground cover, add nutrients to the soil, retain soil moisture, retard brush and weed growth, and control erosion.

Grapple pulling and piling would uproot the large woody brush species (manzanita, deerbrush, and whitethorn). Brush and excess down fuel would be piled away from the residual trees for burning. This type of treatment would cause some impacts on soil porosity and ground cover. See "Section 3.10: Soils" for a discussion of site-specific impacts.

Underburning and Pile Burning—Effects of alternatives B, C, and D are expected to be the same. Shrub growth would temporarily increase after underburning in areas where soil is disturbed by equipment or canopies have been opened up from mechanical thinning or killed in the underburns. This would be a short-term effect, as crowns of residual trees would expand to fill in the canopy openings. In the long term, tree crowns would continue to expand or increase their overlap and canopy density would increase. Shade would continue to increase and shrubs would decline.

Group Selection Treatments

Harvesting, Site Preparation, Reforestation, and Release—Openings created by group selections would enhance the germination and sprouting of various shrubs, herbs, and grass species. In a study conducted on the Plumas National Forest's Challenge Experimental Forest, plant community development in small group selection openings approximately 30, 60, and 90 feet in diameter was studied 28 years after treatment. Conifer and hardwood saplings with a large component of shrubs and mostly perennial forbs dominated the plant community. Most of the shrubs were low in stature (less than 3 feet in height) and tolerant of shade. Normally aggressive shrub species such as manzanita and deerbrush developed poorly and were never really competitive (McDonald and Reynolds 1999).

Release treatments would be used to control competing vegetation. This would involve hand grubbing or scalping, mechanical treatment, and/or mastication of competing plants. Treatments would be scheduled to provide adequate conditions for survival and growth of young conifers. At the time of release, black oak root-crown spouts will be thinned. Three to four of the best black oak sprouts per stump will be retained.

Plantation performance will be monitored the first and third years after group selection harvest to insure successful establishment of regeneration within 5 years. Additional release treatments, interplanting of understocked areas, and thinning of black oak sprouts may be done. Release treatments

would not completely eliminate competing vegetation. Instead, competing vegetation would be present within the stand until conifer canopy cover once again shades out the brush species.

3.12.3.23 Cumulative Effects of Alternative A

Historically, stands in the Watdog Project area had a higher component of shade intolerant species such as ponderosa, Jeffrey, and sugar pine in the overstory. Under the no-action alternative, the understory would be composed primarily of shade-tolerant species, such as white fir and incense cedar, with very few shade intolerant species. Not enough sunlight would reach the ground to ensure the survival of shade intolerant seedlings. Unless fire or some other disturbance creates some openings, the cumulative effects of maintaining the existing stand structure would be a gradual decline of shade intolerant species in the overstory.

Overstocked areas and stressed trees, such as those currently found across the Watdog Project area, are more susceptible to disease and insect infestations. If left untreated, adjacent trees, and eventually adjacent stands, would become infected as the outbreak spreads. Stand growth and vigor would continue to decline. Suppressed and intermediate tree mortality would increase. The cumulative result would be an increase of dead and dying trees that would contribute to fuel ladder build-up.

CWHR or Timber Strata Analysis—Alternative A would not change the current CWHR or timber strata classes, unless a major disturbance such as wildfire, bark beetle infestation, or disease were to occur in the project area.

3.12.3.24 Cumulative Effects of Alternatives B, C, and D

DFPZ Treatments—Removal of diseased and insect-infected trees, especially around stand boundaries, would prevent the spread of mistletoe to the understory or adjacent stands. If some mistletoe-infected trees larger than the upper diameter limit (30 inches dbh for alternatives B and C and 20 inches dbh for alternative D) were retained in the stand, thinning would maintain or improve the vigor of the infected tree allowing it to outgrow and/or better tolerate the infestation (Scharpf and Parmeter 1976, 1982). With improved vigor, the infected trees would be less susceptible to bark beetle attack. Furthermore, since dwarf mistletoe is host-specific, thinning operations would be able to selectively leave non-host tree species in the understory.

CWHR or Timber Strata Analysis for DFPZ Units—Under alternative B, DFPZ thinning would convert stands with dense (greater than 60 percent) canopy cover into stands with open (25–39 percent) or moderate (40–59 percent) canopy cover. In addition, removal of the smaller trees would increase the quadratic mean diameter of the residual stand, moving stands to the next crown size or dbh size class (that is, from CWHR Size Class 3 to 4). Effects for alternatives C and D are similar, except that stands with dense canopy cover would be converted into stands with moderate canopy cover. Removing the smaller trees would also increase the quadratic mean diameter of the residual stand.

The Watdog Project "Silviculture Report," appendix B, table B-1 and figures B-1 through B-4 display the CWHR or timber strata by vegetation type, size class, and canopy cover. Overall, there is little difference in size and canopy cover classes between the alternatives.

In analyzing seral stage diversity (Watdog Project "Silviculture Report," appendix C), for the mixed conifer type, the seedling and sapling (0-1x), poles (2x), small (3a) and large sawtimber (4a) less than 40 percent canopy cover, and the large sawtimber (5c) over 200 years old are below the desired seral stage diversity targets of 100 percent (LRMP, pp. 4-176; 4-187; and 4-194). The small (3bc) and large sawtimber (4bc) greater than 40 percent canopy cover are approximately 450 and 800 percent above the desired seral stage diversity targets, respectively. The large number of acres in the 4bc seral stage could be attributed to protecting and maintaining high canopy cover and tree density for spotted owl PACs, spotted owl habitat areas (SOHAs) and LSOG areas. The 3bc seral stages are mostly younger stands created from past disturbance such as wild fires or timber harvesting. A large portion of acres in the 1x seral stage are attributed to the Devils Gap fire and younger plantations.

Seral stage analysis shows that thinning from below in the DFPZ and group selection harvests for each of the action alternatives would result in minimal change in overall seral stage diversity (figure 3-6). Alternative B would increase the number of acres in seral stage 3a slightly more than alternatives C and D. In order to reach the desired targets for each of the seral stages, more thinning would have to occur in the 3bc and 4bc seral stages; however, this may be unattainable due to the current LRMP amendments.

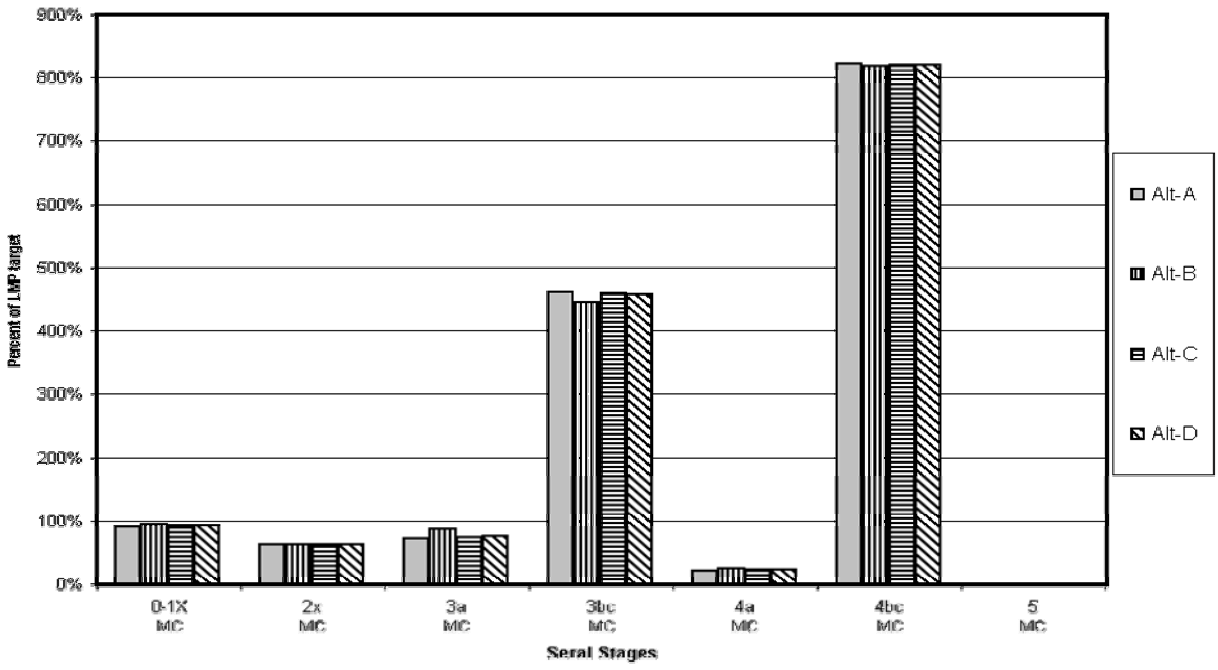


Figure 3-6. Change in seral stage diversity for the Watdog Project alternatives**.**

Group Selection Treatments—Group selection timber harvest would be used to enhance health and vigor of stands and to achieve or maintain desired stocking levels. Group selection harvest would not immediately change the forest structure of a stand from a high fire risk into a fire resilient one, but would initiate changes in forest structure which would occur over an approximately 150 to 200 year rotation. The Watdog Project would begin the process of converting high fire risk stands into more fire resilient stands. Over time, implementation of group selection on a landscape-scale would maintain a wide range of tree ages and size classes from seedlings to large diameter trees. Uneven-aged management, and group selection in particular, results in vertical and horizontal structure more closely associated with pre-settlement forest conditions by breaking up canopy continuity and reducing ladder fuels. This would help change the structure of the forests from even-aged or uneven-aged with a high risk fire ladder potential to the desired condition of uneven-aged, multistory, and fire-resilient. Long-term fire resilience of forested landscapes can be maintained by small group selections conducive to regeneration of fire resistant and shade intolerant ponderosa pine. Group selections permit the maintenance of single canopy layers in any given location, thereby discouraging crown fires (Weatherspoon 1996; Weatherspoon and Skinner 1996).

Because fewer acres of group selection would be implemented under alternative C (151 acres) and alternative D (105 acres) compared to alternative B (231 acres), there would be fewer one to two acre openings for the regeneration and establishment of shade intolerant species. Therefore, these alternatives would result in less long-term change in species composition than under alternative B.

The HFQLG Act includes expectations for treating 0.57 percent of the pilot project acreage annually—or approximately 8,700 acres—using group selection methods (HFQLG FEIS, appendix E). The contribution of the Watdog Project to the annual target for group selection harvest was initially determined to be approximately 14 acres every year or 271 acres every 20 years. However, due to various constraints and land suitability, alternatives B, C, and D propose group selection harvests of 231, 151, and 105 acres, respectively. Alternative B provides 85 percent of the HFQLG expectations for group selection harvests, compared to 56 percent for alternative C and 39 percent for alternative D. For each 20-year re-entry interval, group selection harvests would occur in different portions of a stand to create a mosaic of different age and size classes within a stand.

CWHR or Timber Strata Analysis for Group Selection—Canopy cover in group selection units is currently characterized as open (25–39 percent), moderate (40–59 percent) or dense (greater than 60 percent). Group selection timber harvest would result in stands with portions of non-stocked or sparse canopy cover (0–9 percent or 10–24 percent, respectively). Group selection units with residual large conifers (greater than 30 inches dbh) would develop into multilayered CWHR Size Class 6 stands once planted and natural conifer seedlings become established and contribute to canopy cover. Group selection units would affect less than 8 percent of the total CWHR 4 and 5 stands that are located within the DFPZ and Group Selection treatment units. Overall, group selection harvests would affect approximately 5.3 percent of the treatment area (Watdog Project "Silviculture Report," appendix H, table H-3). On a management area basis, group selection harvests would result in minimal changes in overall seral stage diversity (figure 3-1).

3.12.4 Irreversible, Irretrievable Effects

Alternative A—There would be an irretrievable loss of growth on the larger overstory trees from not thinning the understory or the suppressed and intermediate trees.

Alternatives B, C and D—There would be an irretrievable loss of growth from the natural and planted seedlings within the group selection areas due to retaining trees larger than 30 inches dbh.

3.12.5 Summary of Cumulative Effects

See the "Scope of Analysis" section above for the determination of the geographic and timeframe boundaries for the cumulative effects analysis.

Much of the Watdog Project area has been impacted by mining and logging over the past 150 years. Past natural and human disturbances are inherently reflected in the condition of the current landscape. For example, pole sized trees likely developed due to disturbance within the last half century, whereas small to medium sized trees most likely grew from disturbances 50 to 150 years ago. Since many of these changes were not recorded or were limited to second hand or unreliable sources, effects of the relevant historic actions are described qualitatively rather than quantitatively.

Nonetheless, the relevant existing impacts related to past natural event (i.e., fires, insect and disease outbreaks) and the lingering effects of past projects were taken into account for the VESTRA timber type GIS analysis, which were based on year 2000 aerial photograph interpretation. The aerial photograph interpretation reanalyzed all of size classes (sapling, poles, small trees, etc.) and canopy cover (open, sparse, moderate, and dense) from all of the past actions for each timber or vegetation type within the VESTRA coverage area (developed for the Plumas-Lassen Administrative Study). This analysis was used to determine existing conditions for vegetation resources and is available as a GIS shape file or coverage. In addition, past, present, and reasonably foreseeable future actions not captured by the most recent aerial photographs and vegetation analysis are analyzed quantitatively in order to adequately estimate cumulative effects of the actions on vegetation attributes.

Table 3-1 displays the past, present and foreseeable future actions within the Watdog Project area and the surrounding areas. The table displays the acres for each project, the type of activity, and the number of acres that are located within the Watdog Project area. The Watdog Project "Silviculture Report," appendix A, table A-30 displays the effects analysis for each project on vegetation attributes (i.e., species composition, forest health, canopy cover, seral stage diversity, etc.) by project area and management area. The Watdog Project "Silviculture Report," appendix A, table A-31 quantitatively displays the proportional impact of each project and corresponding treatments (i.e., thinning, group selection, and underburning) on affected management areas and watersheds. Interpretation of these analyses is provided below.

Vegetation Attributes and Seral Stage Diversity. There are no reasonably foreseeable or future projects within the Watdog Project area that are expected to affect vegetation attributes. However, there are adjacent projects (Slapjack and Pinchard Creek) that overlap some of the Feather Falls (#10), Pinchard (#12) and Lost Creek (#13) management areas where the Watdog Project is located. Although resource advisory committee or other grant funding may become available to private landowners to

construct or maintain fuel breaks on their lands after the Watdog Project is approved, no such projects are foreseen at this time.

For the projects listed in the Watdog Project "Silviculture Report," appendix A, table A-30, the majority would have no cumulative effects on vegetation attributes (i.e., species composition, forest health, canopy cover, seral stage diversity, etc) since they are outside the Watdog Project area; the Feather Falls (#10), Pinchard (#12), and Lost Creek (#13) management areas; and the Fall River and Pinchard Creek watersheds. In addition, since less than two trees per acre would be removed for hazard tree projects, hazard tree projects have been determined to have no direct, indirect, or cumulative effects to vegetation attributes (i.e., species composition, forest health, canopy cover, seral stage diversity, etc.) and would not change seral stage diversity classes nor change the size or density classes of the California wildlife habitat relationship (CWHR) vegetation types (see the Watdog Hazard Tree Cumulative Effects Supplement to the Watdog Project Silviculture Report). The desired conditions for maintaining various seral stages or timber strata by vegetation type, size class, and canopy cover (i.e., CWHR) does not include privately-owned lands. Therefore, harvest or thinning projects on private property would have no cumulative effects on vegetation attributes for the Watdog Project. Furthermore, two projects, (the Noxious Weed Treatments and the Grazing Allotment) would have no cumulative effects since they would not change vegetation attributes.

Watdog Project treatments would occur on approximately 4,400 acres , which represents less than five percent of the Feather Falls (#10), Pinchard (#12), and Lost Creek (#13) management areas and less than eighteen percent of the Fall River and Pinchard Creek watersheds (Watdog Project "Silviculture Report," appendix A, table A-31). The South Fork, Slapjack, and Pinchard Creek projects are all located outside the Watdog Project area and would have no cumulative effects on vegetation attributes of the Watdog Project. The South Fork and Slapjack projects are located outside the Fall River and Pinchard Creek watersheds and would also have no cumulative effects on vegetation attributes for the Watdog Project. However, the South Fork (2004), Slapjack (2006), and Pinchard Creek (2009) projects would have minimal cumulative effects on the management areas #10, #12, and #13 of the Watdog Project.

South Fork DFPZ project treatments would affect approximately 1,700 acres of the Lost Creek (#13) management area (Watdog Project "Silviculture Report," appendix A, table A-31). Mastication (400 acres or 0.8 percent of the management area) and underburning (1,410 acres or 2.8 percent of management area) treatments would not change seral stage diversity. Salvage and thinning from below treatments would have minimal effects in seral stage diversity. The salvage (31 acres or 0.1 percent of management area) would slightly increase the seedling and sapling size class and the thinning from below (840 acres or 1.7 percent of management area) would slightly decrease stands with dense (greater than 60 percent) canopy cover into stands with moderate (40–59 percent) canopy cover.

Approximately 1,017 acres of the Slapjack project is located within the Feather Falls (#10) management area with the remainder located in the Challenge (#11) management area. Treatments in management area #11 would not contribute to cumulative changes in seral stage diversity analyzed for the Watdog Project. The Slapjack project treatments would affect less than 7 percent of the Feather Falls (#10) management area (Watdog Project "Silviculture Report," appendix A, table A-31). The DFPZ thinning would convert stands with dense (greater than 60 percent) canopy cover into stands with moderate (40 to 59 percent) canopy cover. In addition, removal of the smaller trees would increase the

quadratic mean diameter of the residual stand, moving stands to the next crown size or dbh size class (i.e., from CWHR Size Class 3 to 4).

DFPZ thinning treatments would result in minimal changes in seral stage diversity in the Feather Falls management area. Mastication in natural stands would slightly change seral stage diversity from a lower size class to a higher size class by removing the understory vegetation. Mastication in the plantations, hand thinning and underburning treatments would not change seral stage diversity in the analysis area. Group selection harvest would change the stands with open (25 to 39 percent), moderate (40 to 59 percent) or dense (>60 percent) canopy cover into stands with portions that are non-stocked (0 to 9 percent) or sparse (10 to 24 percent) canopy cover. The individual tree selection treatments would slightly decrease the number of stands with dense (greater than 60 percent) canopy cover into stands with moderate (40 to 59 percent) canopy cover.

Although the proposed action is still in the early stages of development, the Pinchard Creek project is expected to include approximately 500 acres of group selection, 500 acres of individual tree selection treatments, and 5 to 10 acres of aspen enhancement within the Feather Falls (#10) and Pinchard (#12) management areas or the Pinchard Creek and Fall River subwatersheds, but not within the Watdog Project area. Aspen enhancement (5 to 10 acres) would have no cumulative effects (0.02 to 0.04 percent of the management area or watershed). Group selection harvest (500 acres or 1.0 percent of the management area or 1.9 percent of the watershed area) would change stands with open (25 to 39 percent), moderate (40 to 59 percent) or dense (>60 percent) canopy cover into stands with portions that are non-stocked (0 to 9 percent) or sparse (10 to 24 percent) canopy cover (Watdog Project "Silviculture Report," appendix A, table A-31). Individual tree selection treatments (500 acres or 1.0 percent of the management area or 1.9 percent of the watershed area) would slightly decrease the number of stands with dense (greater than 60 percent) canopy cover into stands with moderate (40 to 59 percent) canopy cover (Watdog Project "Silviculture Report," appendix A, table A-31).

In conclusion, treatments under the Watdog Project, along with the South Fork, Slapjack, and Pinchard Creek projects, would result in minimal changes in seral stage diversity from existing conditions for the Feather Falls (#10), Pinchard (#12), and Lost Creek (#13) management areas. Seral stage analysis for the Watdog Project indicates that thinning from below in the DFPZ and group selection harvests would result in minimal changes in overall seral stage diversity (Watdog Project "Silviculture Report," appendix C). Effects are likely to be comparable for the other projects considered in this analysis because of the similarity of treatments. In order to reach the desired targets for each of the seral stages, more thinning would have to occur in the small to large sawtimber with canopy cover greater than 40 percent seral stages. However, this may be unattainable due to the current LRMP amendments related to canopy cover and basal area requirements as listed in the SNFPA, HFQLG Act FEIS, and ROD.

DFPZ Maintenance. In July of 2003, a ROD was signed for the HFQLG FSEIS. It documented the results of an environmental analysis of effects of alternative management strategies for maintenance of DFPZs within the HFQLG Pilot Project area. The 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. DFPZ maintenance methods were developed from criteria in this HFQLG FSEIS involving land allocations, slope classes, and vegetation characteristics (Appendix H: Watdog Defensible Fuel Profile Zone Monitoring and Maintenance Guidelines).

The HFQLG FSEIS ROD calls for consideration of all practicable methods of vegetation control for site-specific projects, including the use of herbicides. As pointed out in the HFQLG FSEIS, herbicides have to be used within about two years of the initial treatment in order to be effective.

By not including the use of herbicides for the Watdog Project at this time, their use for DFPZ maintenance is essentially precluded. If mastication does not achieve DFPZ objectives in all treatment units, an underburn would be used as a follow-up treatment to meet short-term objectives. In the long term, the foreseeable maintenance of the DFPZ would consist of prescribed fire, mechanical (i.e., mastication, grapple pulling), and hand treatments. Specific maintenance treatments would be determined based on site-specific analysis of land allocations, slopes, vegetation types, and previous underburning treatments (Units 1, 9, 15, 19, and 23).

About 20 percent of the proposed Watdog DFPZ is in plantations. 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 within five years of the initial treatment. However, young shrubs, especially ceanothus species common in the area, have a high percentage of live material that maintains high fuel moisture content throughout the year. Younger shrubs are less flammable than older shrubs, since younger shrubs have a lower proportion of dead to live branches than older shrubs.

Ceanothus and other shrub species with high fuel moisture content can act as heat sinks. They can absorb some of the heat produced by adjacent burning fuels without igniting, thereby retarding fire spread. For example, the Mosquito Fire in August of 1999 started from a lightning strike adjacent to a nine year old plantation of primarily ponderosa pine with a high component of ceanothus shrubs, much like many of the plantations in the Watdog Project area. 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.

The remaining 80 percent of the project area is made up of more natural stands of larger sized trees where the vegetation has not been as intensively treated. After completion of proposed thinning, biomass removal, mastication, and burning activities, some slow to moderate development of manzanita, ceanothus, and other shrubs will occur, and, in some areas, grasses will become more vigorous and dense. As the overstory canopy cover increases, suppression of shrub growth would begin and overall shrub cover would decrease. Since mastication would not change canopy cover levels, or only slightly change them, understory growth is expected to be least in these units. There would also be some natural regeneration of conifers over time. Conifer regeneration could reduce DFPZ effectiveness by creating fuel ladders within 10–20 years after the initial treatment, depending on the site.

Even if no maintenance is conducted in these DFPZs in the future, the DFPZs should be effective for many years. In the natural stands, the DFPZs' effectiveness should not be seriously reduced for 10 to 20 years. In the plantations, the DFPZs' effectiveness should not be reduced for approximately 5 years. Even after that time, the DFPZs will retain many beneficial characteristics such as increased overstory crown spacing and reduced ladder fuels that will aid in fighting fire and reducing fire intensity. For example, the proposed action will remove a significant amount of ladder fuel, so even if significant amounts of understory vegetation grow in the treated stands over the next several years, the result will be a net loss in accumulated fuels. Additionally, Forest Service staff could conduct emergency maintenance and rapidly restore full efficacy to the DFPZ in the event of an oncoming wildfire.

3.13 Wildlife and Fish

3.13.1 Introduction

This section of the EIS summarizes the effects of the proposed action and alternatives on the TES species and MIS analyzed in detail in the Watdog Project BA/BE and MIS Report (available upon request, and incorporated by reference).

The BA/BE, MIS Report and supporting documents (on file at the Feather River Ranger District office) include complete discussions of possible effects of the proposed project and alternatives on:

- **Threatened and endangered species.** TES are those listed under the Federal Endangered Species Act. Endangered species are species that are in danger of extinction throughout all or a significant portion of their range (16 U.S.C. 1532). Threatened species are species that are likely to become endangered species throughout all or a significant portion of their range (16 U.S.C. 1532).

- **Proposed and candidate species.** A proposed species is any species that is proposed in the *Federal Register* to be listed as a threatened or endangered species under the Endangered Species Act (50 CFR 402.03). A Candidate species may become a proposed listed species. The U.S. Fish and Wildlife Service (USFWS) recently changed its policy on candidate species. The term "candidate" now strictly refers to species for which the service has on file enough information to warrant or propose listing as endangered or threatened.

- **Forest Service Sensitive Species.** Sensitive wildlife are those species, generally Federal candidates for listing or species of concern, that have been designated by the Forest Service as needing special management attention because of viability concerns. The Forest Service manages these species to ensure that these species will not require listing as threatened or endangered.

- **Federal Species of Concern (SOC).** Former "candidate category 2" species for which listing is possibly appropriate but for which the U.S. Fish and Wildlife Service lacks sufficient information to support a listing proposal are now called "Species of Concern." SOC are only analyzed if they are also listed as Forest Service Sensitive species.

- **Management Indicator Species** are used in project analyses because their population changes are believed to indicate whether management activities are having an effect on the viability and diversity of animal and plant communities, and their habitats.

- **Neotropical Migratory Birds (NTMBs)** are of special concern because they breed in North America. Due to their sensitivity to environmental change, NTMB species serve as an "early warning" system for alteration of ecosystem structure and function.

3.13.2 Species Considered in the Analysis

Threatened, Endangered, and Sensitive Species. Table 3-47 lists species for which habitat availability and suitability was considered for this project. The table includes determinations made based on the analysis of the proposed project disclosed in the BA/BE, available data, and on the following assumptions: full implementation of identified mitigations and complete compliance with the Plumas National Forest LRMP as amended. Determinations (Summary of Effects) below are discussed in more detail in "Section 3.13.8: Determinations."

In this section, the environmental consequences of the proposed activities will be summarized for those species with a determination of "may affect individuals, but not likely to result in a trend toward Federal listing or loss of viability" for the action alternatives (table 3-47). Species with a "will not affect" determination will not be discussed in this section; see the BA/BE for the discussion of no effects for these species.

Of the species listed in table 3-47, several were eliminated from detailed study for the Watdog Project on the basis that: (1) they are known to be found at much lower or higher elevations, or much further north or south of the project area, (2) suitable habitat is not found within the project area, and (3) surveys within or near the project area did not locate any individuals. Species listed in table 3-48 were not analyzed in detail for the Watdog Project.

Management Indicator Species (MIS). The ROD for the Plumas National Forest LRMP (LRMP 1988) states that viability of species not on the Federal Endangered Species List will be maintained if adequate quality habitat is provided. In addition, the ROD states that the Plumas will conduct selected species surveys, if needed, to establish background population levels on those species where information is lacking. The Plumas National Forest LRMP lists 20 Management Indicator Species while Appendix G details the habitat for which these species occur. Management Indicator Species for which habitat was considered in this document are: California spotted owl, Northern goshawk, American marten, mule deer, and trout group. The California spotted owl, Northern goshawk, and American marten are also Forest Service Sensitive species and were addressed in the BA/BE as well as the "MIS Report."

A listing of MIS species (not including those species that are Threatened, Endangered and Sensitive [TES]) and habitat rating can be found in table 3-40 (p. 3-98) of the HFQLG Act FEIS (USDA FS 1999). This document summarizes information and indicates which MIS species could benefit from Pilot Project Construction activities, which could experience a loss of habitat values, and which species' habitat value would remain the same.

In the HFQLG Act FEIS BE/BA table 3-25, numerical CWHR values for pre-DFPZ construction were compared with expected changes in habitat post-DFPZ construction. The numbers generated provide two sets of information when compared to current conditions: the comparative trend in habitat value (expressed here as the percent change in habitat value) and whether there are any changes in the habitat rating (Low, Moderate, or High).

Table 3-47. Status of Threatened and Endangered, and Forest Service Sensitive species that potentially occur on the Plumas National Forest. Environmental consequences for those species indicated with an asterisk (*) will be summarized in this EIS.

Species	Category	Summary of Effects	
		No-Action Alternative	Action Alternatives
Invertebrates			
Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)	Endangered	WNA[a]	WNA
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Threatened	WNA	WNA
Fish			
Winter-run Chinook salmon (*Oncorhynchus tshawytscha*)	Endangered	WNA	WNA
Central Valley steelhead (*Oncorhynchus mykiss*)	Threatened	WNA	WNA
Delta smelt (*Hypomesus transpacificus*)	Threatened	WNA	WNA
Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)	Threatened	WNA	WNA
Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	WNA	WNA
Hardhead minnow (*Mylopharodon conocephalus*)	Sensitive	WNA	WNA
Amphibians			
California red-legged frog (*Rana aurora draytonii*) *	Threatened	WNA	WNA
Critical habitat for California red-legged frog	Proposed	WNA	WNA
Foothill yellow-legged frog (*Rana boylii*) *	SOC[b]/Sensitive	WNA	MAI[c]
Mountain yellow-legged frog (*Rana muscosa*) *	Candidate/Sensitive	WNA	MAI
Northern leopard frog (*Rana pipiens*)	Sensitive	WNA	WNA
Reptiles			
Northwestern pond turtle (*Clemmys marmorata marmorata*) *	SOC/Sensitive	WNA	MAI
Birds			
Bald eagle (*Haliaeetus leucocephalus*)	Protected[e]/MIS	WNA	WNA
American peregrine falcon (*Falco peregrinus anatum*)	SOC/Sensitive/MIS[d]	WNA	WNA
Northern goshawk (*Accipiter gentilis*) *	SOC/Sensitive/MIS	WNA	MAI
California spotted owl (*Strix occidentalis occidentalis*) *	SOC/Sensitive/MIS	WNA	MAI
Great gray owl (*Strix nebulosa*)	Sensitive	WNA	WNA
Willow flycatcher (*Empidonax trailii brewsteri*)	SOC/Sensitive	WNA	WNA
Greater sandhill crane (*Grus canadensis tabida*)	SOC/Sensitive	WNA	WNA
Swainson's hawk (*Buteo swainsoni*)	SOC/Sensitive	WNA	WNA
Mammals			
Sierra Nevada red fox (*Vulpes vulpes necator*)	SOC/Sensitive	WNA	WNA
American marten (*Martes americana*) *	SOC/Sensitive/MIS	WNA	MAI
Pacific fisher (*Martes pennant pacifica*) *	Candidate/Sensitive	WNA	MAI
California wolverine (*Gulo gulo luteus*) *	SOC/Sensitive	WNA	MAI

Table 3-47. Status of threatened and endangered species that potentially occur on the Plumas National Forest. Environmental consequences for those species indicated with an asterisk (*) will be summarized in this FSEIS (continued).

Species	Category	Summary of Effects	
		No-Action Alternative	Action Alternatives
Invertebrates			
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. WNA = Will not affect.

b. SOC = Species of Concern.

c. MAI = May affect, not likely to adversely affect individuals or result in a trend toward Federal listing.

d. MIS = Management Indicator Species.

e. Species protected under "Bald and Golden Eagle Protection Act"

Table 3-48. List of species not analyzed in detail for the Watdog Project.

Species	Category*	Rationale for Elimination from Detailed Study
Winter-run chinook salmon	Endangered	No known habitat on Feather River District
Central Valley spring-run chinook salmon	Threatened	
Delta smelt	Threatened	
Central Valley steelhead	Threatened	
Lahontan Cutthroat trout	Threatened	
Sierra Nevada red fox	SOC[a]/Sensitive	No known habitat and no observations within project area
Carson wandering skipper	Endangered	
Valley elderberry longhorn beetle	Threatened	
Northern leopard frog	Sensitive	
Greater sandhill crane	SOC/Sensitive	
Bald eagle	Protection Act/MIS[b]	
American peregrine falcon	SOC/Sensitive/MIS	
Swainson's hawk	SOC/Sensitive	

Notes:

a. SOC = Species of Concern.

b. MIS = Management Indicator Species.

The MIS whose habitat would be either directly or indirectly affected by the Watdog Project, identified as Category 3 in table 3-49, 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 selected for Project-Level MIS analysis for the Watdog Project are: California spotted owl, Northern goshawk, American marten, mule deer, and trout group.

Table 3-49. Management Indicator Species, Plumas National Forest, and selection of MIS for Project-Level Analysis for the Watdog Project.

Management Indicator Species	Species Status	LRMP Habitat Indicator	Category for Project Analysis*
Bald eagle (*Haliaeetus leucocephalus)*	Protection Act	Mature forest adjacent to open water bodies	Category 1
Peregrine falcon (*Falco peregrinus anatum*)	Forest Service Sensitive	Cliff nesting habitat	Category 1
California Spotted Owl (*Strix occidentalis occidentalis)*	Forest Service Sensitive	Mature, mixed conifer conditions	Category 3
Northern goshawk (*Accipiter gentilis*)	Forest Service Sensitive	Mature, mixed conifer and red fir conditions	Category 3
American marten (*Martes Americana*)	Forest Service Sensitive	Mature, red fir conditions	Category 3
Mule deer	Harvest	Early seral, shrub	Category 3
Canada goose (*Branta canadensis*)	Harvest	Wetlands	Category 1
Golden eagle (*Aquila chrysaetos*)	Special Interest	Open forest	Category 2
Prairie falcon (*Falco mexicanus*)	Special Interest	Early seral/cliff	Category 1
Trout Group – Rainbow (*Oncorhynchus mykiss*)	Harvest	Coldwater aquatic	Category 3
Trout Group – Brook *(Salvelinus fontinalis)*	Harvest	Coldwater aquatic	Category 1
Trout Group – Brown *(Salmo Trutta)*	Harvest	Coldwater aquatic	Category 3
Largemouth bass (*Micropterus salmoides*)	Harvest	Warmwater aquatic	Category 1

Notes:

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

Neotropical Migratory Birds are protected under the *Migratory Bird Treaty Act* (1918) based on their international importance. The list of NTMB within the California region includes a broad number of habitat associations (USDA 1994, as cited in HFQLG Act FEIS). The Breeding Bird Survey coordinated by the U.S. Fish and Wildlife Service indicates that certain populations of NTMB species in California have been declining over the past 26 years (1996 data, as cited in HFQLG Act FEIS). Although there appear to be multiple causes for declines, habitat fragmentation and decreases in habitat quantity and quality, caused by changes in land use, seem to be largely responsible (Sherry and Holmes 1993, as cited in HFQLG Act FEIS and Terborgh 1992, as cited in HFQLG Act FEIS).

In 1996 the Region 5 "Partners in Flight" working group developed a list of "High-Priority Land Bird Species for Monitoring Efforts" for the Sierra Nevada Bioregion. This list identified three species that are within the pilot project area. They are the great gray owl, willow flycatcher and the Swainson's thrush (SWTH). The great gray owl and willow flycatcher are discussed as Forest Service Sensitive species. The SWTH is considered under the Neotropical Migratory Bird (NTMB) category.

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 agency's 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 across the landscape.

3.13.3 Scope of the Analysis

The project area is defined as the area within which DFPZs, group selection and habitat restoration opportunities such as black oak restoration, culvert removal or upgrade to improve fish passage, meadow restoration and streambank stabilization would occur. Proposed DFPZ and group selection activities would be confined to treatment units as shown in maps 2, 3, and 4 in appendix C of this Watdog FSEIS. The project area is located in predominately Sierra mixed conifer (SMC) forest habitat at elevations ranging from 3,000 to 6,200 feet.

3.13.3.1 Geographic Scope of the Analysis

The analysis area for determining direct and indirect effects to terrestrial wildlife includes proposed treatment units and adjacent lands approximately half of a mile from the outer boundaries of the treatment units (see map 10 in appendix C). This includes 22,659 acres of National Forest System lands and 3,254 acres of private land for a total of 25,913 acres. The boundary for the terrestrial wildlife analysis area was chosen based on several factors. The analysis area is surrounded by; 1) a large area of off base and deferred lands (Feather Falls Scenic Area, Wild and Scenic Middle Fork Feather River) to the north and west; 2) Late Successional Old Growth Ranks 4 and 5 to the southeast and west; and 3) Roadless Area to the north (see map 1 in Appendix C). The Middle Fork Feather River provides a natural topographic boundary for the movement of terrestrial wildlife and a large buffer of relatively undisturbed habitat. The analysis area for direct and indirect effects is large enough in size to apply Region 5 Protocol surveys for all potentially affected TES species. Surveys were conducted within potentially suitable habitat for all TES species.

The analysis area for aquatic species includes thirty subwatersheds ranging from 471 acres to 4,478 acres with a total analysis area of 44,792 acres of private and Federal lands. More information about the subwatersheds can be found in "Section 3.7: Hydrology," of this HFQLG Act FEIS. The major rivers in the analysis area include the South Branch Middle Fork Feather River, the Middle Fork Feather River, and the South Fork Feather River.

For cumulative effects, the analysis area included past, present, and reasonably foreseeable actions in and near the Watdog Project area as discussed in Section 3.1.3 on approximately 25,913acres. As shown on map 10 in appendix C, this primary analysis area includes at least a 0.5 mile buffer around the project boundary. The cumulative effects analysis area was also expanded to include adjacent HFQLG Projects on approximately 153,000 acres. This expanded look was solely to provide a brief discussion of projects adjacent to the Watdog Project such as Basin, Bald Mountain, Bald Onion, South Fork and Brush Creek Projects. As shown on map 13 in appendix C, this analysis area ranges from the vicinity of New Bullards Bar Reservoir in the south to Bucks Lake in the north, and from Cresta in the west to Little Grass Valley Reservoir in the east. Specific vegetation treatment projects considered in the cumulative effects analysis are discussed in the "Cumulative Effects" sections for each species.

3.13.3.2 Time Frame for the Analysis

The time frame for determining cumulative effects depends on the length of time past effects continue on into the future. This will vary widely between species because some wildlife, such as the California spotted owl, require large home range areas with mature, multi-canopy forests and diverse habitat components such as snags and large woody material. Other species, such as the Townsend's big-eared bat, require smaller home range areas and simpler habitats such as caves with riparian foraging habitat.

Consequently, the analysis timeframe will vary for each species and will be dependant in part on past actions where species are located or in areas with suitable habitat. However, from the broadest perspective the time frame for past cumulative effects is approximately 20 to 25 years.

The western slope of the Sierra Nevada in the Plumas National Forest has a high rate of vegetation establishment and growth due to high annual precipitation and highly productive forest soils. Within the 20–25 year timeframe, thinned DFPZs and ITS stands (and similar treatments) generally have had sufficient opportunity to increase canopy closure, basal area, tree density and understory regrowth to develop into mature, multi-canopy forests with diverse habitat components. DFPZ stands treated by mastication, handcut-pile-burn and/or underburns will likely recover some level of understory regrowth within a few years. Acres treated by group selection could require approximately 30–50 years to become suitable habitat for mature/older-forest dependent species and would remain as forest openings for many years. Approximately 10 percent of the canopy is expected to be retained within group selection openings.

Although the effects of the Watdog Project may last for many years into the future, this analysis focuses on the disclosure of potential cumulative effects associated with reasonably foreseeable future actions. Future projects have been identified through 2010 (for the life of the HFQLG FEIS).

3.13.4 Regulatory Framework

The Plumas National Forest LRMP provides specific information on the management of Threatened, Endangered, Proposed and Sensitive species on the Forest. These include forest-wide goals and policies for wildlife, fish and sensitive plants (p. 4-4) and Riparian Areas (p. 4-7), Wildlife objectives (p. 4-14, 4-15, and 4-19), forest-wide direction and standards and guidelines for wildlife, fish, and sensitive plants (p. 4-29 through 4-35). Direction is also found under other areas (for example, timber management) that

directly or indirectly affect animal species and/or their habitats. Management guidelines incorporate regional direction for each species.

The LRMP has been amended by the HFQLG Act of 1999 and the SNFPA ROD and FSEIS (USDA 2004). Guidelines required for compliance with HFQLG Act FEIS (USDA 1999) are listed in the BA/BE. The SNFPA ROD provides implementation direction for the National Forests in the HFQLG Act Pilot Project Area, consistent with the HFQLG Act and alternative B of the HFQLG Act FEIS. All action alternatives considered in this FSEIS would comply with standards and guidelines listed in the SNFPA ROD (p. 68–69) and species-specific management direction provided in the SNFPA ROD.

3.13.5 Analysis Methods

This section discloses the methods used in the analysis of project effects on wildlife. Wildlife surveys were based on habitat typed as suitable and followed Region 5 survey protocols for California spotted owls, Pacific fisher, amphibians and other target species. Surveys for species varied in scale; for example the California spotted owl surveys extended as much as 1/2 mile from the outer boundaries of the treatment units, whereas surveys for amphibians were targeted to streams.

3.13.5.1 California Red-legged Frog, Mountain Yellow-Legged Frog, Foothill Yellow-Legged Frog, and Northwestern Pond Turtle

Over the past several years, amphibian surveys have been conducted on the Plumas National Forest. Most of the surveys have been conducted where biologists have identified possible habitat based on elevation, gradient, existing ponds, and historical references. Since 1990, surveys have been conducted for some specific projects, such as Stream Condition Inventories, range allotments, timber sales, land exchanges or mining claims. In many cases observations were incidental, meaning that the observer was not specifically looking for frogs or turtles.

The “Standard Anuran Survey Protocol” was developed specifically to find amphibian species in Sierra Nevada habitats (Martin et al. 1993). The Plumas National Forest used this protocol to a very limited extent between 1993 and 1995. In 1993 the Plumas National Forest used this protocol to survey the best habitat within randomly selected townships. In 1995, surveys were conducted of suitable habitat between the South Fork of the Feather River and Ponderosa Reservoir.

Surveys for the Watdog Project followed “A Standardized Protocol for Surveying Aquatic Amphibians” (Tech. Rpt NPS/WRUC/NRTR-95-01; Fellers and Freel May 1995) and “Survey Protocol for the California Red-legged Frog,” (USFWS 1995). There is a more recent California Red-legged Frog Survey Protocol from the USFWS (2005). Based on past surveys and ongoing monitoring and surveys, the USFWS agreed that surveys for the Watdog Project met the requirements of the 2005 protocol (Kathy Brown, USFWS, pers. comm.).

Surveys for northwestern pond turtles are generally completed as part of joint amphibian and reptile surveys described above. If not, they follow the “Western Pond Turtle Survey Methods” by Devin Reese, 1993.

3.13.5.2 California Spotted Owl

The report entitled *The California Spotted Owl: A Technical Assessment of Its Current Status* (also called the CASPO Report) identified areas of concern within the range and distribution of the California spotted owl (USDA Forest Service 1992). These areas of concern currently limit the owl population and are identified simply to indicate potential areas where future problems may be greatest if the owl's status were to deteriorate. Two areas of concern were identified in the CASPO Report. These areas are located adjacent to the Plumas National Forest on the Lassen National Forest (p. 46–49 of CASPO Report). Neither is within the Feather River Ranger District of the Plumas National Forest, the Watdog Project area, or the cumulative effects analysis area.

Pacific Southwest research stations biologists involved with the Plumas and Lassen National Forests Administrative Study have been gathering data on California spotted owls in the Plumas National Forest since 2002. One objective of their study is to monitor how changes in habitat due to vegetation management projects affect the owls. The study objectives and methodologies are outlined in *Fire and Fuels Management, Landscape Dynamics, and Fish and Wildlife Resources: Study Design for Integrated Research on the Plumas and Lassen National Forests*, June 11, 2003. Knowledge gained through the case study would allow for adaptive management to be applied to future projects.

Prior to the issuance of the 2004 SNFPA ROD, the 2001 SNFPA ROD served as the California spotted owl strategy for National Forests in the Sierra Nevada. The 2001 SNFPA ROD document has been superseded by the 2004 SNFPA ROD, which now provides the current California spotted owl strategy.

The Forest has conducted project-related surveys for the California spotted owl since the 1992 field season. A two-year protocol level survey for the California spotted owl in the direct/indirect effects analysis area was completed in 2002 and 2003. Additional surveys were completed in 2004. Most owl observations were associated with established PACs. A new PAC, BU073, was created to encompass an activity center for a non-nesting pair. Surveys follow the "Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas," Region 5; March 12, 1991 (revised February 1993).

3.13.5.3 Northern Goshawk

Northern goshawk surveys were conducted in 2002 and 2003. A new PAC (R05F11AD03T53) has been added near Bear Creek for an active nest discovered in 2003. Another new PAC (R05F11AD03T48) was established to encompass an active nest with one juvenile goshawk that was discovered in 2004. These two new PACs are partly within the analysis area. Surveys follow the "Survey Methodology for Northern Goshawks in the Pacific Southwest Region, U.S. Forest Service," Region 5; May 14, 2002.

3.13.5.4 Forest Carnivores

In 1995 the Plumas National Forest designated a "draft" forest carnivore network that consisted of old forest blocks connected by riparian corridors. The old forest blocks included California spotted owl and Northern goshawk PACs, Special Interest Areas, and the Wild and Scenic Areas with some additional mature/old forestlands. A forest carnivore corridor was established along the Middle Fork of

the Feather River as part of the larger "draft" network. The "draft" forest carnivore network provides for linkages across the landscape for Sierra Nevada red fox, fisher, marten and wolverine. The Plumas LRMP does not provide specific management guidelines for forest carnivores, but does instruct the Forest to maintain viability of State-listed species.

During the last decade, several thousand acres of potential carnivore habitat across the Forest (approximately 50 percent of the Forest) have been systematically surveyed to protocol using track plates and camera stations. To date, there have been no fisher, marten, or wolverine observations associated with these surveys. Surveys follow the "American Marten, Fisher, Lynx, and Wolverine: Survey Methods for their Detection," Zielinski/Kucera; Pacific Southwest Research Station (PSW)-GTR-157; August 1995.

3.13.5.5 Pallid, Western Red, and Townsend's Big-eared Bats

The first intensive bat survey work conducted on the Plumas National Forest was completed in June and September of 1991, when independent forest-wide surveys were conducted. None of the species captured were species considered in the BA/BE for the Watdog Project. Additional surveys were conducted in 1992 and pallid bats and western red bats were recorded; however, none were detected in the project area.

From 1996 to 1999, the Sierra Nevada Field Station conducted bat surveys in Plumas and Sierra Counties. Several different species were located, including pallid bats, although none of these sites were near the project area. Prior to 2001, very few bat surveys had been conducted, so the relative abundance and distribution of these species throughout the entire Feather River Ranger District was predominantly unknown. 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 Watdog. Pallid, Western Red and Townsend's Big-eared bats were detected in the Watdog Project area during these surveys. Survey protocol follows an interim protocol approved by Linda Angerer; Forest Service Region 5. In 2006, and currently ongoing in 2007, a pallid bat habitat assessment is being conducted on the Westside of the Plumas NF to determine roost site characteristics in order to assist land managers in managing roost habitat for sensitive bats.

3.13.6 Existing Condition and Environmental Effects

3.13.6.1 Introduction

The section on "Existing Condition and Environmental Effects" is organized as follows:

- Important habitat types are introduced in section 3.13.6.2. This section includes discussion of habitat suitability as influenced by road density and wildfire.
- Mature/Old Forest habitat components and structure are discussed in section 3.13.6.3.
- General effects of the no action alternative (Alternative A) on important habitat types and components are discussed in section 3.13.6.4.

- General effects of the action alternatives (Alternatives B, C and D) on important habitat types and components are discussed in section 3.13.6.5.
- Effects of the alternatives on specific species begins in section 3.13.6.6.

3.13.6.2 Important Habitat Types

The importance of three main habitat types will be discussed in this section:

- Mature/old forest
- Black oak (montane hardwoods)
- Streams, ponds, and other aquatic habitat

Species associated with mature/old forest structure and composition occupy home ranges of widely varying sizes from small areas occupied by small mammals to landscape areas occupied by wide-ranging raptors such as the California spotted owl or carnivores, such as the Pacific Fisher (SNFPA FEIS 1999; chapter 3, p. 111). This applies to aquatic and black oak habitats as well. Aquatic habitat has been shown to have an overall high wildlife diversity and density when compared to the general forest matrix. The SNFPA (ROD 2004, p. 10) goal of protecting and restoring desired conditions of aquatic, riparian and meadow ecosystems and providing for the viability of species associated with those ecosystems remains unchanged. Black oaks provide habitat for species dependent on hardwood habitat as well as forest diversity.

The CWHR system was developed to describe wildlife habitat based on vegetation codes. The CWHR codes for the Watdog Project are Sierran Mixed Conifer and Montane Hardwood. Forest stands are classified based on dominant tree species, tree size, and tree densities. Resulting classes are then rated in regard to habitat value for various wildlife species. CWHR classes with the highest habitat value for mature/old-forest dependent species considered in this document are:

- Size Class 4 (11–24 inches dbh),
- Size Class 5 (greater than 24 inches dbh), and
- Size Class 6 (multi-layered, 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), and
- Density of D (dense canopy closure with 60–100 percent cover).

The analysis of general effects to wildlife habitat focuses on changes to CWHR Size Class 4 and 5 stands brought about by proposed treatments because of the importance of these size classes to a wide variety of wildlife species. No treatments are proposed in CWHR Size Class 6 stands, so this size class will not be discussed further in this section. Each species has specific habitat requirements, so changes in habitat brought about by proposed treatments may affect species in different ways. Species-specific effects are discussed in section 3.13.6.6.

3.13.6.3 Mature/Old Forest Habitat Components and Structure

Although habitat requirements vary widely by species, there are forest components and structures that when altered can have a measurable effect on species (refer to the Watdog Project Wildlife and Fish BA/BE, appendix E for habitat requirement discussions for each species). The HFQLG FEIS/ROD, SNFPA FEIS/ROD and FSEIS/ROD, and associated Wildlife and Fish BA/BEs each identify and discuss the importance of the following habitat components:

Canopy Cover. There is a direct relationship between suitable habitat for mature/old forest dependent wildlife and canopy cover. Many federally listed and Forest Service Sensitive species are associated with these habitats. A moderate to dense canopy cover is important for many wildlife species because it maintains the microclimate within forest stands, provides cover from the harsh weather (snow, rain) provides well-shaded environments with cooler temperatures, provides cover and escape from predators, and higher nutrient soils. Wildlife associated with denser canopy covered forests are also dependent on prey associated with these same forest types.

Large Trees. Mature and older forests typically have more large diameter trees which many wildlife species depend on for survival. Large trees provide protection from adverse weather and the sun, cavities for nesting, limbs for resting and perching, bark for roosting bats, and vegetation and insects for food. In addition, the number of large trees affects the numbers of large trees available as recruitments for future large snags and logs (large woody material).

Snags. Snags are an important structural component in forest communities. Wildlife species that use cavities in live or dead trees for various life functions are referred to as cavity users or nesters, and include representatives from all classes of terrestrial animals. More often than not, cavities are found in dead trees, indicating a dependency of these species on dead trees ranges from absolute to incidental. For some species, the presence of dead trees can spell the difference between local extinction and the perpetuation of existing populations. In forests, cavity-nesting birds may account for 30 to 45 percent of the total bird population (Jackman 1974a; Raphael and White 1984; Scott et al. 1980). Woodpeckers are dependent on snags and other dead wood for nesting, roosting, foraging, and other functions. When abandoned, woodpecker nest cavities are used by other animals (secondary cavity users) for nest sites. Some researchers believe that the use of cavities has allowed birds to become polygamous, nest earlier, have larger clutches, and fledge more young per nesting effort than noncavity-nesting birds (Nice 1957; Steinhart 1981).

The absence of suitable snags can be the major limiting factor for some snag-dependent wildlife populations (Haapanen 1965; Balda 1975). The abundance and diversity of hole-nesting birds are directly related to the dead and dying wood characteristics and general vegetation features of a forest.

Large Woody Material. Dead and down woody materials such as stumps, root wads, bark, limbs, and logs in various stages of decay are important components of wildlife habitats in western forests. 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 utilize dead and down woody materials as either a primary or a secondary component of their habitat requirements. Although many more species are casual users of this material, it is not considered an important enough element to be listed as a habitat requirement. Down logs and large woody debris are also important components of aquatic habitats in forested areas (Swanson et al. 1976).

Most forest ecosystems contain dead and down woody material. This is especially true of the low and high elevation temperate conifer forests where highly productive forest sites are capable of producing large volumes of wood fiber. Large volumes of coarse woody debris are characteristic of unmanaged forest ecosystems. Large down logs can be the dominant feature of old-growth forests, and in numbers, volume, and weight of organic matter, they are an important component (Franklin et al. 1981).

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. Living trees that fall as a result of severe winds, landslides, and floods also are a source of logs. The persistence of large logs has special importance in providing wildlife with habitat continuity over long periods of time and through major disturbances (Franklin et al. 1981). Logs may contribute significantly to reestablishment of animal populations by providing pathways along which small mammals, such as red-backed voles and chipmunks, can venture into clearcuts and other forest openings. Large logs or scattered piles of debris can be important as cover on a site during early stages of succession, enabling wildlife to use forage areas.

Dead and down woody material, and the wildlife that inhabit this material, play an important role in the cycling of nutrients within the forest ecosystem. Large proportions of some nutrients in the forest are contained in trees and leaf litter. This is especially true for phosphorous and nitrogen and to a lesser extent for various other mineral elements. Large amounts of nutrients are stored in branches, twigs, and foliage; smaller amounts are in the main trunk (Zinke et al. 1979).

Black Oak Habitat (Montane Hardwoods). California black oak is a critical species for wildlife and occupies more total area in California than any other hardwood species. Oaks may be the single most important genus used by wildlife for food and cover in California forests and rangelands.

Cavities in the trees provide den or nest sites for owls, various woodpeckers, tree squirrels, and American black bears. Trees provide valuable shade for wildlife during the hot summer months. California black oak forest types are heavily used for spring, summer, and fall cover by black bear. Acorns constitute an average of 50 percent of the fall and winter diets of Western gray squirrel and Black-tailed deer during good mast years. Fawn survival rates increase or decrease with the size of the acorn crop.

Bird and animal species characteristic of the Montane Hardwood habitat include acorn disseminators (scrub and Steller's jays, acorn woodpecker, and western gray squirrel) plus those that utilize acorns as a major food source such as wild turkey, mountain quail, band-tailed pigeon, California ground squirrel, dusky-footed woodrat, black bear, and mule deer. Deer also use the foliage of several hardwoods to a moderate extent. Many amphibians and reptiles are found on the forest floor in the Montane Hardwood habitat. Among them are ensatina, relictual slender salamander, western fence lizard, and sagebrush lizard. Snakes include rubber boa, western rattlesnake, California mountain kingsnake, and sharp tailed snake (CWHR 1988).

Aquatic Habitat. Riparian habitats support greater diversity and abundance of wildlife than most other cover types. These areas function as habitat for vertebrate wildlife and provide corridors for wildlife movement and migration. They act as wildlife refuges during wildfires and stream sides are often the first areas reoccupied by wildlife after stand replacing fire events. Dense and diverse riparian

vegetation provides a large variety and quantity of nest and perching sites, along with food from seeds, fruits, and insects. This habitat supports many birds, mammals, reptiles, and amphibians. There are 502 miles of streams within the analysis area available to aquatic species. Fall River, the South Branch Middle Fork of the Feather River, as well as the Cascade and Pinchard Creeks are the major rivers in the area.

Road Density and Wildlife Habitat. In 1999, the HFQLG Pilot Project area contained approximately 13,200 miles of public and private roads. Approximately 8,512 miles are Forest Service system roads, created for the management, protection, and use of the National Forest lands. Approximately 520 miles of unclassified roads are known to be in the Pilot Project area. Each year new roads are added to the roads "system" through either new construction or classification of previously unclassified roads (HFQLG FEIS, p. 3-7).

Roads are the largest single human-caused source of sedimentation and habitat degradation in the Pilot Project area. Improperly constructed roads, and those that are not maintained, transport sediment to streams and riparian areas degrading water quality and aquatic habitat. Inadequate or failed culverts block fish movement and migrations. By increasing the area and rate of human-caused disturbance, roads contribute to the direct destruction of habitat (HFQLG FEIS, p. 3-7).

The network of roads across the Forest has altered and continues to alter vegetative communities and habitat for wildlife species in many ways, including habitat loss, fragmentation and degradation, reduced effectiveness of near-road habitats, increased edge-effect, mortality due to vehicular collisions and mortality and disturbance due to recreation use, such as hunting. Roads may also act as barriers to wildlife movements. Roads also impact habitat by allowing access for personal use fuelwood harvests, resulting in the loss of snags and downed logs. However, roads provide access to a wide range of habitat improvement projects and wildfire suppression activities. Roads also provide opportunities to the public to enjoy non-consumptive activities associated with a wildlife resource, such as birding or other viewing of wildlife species.

Wildfire and Wildlife Habitat. Active fire suppression in California during much of the 20th century has altered historic fire frequency, fuel loads, and fire dynamics. That is, the significant reduction of fire as an ecosystem process has had important consequences, allowing an accumulation of fuels that had previously been consumed during regular, low-intensity fires. In addition to causing a build-up of woody vegetation in the understory, fire suppression has also promoted an increase in tree density, and some open forests converted to vegetative communities with a greater shrub component. In some locations, there have also been significant increases in small-sized dead and down woody material and an increase in "ladder" fuels connecting ground vegetation to the tree canopies. This has resulted in forests that are more susceptible to severe, crown-consuming fires (University of California Cooperative Extension).

One of the most obvious consequences of fire in forests is the impact to wildlife habitat. Fire has the immediate impact 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 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). Fire conflagrations, on the other hand, can seriously impact 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.

3.13.6.4 General Habitat Effects of the No Action Alternative (Alternative A)

The following discussion focuses on the effects of Alternative A (no action) on mature/old forest habitat components and black oak habitat. The importance of these habitats to wildlife is introduced in section 3.13.6.2. Under this alternative, no DFPZ construction, group selection timber harvest, or activities that have the potential to improve wildlife habitat, such as black oak enhancement, streambank stabilization, meadow restoration, and road decommissioning, would be conducted.

This discussion applies to all species considered in this document. Subsequent sections (for example, habitat effects of Alternative A to Northern goshawk, California spotted owl, Pacific fisher, etc.) will refer to this discussion rather than repeat the information for each species.

Mature / Old Forest Habitat Components and Structure

Canopy Cover. Canopy cover averages 61.2 percent for CWHR 5 stands and 64.3 percent for CWHR 4 stands. Treatments which reduce canopy cover, such as DFPZ thinning and group selection, would not occur. As a result, canopy cover would become more dense and trees would grow at a slower rate, which could prevent or slow down the potential for stands to move to the next size class. Also, the understory layer would be retained.

Large Trees, Snags, and Large Woody Material. 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.
- Large trees would be retained for future recruitment of snags and large woody material.
- No existing snags would be removed.
- No large woody material would be removed.

Depending on each stand's density and tree sizes, tree growth under the no-action alternative could be slowed due to competition for nutrients and space. While maintaining snags, large trees, and large woody material in the short term, this competition could reduce the recruitment of large trees and future snags and large wood material in the long term.

Black Oak Habitat. Under alternative A, proposed black oak enhancement will not be implemented and retained oaks within the 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.

Aquatic Habitat. As discussed in "Section 3.7: Hydrology," there would be no direct effects to stream channels from DFPZ treatments, group selection, transportation improvements, and wildlife restoration because these activities would not occur in these areas.

Vegetation density and accumulation of fuels would continue to increase under alternative A. With those changes, the potential for stand-replacing fire and associated effects on sensitive areas near streams 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, fire adjacent to channels would adversely affect the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation, and the resulting effects on stream and riparian habitats and water quality, would likely increase following a stand-replacing fire (Neary et al. 2005). Following a severe wildfire, proper function and condition of streams and the quantity and quality of aquatic habitat might remain compromised for decades to centuries (Neary et al. 2005).

Under the no-action alternative, there would be no beneficial changes in stream and meadow conditions because transportation improvements and watershed restoration would not occur. Sediment would continue to be directly deposited into affected water bodies and riparian areas, and conditions would continue to degrade. Fish barriers would remain and continue to obstruct access to potential aquatic habitat upstream.

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. However, proposed road closures and decommissioning would not occur so there would be no permanent reduction in road density or disturbance levels from current conditions. The average road density within the project area is currently 6.6 miles per square mile.

Wildfires. Historic fire regimes are described by a five-tiered system, which ranks fire regimes by frequency and severity. Historically, the Watdog Project area was considered to be a Fire Regime 1 / Condition Class 3. Through the absence of fire, this has changed to a Fire Regime 4 / Condition Class 3 (see "Section 3.5: Fire and Fuels" and the BA/BE for more information). These long-term changes in forest structure and composition could lead to an increase in fuel hazards and increase the probability of a stand-replacing fire in the future.

Existing fuel loads left by this alternative would make potential wildfires in the area difficult to suppress and result in a more intense burn, which could lead to increased rates of spread, and increase the potential for stand replacing fires and loss of wildlife habitat.

Low to moderate burns could reduce habitat suitability in the short term. However, high-intensity burns could contribute to habitat loss, as well as loss of critical habitat components such as large trees, snags and large woody material well into the future. A severe wildfire could eliminate mature/late-successional forest habitat for associated species. Wildfires also increase both the potential for sedimentation into streams and stream temperatures. Extensive loss of fish prey species could also occur, which could adversely affect the habitat that amphibians and reptiles, and several fish species require (Rotta 2002).

3.13.6.5 General Habitat Effects of the Action Alternatives (Alternatives B, C, and D)

This analysis considers the effects of the three action alternatives on the mature/old forest, black oak, and aquatic habitats used by many wildlife species. It includes discussion of how changes in habitat components resulting from proposed treatments could reduce habitat suitability of mature/old forest,

aquatic, and black oak habitats in general, as well as for specific dependent species. It also discusses the potential effects of road density and wildfire for all habitats.

This discussion applies to all species considered in this document. Subsequent sections (for example, habitat effects of Alternative A to northern goshawk, California spotted owl, Pacific fisher, etc.) will refer to this discussion rather than repeat the information for each species.

Management Requirements for the Action Alternatives

As described in more detail in the following sections, application of the following management requirements will minimize potential effects to wildlife and/or their habitat. **These management requirements apply to all action alternatives. Mapped locations of PACs, SOHAs and the "draft" forest carnivore network are contained in the Plumas National Forest corporate GIS layer.**

- Treatments in the Watdog Project would avoid California spotted owl Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs).
- Treatments in the Watdog Project would avoid Northern goshawk PACs.
- There are no known American marten and Pacific fisher den sites within the project area.
- No treatments are proposed within the draft forest carnivore network.
- Ninety percent of the proposed treatments are located on 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 ridge-top 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 near ridge-tops and do not typically provide suitable breeding habitat for amphibians and pond turtles.
- Treatment in riparian areas would be limited. In DFPZ units, treatment in RHCAs would be limited to underburning, hand piling, and hand thinning except in some plantations where mechanical treatment (mastication) is prescribed. An estimated 25 percent of total acreage of DFPZ treatment units is in RHCAs. Group selection would avoid RHCAs. Refer to "Section 3.7: Hydrology" for more discussion of treatments within RHCAs.
- Management requirements include the retention of important habitat components such as large trees (30 inches dbh or greater), snags (four per acre of 15 inches dbh or greater), and large woody material (10 to 15 tons per acre of the largest diameter). Where oak is present within DFPZs, a minimum of 25 to 35 square feet basal area per acre of oaks over 15 inches dbh would be retained. Hardwoods 30 inches dbh and greater would be retained within group selections.

Effects on Mature/Old Forest Habitat Components and Structure

Canopy Cover. Mature/old-forest (conifer and hardwood) associated species have been shown to select stands with at least 40 percent canopy cover for foraging habitat and at least 60 percent canopy cover for nesting habitat. In addition, removal of the understory may affect the suitability of habitat for foraging in stands with more than 40 percent canopy cover. See tables 3-50 through 3-52.

DFPZ construction/group selection would be accomplished through thinning from below with a variety of site-specific prescriptions, mastication of shrubs and small trees, and the reintroduction of fire into the ecosystem. Thinning that involves the cutting of some dominant and codominant conifers remove both large structure and canopy cover. DFPZ thinning and group selection harvest would reduce canopy cover; however, underburning and mastication would have no effect or minimal effect on canopy cover (see "Section 3.5: Fire and Fuels").

Treatments in DFPZ units would be conducted on approximately 1,350 acres of CWHR Size Class 4 (Forest Service Size Class 3; tree dbh of 11 to 24 inches), and approximately 700 acres of CWHR Size Class 5 (Forest Service Size Class 4; tree dbh of 25 to 40 inches), for all action alternatives. Refer to tables 2-3, 3-34 through 3-44 and 3-50 through 3-52.

Comparative difference of canopy cover by alternative:

- Alternative B proposes an average canopy cover of 37 percent (with a range of 25.6 percent to 58.5 percent), and thin to 70 trees per acre, for 1,342 acres of CWHR Size Class 4. Alternative B also proposes an average canopy cover of 41 percent (with a range of 40 to 45 percent), and thin to 93 trees per acre, for 678 acres of CWHR Size Class 5.

- Alternative C proposes an average canopy cover of 43 percent (with a range of 40 to 59 percent) and thin to 89 trees per acre, for 1,342 acres of CWHR Size Class 4. Alternative C also proposes an average canopy cover of 41 percent (with a range of 40 to 45 percent), and thin to 93 trees per acre, for 678 acres of CWHR Size Class 5.

- Alternative D proposes an average canopy cover of 50 percent (with a range of 39 to 59 percent) and thin to 126 trees per acre, for 1,342 acres of CWHR Size Class 4. Alternative D also proposes an average canopy cover of 47 percent (with a range of 40 to 50 percent) and thin to 140 trees per acre, for 678 acres of CWHR Size Class 5.

Comparative difference of canopy cover between alternatives:

- For CWHR Size Class 4 stands in the DFPZ: the overall difference in canopy cover between alternatives is approximately 13 percent, ranging from 37 percent under alternative B to 50 percent under alternative D. For CWHR Size Class 5 stands in the DFPZ, the overall difference in canopy cover between alternatives is approximately 6 percent, ranging from 41 percent under alternative B to 47 percent under alternative D.

  For CWHR Size Class 4 stands in the DFPZ: alternative B would reduce canopy cover below 40 percent on approximately 1,100 of the 1,342 acres, and alternatives C and D would retain a minimum of 40 percent canopy cover on the 1,342 acres. However, canopy cover would average 50 percent under alternative D compared to 37 percent for alternative B and 43 percent for alternative C.

- For CWHR Size Class 5 stands in the DFPZ: alternatives B, C, and D would maintain a minimum canopy cover of 40 percent on the approximately 678 acres. However, canopy cover would average 47 percent under alternative D compared to 41 percent under alternatives B and C.

Table 3-50. Comparison of post-treatment canopy cover by alternative.[a]

CWHR SIZE	Treatment	Alternative A	Alternative B	Alternative C	Alternative D
		Existing Conditions	Post-Treatment		
CWHR Size Class 4 stands	DFPZ thinning from below	64% (range from 48 to 83%)	37% (range from 26 to 59%)	43% (range from 40 to 59%)	50% (ranges from 39 to 59%)
	Group Selection Treatment Units		12%	12%	12%
CWHR Size Class 5 stands	DFPZ thinning from below	61% (range from 49 to 75%)	41% (range from 40 to 45%)	41% (range from 40 to 45%)	47% (range from 40 to 50%)
	Group Selection Treatment Units		15%	15%	15%

Note: a. Mature / old-forest (conifer and hardwood) associated species have been shown to select stands with at least 40 percent canopy cover for foraging habitat and at least 60 percent canopy cover for nesting habitat.

Under all action alternatives, thinning would occur from below to remove ladder and canopy fuels. This would increase ground-to-crown height, spacing between trees, and spacing between tree crowns. Removal of suppressed, intermediate, and some co-dominant trees with crowns beneath and adjacent to healthy larger trees (greater than 30 inches dbh) would be emphasized. **Removal of 6 to 20 inch dbh trees would result in the greatest change in canopy cover between alternatives**. Compared to alternatives B and C, fewer 6 to 20 inch dbh trees would be removed under alternative D. The removal of trees 20 to 29.9 inches dbh and greater would have the greatest short-term and long-term effect on species based on their value as usable wildlife trees and the numbers proposed to be removed. For trees in the 20 to 29.9 inch dbh size class, field-verified estimates indicate that approximately 2.5 (for CWHR 5s) to 4 (for CWHR 4s) trees per acre could be removed for all action alternatives. These trees would be removed due to poor crowns, defects, disease, insect damage, or because their crowns are beneath those of larger sized trees (greater than 30 inches dbh). Therefore, of trees between 20-29.9”dbh, approximately 5,368 trees within stands typed as CWHR 4s and 1,356 trees within stands typed as CWHR 5s would be removed. Modeled estimates of the tree removal are depicted in tables 3-39 through 3-40. Removal of smaller trees would reduce stand densities and result in an increase in growth of remaining tree, potentially moving stands to the next crown size or dbh size class (i.e., from CWHR Size Class 4 to 5). Refer to Tables 3-34 and 3-44 in “Section 3.12: Vegetation” and additional information.

Table 3-51. CWHR 4 (FS size class 3) average canopy cover, including Group Selections.

EA #	Acres	Alt A % CC	Alt B %CC	Alt C %CC	Alt D %CC
2	113	58	53.5	53.5	53.5
7	19	79.7	52.6	52.6	52.6
10	79	81.2	58.5	58.5	58.5
26	5	75.6	50.8	50.8	50.8
29	6	66.5	52	52	52
33	31	76.4	36.7	40	50.4
42	56	59	36	40	50.1
53	108	48	35	40	38.9
56	35	52	30.9	40.3	46.5
63	158	57	37.4	40	50
65	33	61.2	29.8	40.4	48.6
69	35	57	36.7	40	50.1
71	96	55.2	35	40	50
76	28	61	28.5	40	50
78	136	58.2	27.9	40	50
83	44	54.3	38.3	40	47.9
85	10	57.1	36	40	50
88	24	70.1	25.6	40	50
90	48	59	31.1	40.1	50
98	54	48.9	30.4	40	42.8
101	84	59	34	40	50
105	23	64.7	40.1	41.4	50
107	8	61	37	40	45.7
109	48	58.6	27.3	40	50.2
113	27	59	37.3	40	50
114	34	59	35.3	40	50
Total	**1,342**				
Average		**61.45**	**37.45**	**42.68**	**49.56**

Notes:
Alternative B - DFPZ thinned from 25.6 to 58.5 (37.4% avg.) percent canopy cover.
Alternative C - DFPZ thinned from 40.0 to 58.5 (42.7% avg.) percent canopy cover.
Alternative D - DFPZ thinned from 38.9 to 58.5 (49.6% avg.) percent canopy cover (20”dbh harvest minimum).
Information used to determine percent canopy (%CC) is from Forest Vegetation Simulation (FVS), vegetation layers and aerial photographs.

Table 3-52. DFPZ CWHR 5 (FS size class 4) average canopy cover, including Group Selections.

EA #	Acres	Alt A %CC	Alt B/C %CC	AltD %CC
20	66	71	41	50
31	11	75	45	50
35	40	56	40	40.6
37	76	54	40.7	42.1
40	113	61	44.7	50.1
45	135	63	41	50
51	35	59	40	50
59	95	63	40	50
73	72	49	40	40.4
104	35	62	40.3	46.9
Total	**678**			
Average		**61.3**	**41.3**	**47.4**

Notes:
Alternative B - DFPZ thinned from 40.0 to 45.0 (41.3% avg.) percent canopy cover.
Alternative C - DFPZ thinned from 40.0 to 45.0 (41.3% avg.) percent canopy cover.
Alternative D - DFPZ thinned from 40.4 to 50.1 (47.4% avg.) canopy cover (20”dbh harvest minimum)

Tables 3-39 and 3-40 display existing stand structure attributes (average canopy cover percent and trees per acre by tree size class) for CWHR Size Class 4 and 5 stands in the project area. The trees per acre values in the table for the medium trees (20–30 inches dbh) are estimated from the Forest Vegetation Simulator model, and in parentheses, the values adjusted from the preliminary cruise data. One of the limitations of the Forest Vegetation Simulator growth model is that it is a distance independent model where the spatial arrangement or locations of trees are not modeled. Therefore, when a thinning from below prescription is applied, the models starts thinning sequentially from the smallest trees to higher dbh classes until the canopy cover, basal area, or tree size requirements have been met. The model cannot simulate removing a 22-inch dbh tree that is underneath the canopy of a larger (i.e., 40 inches dbh) tree. Therefore, the marking guidelines allow adjustments to spacing based on tree size and variation within spacing guidelines to increase crown separation and allow retention of the healthiest, largest trees (Watdog Project “Silviculture Report,” “Appendix D: Silviculture Prescription and Marking Guidelines”). Canopy cover in the smaller tree size classes (saplings, poles, and small trees) would be reduced substantially after thinning, reducing the fuel ladder and canopy fuels.

Effects of alternative C are expected to be the same as alternative B, except that there will be slightly more canopy cover in the sapling and pole size classes for the CWHR Size Class 4 stands. Tables A-15 through A-19 in appendix A of the Watdog Project “Silviculture Report” display the canopy cover and trees per acre by size class for each treatment unit. Fuel ladder potential would be slightly higher than alternative B, as tree crowns would be spaced farther apart. Alternative D would have the highest fuel ladder potential of all the action alternatives. The number of trees per acre is important to wildlife habitat because as the tree density per acre decreases, the remaining trees have a higher growth potential. In general, the number of organisms that can utilize a tree for homes, breeding, food, etc. increases as trees become larger. As the number of large trees increases, more mature/old-forest dependent wildlife species can utilize the “habitat.” In addition, the amount of understory retained (predominately the 6 to 20 inch trees) can affect the suitability of the habitat for foraging and nesting. For example, retaining a minimum of 40 percent canopy cover without any understory may not maintain

even minimal quality foraging habitat for mature/old-forest dependent species, since habitat requirements for some species (i.e., California spotted owl) call for a multi-storied canopy.

Stands would be thinned to 70 trees per acre at 25 foot spacing for alternative B, compared to 89 trees per acre for alternative C, and 126 trees per acre for alternative D. All action alternatives result in a reduction of the number of trees per acre, primarily in the 0–6 inch dbh size class. However, mastication and prescribed burning would not effect much change on overstory stand structure.

Underburning is proposed for approximately 2,800 acres in Watdog DFPZ units. Approximately 500 acres would be burned annually over a five-year period. **Underburns typically kill all seedlings, small trees (up to 4 inches dbh), and non-sprouting shrubs in the fire path. In addition, 40–60 percent of trees 6–8 inches dbh may burn.**

Underburns can also kill trees 8–24 inches dbh, but usually no more than 30 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. In the long term, the species should benefit by protection of the habitat from wildfire. Also, the understory vegetation would return over time, to varying degrees, dependent on the specific site. In addition, protection measures, such as Limited Operating Periods, are proposed for TES species (appendix B), which would remove or lessen the effects of underburning.

Firelines constructed around the perimeter of the DFPZ units that will be underburned can also have an impact on terrestrial habitat. On the Watdog Project there will be approximately 20 miles (2,040 chains) of firelines built by hand crews and 10 miles (800 chains) of firelines made by tractors. Construction of the firelines will result in noise disturbance. In addition, tractor lines are often used as trails by OHV enthusiasts after project activities are completed. However, following standard design practices such as riparian buffers and implementing BMPs, the long-term effects should be minimal.

Group selection harvest would occur on 5.3 percent of the project area (231 acres) under alternative B. To achieve 40 percent canopy cover minimums for alternative C, fewer acres of group selection are proposed (151 acres or 3.4 percent of project area). To achieve an average of 50 percent canopy cover for alternative D, group selection acres would be reduced to 105 acres (2.4 percent of the project area) and treatment of some units changed from harvest to mastication. According to Appendix B (CWHR Analysis) of the Watdog Silviculture Report, group selection units would affect less than 8 percent of the total CWHR 4 and 5 acres that are located within the DFPZ and Group Selection treatment units.

Group selection treatments would result in the creation of forest openings and gaps that would have (1) all conifers and hardwoods below 30 inches dbh removed; (2) four of the largest snags/acre retained that do not pose a health and safety risk to operations; and (3) 10–15 tons per acre of the largest down logs greater than 12 inches diameter retained where it exists. Within a few years, group selection locations grow a layer of herbs/grasses, shrubs and tree seedling. Group selection timber harvest would result in stands with portions of non-stocked or sparse canopy cover (0 to 9 percent or 10 to 24 percent, respectively). Within the “matrix” (conifer stands between the groups) are openings within the understory that are expected to be used for skid trails that will be used to remove sawlogs from the groups to designated landings.

As stated in the HFQLG Act FEIS on pages 2 to 5, "Group selection treatment areas are not considered to be individual timber stands, but are viewed as subcomponents of larger stands. Treatment effects on crown cover and basal area retention are, therefore, averaged over the larger stand." Changes in vegetation size class are expected to be most dramatic in smaller stands with more area proposed for treatment than larger stands with less treatment within the stand. CWHR habitat classification (see Glossary) serves as the baseline for analysis of vegetation changes. As discussed in section 3.13.6.2, habitat suitability of proposed treatment units is discussed in terms of CWHR habitat typing.

Large Trees. The SNFPA FSEIS (HFQLG Land Allocation) and SNFPA ROD (Table 2) standard and guideline for large trees would be followed for the Watdog Project "Design projects to retain all trees equal to or greater than 30 inches dbh, except for operability".

On sites such as those found in the Watdog Project area, it takes on average 30 to 50 years to grow a CWHR Size Class 4 stand (between 11 to 24 inches dbh) stand and approximately 100 years to grow a CWHR Size Class 5 stand (greater than 24 inches) (Oliver 1997 and Dunning and Reineke 1933). Moderate growing sites (soils) and spacing conditions would support trees in a maximum sized (24 inch dbh) CWHR Size Class 4 stand. Under these conditions, stands in the Watdog Project area would require approximately 10 years to become a CWHR Size Class 5 stand (greater than 24 inches dbh).

Approximately 400 trees, 30 inches dbh and larger, would be removed on approximately 52 acres for each action alternative to allow for permanent and temporary road construction, reconstruction of temporary roads, and construction and reconstruction of landings ("Silviculture Report," table A-32). This represents removal of approximately 2% of trees 30 inches dbh and larger from the project area. It is estimated that it takes approximately 120 years to grow a 30 inch dbh tree under conditions similar to those found in the Watdog Project area (Dunning and Reineke 1933). Alternatives B and C propose 1.5 miles of new road construction. Alternative D proposes 0.5 miles of new road construction (which would also reduce the landings). Therefore, Alternative D would remove fewer trees that are greater than 30 inches from 2% to less than 1%.

The "Watdog Project Siliviculture Report-Hazard Tree Cumulative Effects Supplement (Supplement)" quantifies how many hazard trees would be removed and the effect on large trees (i.e., greater than 30 inch dbh). Less than 4 percent of the large trees would be affected in the Watdog Project area. The remaining 96 percent of the large trees that are 200 feet away from the roadway would serve as future potential snag and down woody material recruitment.

From the Supplement, Table 5 quantitatively displays the proportional impact of each hazard tree removal project by management areas and subwatersheds. Hazard tree removal projects only accounts for 1.2 percent (i.e., Lost Creek MA) to 4.1 percent (i.e., Pinchard MA) of a management area. On a subwatershed level, hazard tree removal projects only accounts for 0.5 percent (Mountain House Creek) to 3.1 percent (Pinchard Creek). Using the wildlife cumulative effects analysis area (320,857 acres), hazard tree removal projects (1,790 acres) only accounts for 0.6 percent of the analysis area. These percentages assume that the total acres of the hazard tree removal projects were a clear-cut. However, since hazard tree projects would remove less than two trees per acre within the Watdog Project Area, the effects to a management area or subwatershed area would be substantially less than listed above.

Additionally from the Supplement, the potential number of large trees greater than 30 inches dbh that would be affected within the Watdog Project area due to hazard tree removal would be less than 2.0

percent (Table 3). Overall, less than 3.4 percent of the large trees greater than 30 inches dbh within the Watdog Project area would be affected (Table 3). Therefore, the cumulative effects from hazard tree removal projects to large trees and future potential as snags and down woody material would be minimal.

Snags. Refer to the large tree discussion above. The SNFPA FSEIS (HFQLG Land Allocation) and SNFPA ROD (Table 2) standard and guideline for snags would be followed for the Watdog Project. Four of the largest snags per acre (using snags larger than 15 inches dbh) would be retained, clumped and distributed irregularly. The potential loss of some snags due to hazard removal or use of prescribed fire has been 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.

The treatment areas were inventoried using the current Forest Inventory and Analysis User's Guide for the Pacific Southwest Region. The Region's Forest Inventory Analysis (FIA) system is used to collect data from a series of random points located within each of a number of stands exhibiting a possible need for treatment. The field data is loaded into the FIA program and is used as a database to generate various reports. The FIA data was also loaded into the Forest Vegetation Simulator (FVS) which is a forest growth model that predicts forest stand development. This model was used to predict stand development after alternative treatments. The FIA plots and FVS runs show that approximately 29 snags per acre exist within the Watdog project area, including the plantations and underburning stands. Of the 29 snags, approximately 4.1 snags per acre are greater than 15”dbh. Not including plantations and underburning stands: within **CWHR4 stands the retention of snags will be 6.8 snags per acre and within CWHR5 stands snag retention will be 4.6 snags per acre.**

Hazard tree removal projects generally remove tree hazards that are within 150 to 200 feet of a roadway, recreation area, or facility. Reducing risks to public health and safety and damage to property is of prime importance in hazard tree abatement. There are no requirements to move down logs to areas where there is a deficit of down woody material. There would be opportunities to leave additional snags and cull trees as down logs within the treatment unit that is beyond 200 feet from the roadway.

Large Woody Material. Refer to the large tree and snag discussions above. The SNFPA FSEIS (HFQLG Land Allocation) and SNFPA ROD (Table 2) standard and guideline for large down woody material would be followed for the Watdog Project: 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 under the HFQLG FEIS and SNFPA FSEIS for TES species.

Down woody material and down logs are discussed throughout the Watdog Soils Report. Section 6.3.3 of the Watdog Soils Report, Table 5 displays the number of down logs by decomposition classes for each unit. The majority of units that are deficit of down woody material are plantations (Summary Table S-1 of the Watdog Soils Report).

Hazard tree removal projects generally remove tree hazards that are within 150 to 200 feet of a roadway, recreation area, or facility. Reducing risks to public health and safety and damage to property is of prime importance in hazard tree abatement. There are no requirements to move down logs to areas

where there is a deficit of down woody material. There would be opportunities to leave additional snags and cull trees as down logs within the treatment unit that is beyond 200 feet from the roadway.

A mitigation measure for down logs is contained in the Watdog EIS, Appendix E, Table E-1, page E-5 for the retention of "cull" logs where the requirement of 10-15 tons per acre of 10 foot/20 inch diameter logs are not existing. Typically, retention of large woody material is NOT a fuels issue. It is the smaller or finer fuels, especially ladder fuels, which is of concern for risk of stand replacing fires.

General Effects on Black Oak Habitat

The 2004 SNFPA defines a large oak as "a dbh of 12 inches or greater (SNFPA FSEIS p53). The HFQLG FEIS for direction regarding oak management, Table 2.5, page 2-10, states that the "Current Forest Plan Direction" is: Where oak is present, retain an average 25 to 35 square feet basal area per acre of oaks over 15 inches dbh. Site specific planning will determine feasibility and specific needs. Retain smaller oaks, if determined to be necessary for future recruitment. Under the Watdog Project where oak is present within DFPZs, a minimum of 25 to 35 square feet basal area per acre of oaks over 15 inches dbh would be retained. Hardwoods 30 inches dbh and greater would be retained within group selections.

Where California black oak is present within the DFPZ, an average basal area of 25 to 35 square feet per acre would be retained for oaks over 15 inches dbh. According to the more recent Watdog Cruise Report (data in Watdog project file), no black oaks greater than 12 inches dbh were marked for removal within the DFPZ. Therefore, for the 4,021 acres of DFPZ, excluding group selection areas, oak retention standards and guidelines would be met where it currently exists.

An estimated 393 out of a total number of 4,284 black oak trees in the project area greater than 12 inches may be removed from the 231 acres of GS units (refer to table 3-44). These 393 black oak trees that may be removed account for 9.2 percent of large black oaks within the project area. Approximately 90.8 percent of the black oak trees greater than 12 inches within the project would remain. Supplemental criteria that were used in GS layout, included avoiding placing groups in black oak concentration areas where possible (refer to Watdog Project–Silviculture Report). Therefore, it is expected that since GS were placed to avoid oaks, in particular black oaks, that oaks adjacent to GS units would increase in size and vigoe as a result of the conifer removal. Also, the Watdog Project EIS does provide alternatives that would reduce the effects to black oaks. Alternative C, and to a greater degree Alternative D, would have fewer group selection treatments and therefore less short-term impacts on black oaks.

The proposed GS harvest would result in a short-term reduction in the number of large diameter black oak trees. However, the proposed group selection harvests would create early seral stages of hardwoods, which would meet 2004 SNFPA objectives of maintaining a diversity of structural and seral stage conditions and providing recruitment of young hardwoods (section 3.12.3.20). In addition, the Watdog Project proposes to restore 40 acres of black oak stands by removing encroaching conifers and create openings around existing black oaks.

General Effects of Roads and Road Density

Many species are sensitive to the noise and human activity associated with roads. For example, the Duncan Furbearer Interagency Workgroup and the Mooretown Deer Herd Management Plan both recommend a maximum road density of 2 miles per square mile in order to minimize disturbance to forest carnivores and mule deer, respectively. Under Alternatives B and C, there will be approximately 1.2 miles of new system (permanent) road construction. Alternative D will have no new road construction. Alternatives B, C and D each propose 5.7 miles of temporary road reconstruction. As discussed above, approximately 400 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.

Road system treatments would result in approximately 13 miles of noise disturbance, and the construction of 1/2 mile of new temporary road would provide additional access and increase human disturbance. However, 5.3 miles of road closures and 17.1 miles of decommissioning of mostly old temporary roads are also proposed. The average road density within the project area is 6.6 miles per square mile.

Decommissioning roads would lower the average road density to 5.3 miles per square mile. These activities could result in some site-specific short-term disturbance but could also create additional nesting, denning, foraging and resting habitat in the long term. However, disturbance in the long term would be only slightly reduced as a result of the proposed road reduction. In addition, potential affects to habitat components and habitat loss to wildfire, as discussed, could also be affected in the long term as a result of the no-action alternative.

General Effects Due to Wildfires

For each action alternative there will be a short-term disturbance and loss of canopy cover and understory as a result of DFPZ and group selection activities. However, proposed fuel reduction activities would protect habitat in the long term by reducing the risk of stand replacing fires.

The action alternatives provide a way to control and suppress potential wildfires in the area by actively treating fuels and decreasing the potential for more intense burn, which could lead to increased rates of spread and loss of wildlife habitat. Important forest structure and components such as large trees and large wood material would be maintained (section 3.13.6.2).

The loss of mature/late-successional forests could eliminate habitat for species associated with those forests in the event of a severe wildfire. Wildfires also increase the potential for sedimentation and can also lead to an increase in stream temperatures, which could account for a loss of fish prey species and could adversely affect the habitat that certain amphibians, reptiles, and fish species require (Rotta 2002).

General Effects on Aquatic Habitat

Acres proposed for treatment within the RHCAs are the same for alternatives B, C and D. Results from the cumulative watershed analysis report (CWE) by the District Hydrologists shows that the ERA is approximately the same for the action alternatives. It has been determined that the direct, indirect and

cumulative effect to the aquatic system will be the same for all action alternatives. Thus, the alternatives are analyzed together.

Direct and Indirect Effects. There would be minimal direct effects from the DFPZ construction, group selection, and aspen regeneration harvest to TES herptofauna and fish, as these vegetation management activities would occur mostly outside of RHCAs. The Feather River Ranger District silviculturist estimates that only one of the group selections would require a skid trail that would cross a dry streambed. No group selection skid trails would cross-streams with running water. In addition, it is expected that none of the skid trails associated with DFPZ construction would cross RHCAs. Consequently, direct effects due to skidding are expected to be minimal. All riparian protection standards apply to the action alternative. SAT guidelines and associated RMOs will be met with the action alternatives. All applicable BMPs and Soil Standard Protection Measures will be instituted (appendix B).

Under the proposed action, there is potential for direct effects on hydrologic function from prescribed vegetation management activities, transportation improvements, wildlife restoration, and watershed restoration. It is assumed that protection of headwaters and tributaries to larger watersheds, along with implementation of effective non-point source conservation measures (BMPs), would provide protection of the entire watershed. If sedimentation is controlled through implementation of BMPs, potential of sedimentation to the immediate channel and channels downstream should be small.

In the proposed DFPZ treatment units, RHCAs in plantations would be treated to improve riparian habitat conditions (see appendices of the "Hydrology Report"). In RHCAs, no-tractor equipment zones would be marked on the ground, based upon Streamside Management Zone (SMZ) guidelines contained in the 1988 Plumas National Forest LRMP and field surveys. In harvest units, equipment outside the exclusion zone may reach a maximum of 18 feet into the no-tractor equipment zone along RHCAs to remove trees. Limiting equipment "reach" to a maximum of 18 feet insures trees along streambanks would not be removed and ensures continued bank stability. In underburn units, fires would not be ignited in RHCAs but may be allowed to creep into them.

Hand thinning is proposed within portions of RHCAs in units 27, 93, and 95. The total acreage of these units is 31 acres, so minimal treatment is proposed in the RHCAs. If hand thinning does occur; conifers from 3 feet in height to 6 inches in diameter would be hand-thinned to a spacing of 15 feet. All hardwoods and riparian vegetation would be retained. Wherever possible, hand piles would be located away from riparian vegetation to prevent scorching. Conifers encroaching upon aspen stands in RHCAs would be removed to restore diversity and productivity of native plant communities in the riparian zone. Special protection measures are proposed to minimize impacts to aspen stands and RHCAs during removal operations (appendix B). These measures include designating aspen stands as no-equipment areas, limiting removal operations to the period between August 15 and the first wetting rains in the fall, designating skid trails, directionally felling trees, marking leave trees, and end-line yarding. Conifers needed for streambank stabilization or shading would not be removed. Monitoring to determine the effect of this treatment on the aspen stands and RHCAs would be conducted. All riparian protection standards apply to the action alternative. SAT guidelines and associated RMOs will be met with the action alternative. All applicable BMPs and Soil Standard Protection Measures will be instituted.

There is the potential for short-term direct effects (e.g., increased sedimentation) on hydrologic function from transportation system improvements and watershed restoration activities, especially from

in- or near-stream activities like culvert improvement, streambank stabilization, meadow restoration, and fish barrier removal. Overall hydrologic function would improve as a result of these activities. Decommissioning of roads in RHCAs has the potential to cause short-term direct effects, but would result in long-term improvements to stream and meadow conditions. A net reduction in direct effects would occur after the completion of restoration activities.

General Cumulative Effects

Because of project location, project design features, intensity of treatments, mitigation measures, and the results of TES surveys, no direct and minimal to low indirect effects on terrestrial and aquatic habitat are expected as a result of the proposed treatments for the Watdog Project.

Past activities (1988 to 1991; pre CASPO Interim Guidelines) within the Watdog Project area such as Watson North, Watson South, Hartman II, South Branch and Tamarack Flat affected habitat suitability to varying degrees (table 3-1). Some projects included large areas of clearcut treatments that will not provide suitable habitat for most species, other than early seral stage-dependent species such as deer, for 25 to 50 years. Other than the loss or reduction in quality of habitat it is unclear as to the extent of the effect on TES species since very little survey work was conducted in conjunction with past activities. It is expected that the proposed treatments for the Watdog Project will result in low incremental impact when added to these past actions and that the impact will be for the short term and provide for a long-term gain in habitat protection and quality.

Past activity actions such as Watson Thinning (1995–6; 100 acres of commercial thinning, 90 acres of biomass thin, 65 acres mastication and 25 acres of pre-commercial thin) and Steward Thinning (1997; 188 acres of intermediate thinning) affected habitat suitability at varying levels but followed CASPO Interim Guidelines habitat requirements for strata typed as “select” and “other.” However, it is expected that the proposed treatments for the Watdog Project will result in low incremental impact when added to these past actions and that the impact will be for the short term for a long-term gain in habitat protection and quality.

One active range allotment is ongoing but the Watdog Project is not expected to result in any incremental impact in relationship to the allotment. There have been several watershed improvement projects within the analysis area and with protections measures such as Limited Operating Periods the actions have provided habitat enhancement and protection. The Hartman Bar Hazard Tree Removal project was implemented in 2006 removing hazard trees along a portion of a road that receives moderate recreation use. The proposed action included resource protection measures such as Limited Operating Periods and design features such as large woody material retention. It is expected that the treatments for the Watdog Project will not result in any incremental impact when added to these past range, watershed and hazard tree removal actions.

Directly northwest and west of the Watdog Project are the Middle Fork Feather River Wild and Scenic River Area and the Feather Falls Scenic Area. There are no known recreational projects or mining activity in the recent past or foreseeable future therefore the proposed treatments for the Watdog Project will not result in any incremental impact when added to the ongoing recreational use and mining activity actions.

Directly southeast and south of the Watdog Project is a large area of private lands which have been harvested and salvaged logged at varying degrees. Presently there is the Feather Falls Salvage project which proposes to salvage up to 14,314 acres of dead, dying or diseased trees. It is unclear what the wildlife and fisheries species impact will be from this action but some level of effects are expected. However, proposed treatments for the Watdog Project are expected to result in low incremental impact when added to salvage actions on the private land. In addition, the Defensible Fuel Reduction Zone treatments proposed for Watdog Project should help to protect private lands, as well as public, from habitat loss as a result of wildfires.

3.13.6.6 Species-Specific Existing Condition and Environmental Effects Analysis

In this section, the environmental effects/consequences of the proposed activities will be summarized for the following Threatened, Endangered, and Sensitive species; Management Indicator Species; and NTMBs. **Refer to section 3.13.6.5 above for general terrestrial and aquatic habitat effect discussions.**

- Section 3.13.6.6.7, California red-legged frog, mountain yellow-legged frog, foothill yellow-legged frog, and Northwestern pond turtle
- Section 3.13.6.6.8, Northern goshawk
- Section 3.13.6.6.9, California spotted owl
- Section 3.13.6.6.10, American marten, Pacific fisher and California wolverine (Forest Carnivores)
- Section 3.13.6.6.11, Pallid, Western Red, and Townsend's Big-eared Bats
- Section 3.13.6.6.12, Mule deer
- Section 3.13.6.6.13, Trout group
- Section 3.13.6.6.14, Swainson's thrush

3.13.6.6.7 California Red-legged Frog, Mountain Yellow-Legged Frog, Foothill Yellow-Legged Frog, and Northwestern Pond Turtle

Existing Condition

Riparian habitats support greater diversity and abundance of wildlife than most other cover types. These areas function as habitat for vertebrate wildlife and provide corridors for wildlife movement and migration. They act as wildlife refuges during wildfires and stream sides are often the first areas reoccupied by wildlife after stand replacing fire events. Dense and diverse riparian vegetation provides a large variety and quantity of nest and perching sites, along with food from seeds, fruits, and insects. This habitat supports many birds, mammals, reptiles, and amphibians. There are 502 miles of streams within the analysis area for aquatic species. Pinchard and Cascade Creeks, Fall River, and the South Branch of the Middle Fork of the Feather River, are the major rivers in the area.

California Red-Legged Frog. Suitable habitat for the red-legged frog has been identified as slow-moving streams, ponds with a depth of 3–5 feet, and adjacent areas 300 feet upslope with the following attributes (USFWS 1997):

- Dense, shrubby, or emergent riparian vegetation closely associated with deep, still, or slow-moving water is required by adults (Jennings et al. 1992).
- Deep-water pools with dense stands of overhanging willows and an intermixed fringe of cattails.
- Well-vegetated terrestrial areas within the riparian corridor may provide important sheltering habitat during the winter.
- California red-legged frogs estivate in small mammal burrows and moist leaf litter up to 85 feet from water in dense riparian vegetation (Rathbun et al. 1993).
- The elevational range of this frog is from 0 to 4,500 feet (Welsh et al. 1991).

The analysis area is approximately 2 miles east of a core area as designated by the USFWS in the Recovery Plan (USDA Fish and Wildlife Service 2002). A known population is located over 6 miles beyond the aquatic analysis area boundary. Some of the DFPZs are below 5,000 feet in elevation, which is considered to be the upper altitude limit for this species by the USFWS. No California red-legged frogs were found during protocol-level surveys (summer 2003) of potentially suitable habitat in the DFPZs and a one-mile radius of the DFPZs. As part of this survey, one permanent pond, one permanent ditch, and two permanent streams were identified as potential habitat and surveyed more intensively.

Foothill Yellow-Legged Frog. The frog is found in the Sierran foothills in riffles and pools with some shade (greater than 20 percent), as well as moderately vegetated backwaters, isolated pools, and slow moving rivers with mud substrate. It breeds in shallow, slow flowing water with at least some pebble and cobble substrate, and is rarely found far from permanent water.

There are numerous observations of foothill yellow-legged frogs across the Feather River Ranger District. Reproductive success of these populations is unknown; however, sightings have been noticeably concentrated along the lower portion of the South Fork Feather River, Onion Creek, Slate Creek, and Flea Valley Creek, suggesting localized breeding success. There have been three foothill yellow-legged frog observations at different sites approximately one mile from treatment boundaries.

The Watdog Project area is at the higher end of the elevation range for this species. Approximately 0.25 mile of perennial stream and 5 miles of intermittent streams are within the treatment units. No foothill yellow-legged frogs were found during surveys (summer 2003) of suitable habitat within DFPZ units and a half mile buffer surrounding the DFPZs. Approximately 27 miles of perennial and intermittent streams and 52 springs within or adjacent to the treatment were surveyed.

Mountain Yellow-Legged Frog. This frog is found from Plumas to Tulare Counties in ponds, tarns, lakes and streams with sufficient depth and adequate refuge for over-wintering. The species has been observed across the Feather River Ranger District. They have been seen in generally preferred habitat types as low as 3,000 feet—below the normal elevation range for the species—and up to approximately 6,000 feet. No known large-scale breeding sites have been discovered to date. Individuals have commonly been detected alone or in pairs. The species appears to have disappeared from a significant number of historic locations and the abundance of the species appears to be quite low.

The Watdog Project area is within the typical elevation range for this species. Approximately 0.25 mile of perennial stream and 5 miles of intermittent streams are within the treatment units. No mountain yellow-legged frogs were found during protocol-level surveys (summer 2003) of potentially suitable habitat in the DFPZs and within a 0.25 mile radius of the DFPZs. Approximately 27 miles of perennial and intermittent streams and 52 springs within or adjacent to the treatment were surveyed. There are no records of observations for this species within any treatment units. The only sighting within a mile of a treatment unit boundary occurred in 1982 near McNair Saddle, over 0.5 mile from the closest treatment unit.

Northwestern Pond Turtle. This reptile is found in aquatic habitat in spring and summer and adjacent upland habitat in fall and winter. In rivers, it needs slow flowing areas with deep underwater refugia and emergent basking sites. Migration, hibernation, and nesting occur on land up to 330 feet from riparian areas.

There are widely scattered northwestern pond turtle observations across the Forest. The observations have been mainly within ponds, wet meadows, and pooled backwater on creeks, as well as land adjacent to Forest System Land System. The Watdog Project area is at the higher end of the elevation range for this species. The proposed DFPZs are located mainly on ridgetops, which is not typically northwestern pond turtle habitat. Water sources within and adjacent to DFPZs are often steep, intermittent or ephemeral streams. Scattered ponds found in these areas are small and dry up by mid-summer.

In 2003, one northwestern pond turtle was observed within the analysis area, slightly less than 0.5 mile from a treatment unit. Prior to 2003, no sightings of northwestern pond turtles had been recorded within the analysis area. The closest observation of this species was on private land over 2 miles from the nearest treatment boundary.

Effects of the No Action Alternative (Alternative A)

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 would be negligible in comparison 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.

Effects of the Action Alternatives (Alternatives B, C and D)

For more information on the general effects of the action alternatives on aquatic habitat, see "Section 3.13.6.5: General Habitat Effects of Alternatives B, C, and D" above. Effects of the no-action alternative are discussed in section 3.13.6.4.

Direct Effects. Effects of alternatives B, C, and D on amphibians and reptiles are expected to be the same. Mechanical harvesting would not result in direct mortality to amphibians or reptiles because treatments are scheduled during the nondispersal period (before October 15th or first wetting rains), when amphibians and reptiles would be concentrated in RHCAs where treatments are prohibited.

The Feather River Ranger District silviculturalists estimate that only one of the group selections would require a skid trail that would cross a dry streambed. No group selection skid trails would cross streams with running water. In addition, it is expected that none of the skid trails associated with DFPZ construction would cross RHCAs. Consequently, direct effects due to skidding are expected not to occur or be minimal.

Wetlands within or adjacent to the project area that are scheduled for fish barrier removal, road construction and reconstruction, or road decommissioning have been surveyed and necessary resource protection measures have been applied (see Appendix E for Resource Protection Measures). Stream crossings, springs, and water sources for dust abatement would be checked by the district biologist for presence of sensitive frog or turtle species prior to project implementation.

All action alternatives call for approximately 2,800 acres of prescribed burning. Prescribed fires would not affect canopy cover within RHCAs, although some ground cover would likely be removed. However, any ground cover removed would be minimal as the fires would not be ignited in the RHCAs. Burns occurring before the first soaking rains of the fall are least likely to directly affect amphibians and reptiles, as individuals are most likely to be within RHCAs, which includes the stream channel, at that time. However, burns occurring during the spring are more likely to cause direct effects on amphibians and reptiles, as individuals are most likely to be dispersed outside of RHCAs at that time.

Mastication would be conducted during dry months when amphibians and reptiles are expected to be more closely associated with riparian zones. Pile burning could have the potential to harm amphibians or reptiles that use these piles as shelter during overland dispersal (fall through spring). Mitigations to be applied to pile burning such as directional ignition to provide escape, are listed in Section IV of the BA/BE and appendix B of this document. Implementation of Resource Protection Measures would help minimize direct effects on amphibians and reptile species.

Indirect Effects. Water temperatures would not be affected as very little canopy cover would be removed in streamside riparian zones.

Prescribed burns would be designed to retain large pieces of dead and down material and maintain adequate ground cover to reduce erosion. Implementation of the Resource Protection Measures in project description and procedures detailed in the Burn Plan for the project would reduce the probability of habitat loss for all species resulting from prescribed fire. The action alternatives could reduce the potential for a stand-replacing wildfire, which is a threat to habitat for forest dwelling species.

Group selection and DFPZ construction in uplands outside of RHCAs can potentially change the hydrologic regime in an area (BA/BE, p. 53) and alter water flows which in turn could reduce the availability of surface water. This reduction of available surface water may lead to a reduction in suitable habitat for amphibians and reptiles (refer to HFQLG Act BA/BE for more discussion). Soil erosion could direct sedimentation into streams that could suffocate egg masses and/or tadpoles. However, with the implementation of SAT guidelines, RHCA buffers and BMPs, it is anticipated that there will be no to minimal disruption in surface and subsurface flows or sedimentation into streams (see the Watdog Project “Hydrology Report” for more information).

Cumulative Effects. The action alternatives could contribute to impacts on suitable habitat resulting from vegetation management, grazing, recreational uses, introduction of non-native species, road construction, water diversions, and wildfire; however, potential cumulative impacts are minimal, as there is little habitat in the treatment units. The Fall River grazing allotment overlaps the entire Watdog Project area. Grazing in meadow systems and recreational use can remove bank cover, resulting in less breeding habitat due to vegetation removal, sedimentation, and disturbance during the breeding season. Implementation of the Watdog Project will not increase grazing or recreational activity in the area or contribute to the removal of bank cover. Therefore, the Watdog Project is not expected to add cumulatively to any grazing or recreational effects on breeding habitat for these species. In addition, implementation of the RHCA, BMPs, Resource Protection Measures, and U.S. Fish and Wildlife Service conservation measures would reduce or eliminate potential direct or indirect impacts of the proposed action.

3.13.6.6.8 Northern Goshawk

Existing Condition

The Northern goshawk is being addressed as both a Sensitive species and a Forest MIS. Habitat for Northern goshawk is found throughout the Sierra Nevada of northern California in dense mature conifer and deciduous forests interspersed with meadows, other openings and riparian areas. Tree size and canopy cover classes which provide suitable nesting and foraging habitat (HFQLG FEIS, p. 3-106) are shown in table 3-53.

Table 3-53. Northern goshawk nesting and foraging requirements by CWHR forest strata type.

	CWHR Forest Strata Type	Suitable Acres within AnalysisArea (preproject)	Suitable Acres within Analysis Area (post project)	% of suitable habitat within Anaylsis Area (post project)
Suitable Nesting Habitat	4M, 4D, 5M, and 5D	5,518	Alternative B = 4,832 Alternative C = 5,430 Alternative D = 5,410	Alternative B = 87.5 Alternative C = 98.4 Alternative D = 98.0
Suitable Foraging Habitat	3M, 3D, 4P, 5P, and 6	8,114	Alternative B = 7,869 Alternative C = 8,000 Alternative D = 8,054	Alternative B = 96.9 Alternative C = 98.6 Alternative D = 99.2

Note: CWHR size classes are defined as follows:

3 = poles 6–11 inches dbh	D = Dense Canopy Cover > 60%
4 = small 11–24 inches dbh	M = Moderate Canopy 40–59%
5 = medium/large>24 inches dbh	P = Open Canopy Cover 25–39%
6 = old forest multistory	S = Sparse Canopy 10-24%

All or portions of five Northern goshawk PAC's totaling 402 acres are located within the Watdog analysis area. The PAC's have been established to protect known goshawk nesting habitat. Within the Watdog analysis area, there are 5,518 acres of land typed as potentially suitable goshawk nesting habitat and 8,114 acres of land typed as potentially suitable goshawk foraging habitat (refer to Table 3-53 above. This estimate is based on the VESTRA vegetation typing based on 2000 aerial photos. This is the most recent vegetation data available for Watdog. These estimates of habitat area do not include Northern goshawk PACs and California spotted owl PACs and spotted owl habitat areas. According to the district silviculturalist, stands in the Watdog Project area have not been altered by vegetation management projects in the years since the aerial photos were taken.

Effects of the No Action Alternative (Alternative A)

Direct Effects. Refer to California spotted owl discussion. There would be no direct effects on goshawks or goshawk habitat because no activities would occur that could cause disturbance to known nesting goshawks or existing nesting 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 in the short- and long-term.

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).

Effects of the Action Alternatives (Alternatives B, C and D)

For more information on the general effects of the action alternatives on the habitat of the northern goshawk, see "Section 3.13.6.5: General Habitat Effects of Alternatives B, C, and D" above. Effects of the no-action alternative are discussed under section 3.13.6.4 above.

Direct Effects. Analysis of direct effects on northern goshawk is focused on known PACs identified through the 2002–2003 surveys and historical information. Effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the "Indirect Effects" section below. No direct effects on Northern goshawk are expected because:

- Following Region 5 Northern goshawk survey protocol, all potentially suitable habitat was surveyed for activity centers within a 0.25 mile buffer from proposed treatments.
- Goshawk PACs will not be entered for the Watdog Project. All or portions of five goshawk PACs (402 acres) occur in the analysis area. Four goshawk PACs overlap with spotted owl PAC habitat. (Goshawk nesting habitat requirements are similar to California spotted owl nesting requirements [HFQLG FEIS, p. 3-106]). Surveys conducted in 2002–2003, and historical information, have provided information as to where the present nests are located and the reproductive status of these pairs. Goshawks have as many as 8 alternate nests within their territories that they rotate through the years (Squires and Reynolds 1997).
- Limited operating periods will be implemented for treatment units and haul roads within ¼ mile of active nest sites from February 15 to September 15. Limited operating periods are expected to eliminate effects from increased human activity and vehicle and equipment noise. A limited operating period is in place for trucks hauling timber on the portion of road 22N94 that is located in the SW ¼ Section 4 and the NW ¼ Section 9, T21N, R7E.
- If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, PACs will be delineated and applicable resource protection measures applied, such as Limited Operating Periods.
- No new road construction or reconstruction will occur in Northern goshawk PACs.

Because proposed treatments could occur in 2007 through 2011, there is the potential that goshawks could establish new activity centers (nests) and/or new territories (PACs) during project implementation.

Indirect Effects. Within the 22,659 acre (Forest Service System lands) analysis area, there are 5,518 acres of potentially suitable goshawk nesting habitat and 8,114 acres of potentially suitable goshawk foraging habitat. Analysis of suitable nesting and foraging habitat is defined by CWHR forest strata types as identified in the HFQLG Act FEIS (p. 3-106). Overall, there is little difference in size and canopy cover classes between the alternatives. Table 3-54 shows northern goshawk nesting and foraging requirements per CWHR forest strata type. 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.

Table 3-54. Vegetation treatments proposed in potential northern goshawk foraging habitat surrounding PACs.

	Thinning in DFPZs		Mastication		Mastication – Prune	Hand Cut – Pile Burn	Under-burn	Group Selection		
	Alternative									
PAC Number	B, C	D	B, C	D	B, C, D	B, C, D	B, C, D	B	C	D
T26	17	10	0	7	24	7	0	1.6	1.6	1.6
T27	166	0	11	177	18	0	0	15	7.6	1.0
T48	9	9	19	19	0	14	6	3	2.7	2.7
T25	416	275	0	141	38	0	11	16	3	1
T53	60	60	4	4	0	0	6	6.5	2.2	1.9

According to the analysis of the HFQLG FEIS (p. 3-105 through 3-107), loss of 8.5 percent of nesting habitat combined with a loss of 9 percent of foraging habitat during the Pilot Project period "may affect individual goshawks but not lead to a trend toward listing" (HFQLG FEIS p. 3 106).

Habitat suitability for the northern goshawk could be affected by the reduction in canopy cover (40 percent) within DFPZs. However, although canopy cover would be reduced for the majority of treatments, it would not be "lost (removed)," meaning that canopy cover would slowly increase in the years after treatment as the canopies of remaining trees occupy newly available growing space. Alternative B would reduce suitability of 686 acres (7 percent) of potentially suitable nesting habitat and 245 acres (3 percent) of potentially suitable foraging habitat within the analysis area. Alternative C would reduce suitability of 88 acres (1 percent) of potentially suitable nesting habitat and 114 acres (2 percent) of potentially suitable foraging habitat. Alternative D would reduce suitability of 108 acres (1.4 percent) of potentially suitable nesting habitat and 60 acres (less than 1 percent) of potentially suitable foraging habitat within the Watdog analysis area (tables 3-50 through 3-52).

Northern goshawk nesting and foraging requirements by CWHR forest strata type are shown in table 3-53. Proposed treatments with the greatest impact on canopy cover are thinning in DFPZs and group selection. These treatments are primarily proposed in Size Classes 4 and 5 stands. Mastication and underburning are not expected to affect canopy cover because these treatments remove brush and small trees rather than the overstory. **Refer to tables in Chapter 2, and Tables 3-34 through 3-44 "Section 3.12: Vegetation", Tables 3-50, 3-51 and 3-52 above, and associated discussions.**

Under alternative B, the prescription for DFPZ units in CWHR Size Class 4 stands would leave 20 units currently typed as suitable goshawk habitat with less than 40 percent canopy cover, resulting in unsuitable foraging or nesting habitat for the goshawk. Alternative C would retain a minimum of 40 percent canopy cover in Size Class 4 stands, while alternative D would retain a minimum of 40 percent in canopy in all but one Size Class 4 stand.

Under alternatives B and C, DFPZ units in CWHR Size Class 5 stands may still provide adequate post–fledging and/or foraging habitat for goshawks as the prescription calls for maintaining a minimum of 40 percent canopy cover. Alternative D would pose the least risk because an average of 50 percent canopy cover would be retained for CWHR Size Class 4 and 5 stands.

Because northern goshawks prefer mature forests with large trees and open understories, they may be impacted in the short term by proposed treatments. However, treatments proposed for Alternative B should improve foraging and nesting habitat in the long term. Alternative B would reduce the potential loss of suitable nesting and foraging habitat by providing more effective fuel reduction treatments, reducing fuel-loading, providing for safer zones from which to fight fires, and reducing the potential of stand replacing fires in the long term.

Group selection openings may be marginal habitat or unsuitable for foraging goshawks. Post-treatment, the majority of group selection units will be CWHR Size Class 1 stands, with trees in the seedling stage (dbh of less than one inch). Most group selections are 0.25 acre to 2 acres in size. Young forests (less than 30 years old) generally do not provide the appropriate conditions (large trees with well developed canopies, adequate flight space beneath the canopy) for goshawk hunting (Bloxton 2002). Two studies of habitat used by goshawks for foraging in California indicate that they avoid open areas (Squires and Reynolds 1997).

Common prey species utilized by the goshawk in California include Douglas squirrel, golden-mantled ground squirrel, northern flicker, and Stellar's jay (Rotta 1999). How these important prey species would respond to group selection units and DFPZs within the first 5–15 years after timber harvest is not known. 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 the Pacific Southwest Research Station through the Plumas and Lassen National Forests Administrative Study. Although data is not yet available, post project monitoring would provide information about the response of these prey species to DFPZ and group selection treatment.

Permanent and temporary road construction, reconstruction of temporary roads, and new and reconstruction of landings (and therefore the removal of approximately 400 trees over 30 inches dbh) would occur within habitat typed as suitable, although not determined as occupied, for the Northern goshawk. As discussed in the "General Effects" section, the removal of trees 20 to 30 inches dbh and greater would have the greatest long-term effects on species and their habitat and would affect numbers of large trees available for future snag recruitment. Road treatments could result in some site-specific short-term disturbance but could also create additional nesting, denning, foraging and resting habitat in the long term. However, disturbance in the long term would be only slightly reduced as a result of the proposed road reduction.

Cumulative Effects. Cumulative effects on northern goshawks occur from habitat modification resulting from logging, road construction, fire, and mining; modification of prey species habitat; and

disturbances from roads, harvest activity, and recreational use. The establishment of northern goshawk PACs, as well as California spotted owl PACs, will conserve habitat for this species. The project may affect individual northern goshawks and change the distribution of goshawk habitat because it is a part of the larger HFQLG Pilot Project. Since direct effects are not expected and indirect effects are likely to be minimal or low and improve foraging habitat in the long term, it is expected that there would be few cumulative effects. Cumulative effects will be similar for alternatives B, C, and D.

More information about cumulative effects is found in the "General Cumulative Effects" section above. The only HFQLG projects directly adjacent to the Watdog Project are Bald Onion and Bald Mountain Projects. The Bald Onion Project would not modify any acres of suitable nesting habitat or foraging habitat. Implementation of this project is scheduled to begin in 2007. The Bald Mountain Project would reduce suitability of 79 acres of suitable nesting habitat, outside of PACs, and 5 acres of suitable foraging habitat. However, there would not be a loss of habitat and habitat would still be capable of becoming suitable in the future. Implementation of this project is scheduled to begin in 2007.

Other proposed HFQLG projects that would alter suitable nesting and foraging habitat are the South Fork and Brush Creek Projects, implemented in 2003 and 2004, respectively. Both projects predominantly treated the understory and only removed trees up to 12 inches in diameter. The Basin Project would reduce suitability of 971 acres of suitable nesting habitat outside of PACs, and 251 acres of suitable foraging habitat. Implementation of this project is scheduled to begin in 2007. These projects would reduce suitable habitat in the short term but provide higher quality habitat in the long term as a result of reducing understory density and increasing tree sizes and reducing the potential for stand-replacing fires. The effects determinations for the above projects is "May affect but not likely lead to a trend toward listing" based on no direct effects and low indirect effects. Due to the direct and indirect effects on the Goshawk as a result of the Watdog Project, there is not expected to be a change in Forest-wide habitat or population trends for this MIS. This determination for the Goshawk based on the following; (1) no goshawk PACs will be affected by this project, (2) no goshawks will be affected during reproduction due to LOP placed on nest sites and haul routes within ¼ mile, (3) nesting and foraging habitat will be affected, but at such low levels (7 percent maximum under any alternative) that habitat trends will still remain stable forestwide and (4) the quality (level of suitability for nesting and foraging) of the habitat should increase in the short-term as a result of opening up the understory.

3.13.6.6.9 California Spotted Owl

Existing Condition

The California spotted owl is being addressed as both a Sensitive species and a Forest MIS. Habitat for the California spotted owl is scattered throughout the Sierra Nevada province. The species is found in forests with a minimum of 40 percent canopy closure and an average dbh of 30 inches. Several land allocations have been developed to protect and/or manage for suitable spotted owl habitat:

- **Protected Activity Centers (PACs)** are 300 acres of protected nesting habitat surrounding activity centers such as nest sites. The Watdog analysis area includes 2,812 acres in all or portions of 15 PACs. No treatments units are within PACs. Thirteen PACs are within ¼ mile of a treatment.

- **Home Range Core Areas (HRCAs)** are 1,000 acre foraging buffers that surround and include the PACs. There are 5,794 acres of HRCAs within the Watdog analysis area.
- **Spotted Owl Habitat Areas (SOHAs)** are 1,000 acre blocks of nesting, foraging, and roosting habitat. The analysis area includes portions of four SOHAs, totaling 763 acres. No treatment units are within SOHAs.

In addition to the nesting, foraging, and roosting habitat formally designated as PACs, HRCAs, and SOHAs, there are an additional 2,031 acres of potentially suitable spotted owl nesting habitat and approximately 4,613 acres of potentially suitable spotted owl foraging habitat within the analysis area. This estimate is based on the most recent vegetation data available for the Watdog Project area (VESTRA). VESTRA vegetation typing is based on year 2000 aerial photos. According to the district silviculturalist, Watdog Project treatment units have not been altered by vegetation management projects in the years since the aerial photos were taken.

Effects of the No Action Alternative (Alternative A)

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. However, fires are unpredictable and are subject to spreading depending on the orientation of the landscape and prevailing winds. Ladder fuels, can also play a large roll as to whether the fire reaches the canopy of large trees. See “Section 3.5, Fire and Fuels” and Section 3-12, Vegetation” 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 are 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. There would be no actions designed to control the risk of high intensity wildfire (based on analysis conducted in SNFPA [2001]).

Effects of the Action Alternatives (Alternatives B, C and D)

For more information on the general effects of the action alternatives on the habitat of the California spotted owl, see “General Habitat Effects of Alternatives B, C, and D” above. Effects of the no-action alternative are discussed under section 3.13.6.4 above.

Considering that over 90% of the Watog project is along ridgetops, and that the southern and eastern borders are surrounded by heavily managed private lands, and that the northern and western borders are the steep Middle Fork Feather River, the number of Protected Activity Centers (PACs) is probably at or close to capacity. There is potential habitat along the northern border of the Watdog project that could

be occupied. Presently, under HFQLG, the majority of this land is off-base and deferred lands which are not available for treatment.

No new road construction will occur in California spotted owl PACs or SOHAs. For any road construction in PACs a LOP would be applied an all CSO ativity centers. An LOP will be applied to haul routes within a ¼ mile of an active nest. Noise from vehicles and equipment and increased human activity and presence could affect this species. Disturbance would be limited to individual treatment units and last a few days to 2two qweeks in any location. Implementation of the LOPs for known nests, as listed in the HFQLGFRA FEIS ROD, would reduce impact on CSOs. Impacts from disturbance would be limited and not substantially affect habitat use or productive capacity of this species. No treatment of aspen stands would occur in Californai spotted owl PACs or SOHAs or within ¼ mile of known active nests.

Direct Effects. Analysis of direct effects on California spotted owl is focused on PACs and spotted owl habitat areas existing or created as a result of surveys. Effects on other potentially suitable nesting and foraging habitat outside of PACs and Spotted Owl Habitat Areas (SOHAs) are discussed in the "Indirect Effects" section below. Direct effects are expected to be minimal for all action alternatives, as described below.

- Following Region 5 California spotted owl survey protocol; all potentially suitable habitat was surveyed for activity centers within a 0.25-mile buffer from proposed treatments.
- Direct effects on California spotted owls are not anticipated within 2,812 acres of PAC or 763 acres of SOHA, as no treatment units fall within these protected areas.
- If spotted owls are detected during future surveys or project-related activities, PACs and Home Range Core Areas would be delineated, and all treatments would be modified to comply with the standards and guidelines of the HFQLG Act FEIS and ROD.
- Limited operating periods would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections.
- Proposed treatment activities could occur as early as 2008 and may continue five years beyond the initiation of implementation. The California spotted owl survey protocol requires additional surveys if project activities continue more than two years after the last survey year. New territories (nests) that were not located using survey protocol could be established during project implementation.
- No new road construction would occur in spotted owl PACs or SOHAs. A limited operating period would be applied for any road reconstruction in PACs.
- Limited operating periods are expected to reduce impacts from increased human activity and vehicle and equipment noise. A limited operating period would be applied to haul routes if future surveys or incidental observations detect active nests within 0.25 mile. No Limited Operating Periods on haul routes are currently proposed. Disturbance would be limited to individual treatment units and would last a few days to 2 weeks in any location. Impacts from disturbance are not expected to substantially affect habitat use or reproductive capacity of this species.

Indirect Effects. Suitable nesting and foraging habitat for California spotted owls that may be affected by this project exclude areas protected within California spotted owl PACs and spotted owl habitat areas, but include acres within Northern goshawk PACs. Protected habitat within Northern goshawk PACs may or may not be suitable for California spotted owls.

Within the 22,659 acre (Forest Service System Land) analysis area there are 2,031 acres of suitable nesting habitat and 4,613 acres of suitable foraging habitat **outside of PACs and SOHAs.** This analysis is based on CWHR forest strata types identified as nesting and foraging habitat in the HFQLG Act FEIS (p. 3-103). **Refer to tables in Chapter 2, Tables 3-34 through 3-44, in "Section 3.12: Vegetation", Tables 3-50, 3-51 and 3-52 above, and associated discussions.** 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. In addition, the Watdog area was surveyed for 3 years and had additional follow-ups while the regional protocol requires only 2 years of surveys. Between the no-action alternative and the action alternatives, little change in canopy closure and size class is expected in mastication or underburn treatments because these treatments primarily remove understory vegetation rather than overstory vegetation.

There is a very small percentage of habitat typed as nesting within treatment units. Over 90 percent of the Watdog Project area is located on ridge-tops, which are utilized for foraging but not preferred for nesting by the owls. Therefore, any effects to potentially occupied nesting habitat **outside of PACs and spotted owl habitat areas** are expected to be minimal. See Table 3-55 below.

Table 3-55. Outside of PACs and SOHAs, California spotted owl nesting and foraging habitat requirements by CWHR forest strata type and acres of habitat untreated and treated, pre- and post-project by alternatives. *Acres treated by underburn did not result in habitat modification.

	CWHR* Forest Strata Type[a]	Pre-project	Post-project	
		Suitable Acres	Suitable Acres (%) untreated	Suitable Acres (%) treated
Suitable Nesting Habitat	5M and 5D	Alternative A = 2,031	Alternative B = 1,904 (93.7%) Alternative C = 1,956 (96.3%) Alternative D = 1,975 (97.2%)	Alternative B = 127 (6.3%) Alternative C = 75 (3.7%) Alternative D = 56 (2.8%)
Suitable Foraging Habitat	4M and 4D	Alternative A = 4,613	Alternative B = 3,933 (83.3%) Alternative C = 4,486 (97.3%) Alternative D = 4,503 (97.6%)	Alternative B = 680 (14.7%) Alternative C = 127 (2.7%) Alternative D = 110 (2.4%)

Note: * CWHR size classes are defined as follows:

4 = small 11–24 inches dbh D = Dense Canopy Cover> 60%

5 = medium/large>24 inches dbh M = Moderate Canopy 40–59%

In terms of canopy cover, alternative B would reduce suitability of 127 acres (6.3 percent) of suitable nesting habitat and 680 acres (14.7 percent) of suitable foraging habitat within the analysis area. Alternative C would reduce suitability of 75 acres (3.7 percent) of suitable nesting habitat and 127 acres (2.7 percent) of suitable foraging habitat within the analysis area. Alternative D would reduce suitability

of 56 acres (2.8 percent) of suitable nesting habitat and 110 acres (2.4 percent) of suitable foraging habitat.

Implementation of project activities (primarily thinning and group selection) could take existing suitable foraging habitat within Home Range Core Areas (mapped foraging areas) below 40% canopy cover, the minimum canopy cover for suitable foraging habitat. Alternative D has the least effect of reducing habitat below minimum levels suitable for foraging, while alternative B has the greatest effect. Of the 22,659 acre (Forest Service System Land) analysis area, 5,794 acres are within California spotted owl Home Range Core Areas, 263 of these acres are in areas where two Home Range Core Areas overlap. Under alternative B, implementation of DFPZs and group selections would treat 737 acres (10 percent) of Home Range Core Areas within the analysis area (Table 3-56). This includes approximately 681 acres within DFPZ units and approximately 57 acres of group selection.

Overall canopy cover for DFPZ units is affected by implementation of group selection within the DFPZ units because there are no canopy cover requirements for group selection other than the required retention of trees 30 inches dbh and greater. Post-treatment canopy cover in group selections is expected to range from 11–15 percent. The larger the stand, and the less treatment within the stand, the less changes will be seen in canopy cover. This effect increases from alternatives D to C to B.

Table 3-56. Acres of treatment in fifteen California spotted owl Home Range Core Area for the action alternatives. Each of the 15 HRCAs contains a minimum of 700 acres.

Harvest		Mastication		Masticate and Prune	Grapple Pile and Burn	Underburn		Group Selection	
Alternatives									
B, C	D	B, C	D	B, C, D	B, C, D	B, C, D	B	C	D
Home Range Core Area (acres)									
386	196	54	244	20	10	223	41	26	20

Acres within individual Home Range Core Areas are presented in Table 3-57. DFPZ units in CWHR Size Class 5 stands may still provide some marginal to adequate foraging habitat for spotted owls because the prescription calls for maintaining a minimum of 40 percent canopy cover (Verner et al. 1992). The prescription for DFPZ units in CWHR Size Class 4 stands would leave most units (1,233 acres) with less than 40 percent canopy cover, resulting in unsuitable foraging habitat, at least in the short term, for the California spotted owl. However, in the long term it is expected that the area would provide more suitable foraging habitat for the owl.

Alternative B will reduce canopy cover below 40 percent in approximately 177 acres (24 percent) of suitable foraging habitat within Home Range Core Areas. However, this is expected to be a short-term impact to achieve fuels hazards reductions, improve fire-fighting capabilities and prevent potential stand replacing fires. Alternative C would maintain a minimum of 40 percent canopy cover—the minimum suitable foraging level. Alternative D would maintain an average of 50 percent canopy cover which would be above minimum suitable foraging levels. Although alternatives C and D would maintain foraging levels in the short term, there could be a loss of foraging, and possibly nesting, habitat in the long term as a possible result of stand replacing fires. Overall, there is approximately a 12 percent

difference in canopy cover on the harvest treatments for CWHR Size Class 4 stands and 6 percent difference for CWHR Size Class 5 stands.

Table 3-57. Changes to California spotted owl Home Range Core Areas for each California spotted owl PAC as a result of the preferred alternative (B) treatments.

HRCA (by PAC #)	DFPZ (acres)	Group Selection* (acres)
BU047	35.7	3.5
BU048	86.2	9.7
BU056	35.7	3.5
BU073	28.5	2.7
PL023	44.4	7.1
PL024	70.5	10.7
PL100	4.9	0
PL141	2.1	1.9
PL195	66.1	6.5
PL290	12.9	1.2
PL291	40.4	1.1
PL320	18.2	2.6
PL321	5.0	0
PL322	73.6	0
PL323	156.3	6.1
Totals	**680.5**	**56.6**

Note:

* Group selection acres are shown separately.

For all action alternatives, the majority of group selection units will become CWHR Size Class 1 (trees are in the seedling stage with a dbh of less than 1 inch) after treatment. Group selections range from 0.5 acre to 2 acres in size. Residual conifers within the groups would provide approximately 10.8 percent canopy cover in CWHR Size Class 4 stands and 14.7 percent in CWHR Size Class 5 stands. This makes the group selection acreage unsuitable for foraging and nesting habitat.

Effects Common to all Action Alternatives

Treatments affecting ground-level fuels would modify habitat for prey species. Prescribed burns (approximately 2,800 acres) would be designed to retain large pieces of dead and down material and maintain adequate ground cover to reduce erosion. Burns would primarily remove the 0 to 6 inch dbh tree size and shrubs. Removal of shrub cover may increase the susceptibility of prey species to predators such as the spotted owl. Prescribed burns leave a mosaic of burned and unburned areas, thus some shrubs would remain to provide cover for prey species using these areas. Retention of snags and down woody material would aid in minimizing effects on the spotted owl and their prey species. Similarly, the prescription for RHCAs would minimize the loss of ground cover within riparian areas.

How prey species preferred by spotted owls (dusky-footed woodrats and northern flying squirrels) would respond to group selection and DFPZ construction is being studied as part of the Plumas and Lassen National Forests Administrative Study. Post-treatment, habitat within most group selection units would be classified as SMC 1-2 (seedlings and saplings). As the SMC 1-2 habitat matures, woodrats may recolonize sooner than flying squirrels as they are known to utilize earlier successional habitats (Zeiner et al. 1990b). A study in northwestern California showed that woodrat density was low until previously cut stands reached the sapling stage (15 to 40 years after timber harvest) (Sakai and Noon 1993). Flying squirrels would likely be absent within the group selection openings (Waters and Zabel 1995). Proposed reforestation would accelerate the process.

These small openings within the forest may be marginal for foraging spotted owls due to the isolation from the forest interior (Glenn et al. 2004). Reforestation should shorten the timeframe to develop forested stands as well as accelerate the development of old forest conditions that owls prefer when compared to natural succession. The small mammal component of the Plumas and Lassen National Forests Administrative Study would monitor changes in small mammal density/distribution that may occur as a result of project implementation. However, data from the Study is not yet available. Edges created by groups within suitable owl habitat may reduce the use of foraging habitat by spotted owls and increase use by great horned owls (an effective competitor and predator of the spotted owl).

The effects of a potential wildfire on wildlife habitat are discussed in general under the "Effects of Alternative A" section. In relation to the California spotted owl, alternative D would have a short-term effect of maintaining foraging habitat at minimum levels and above. However, alternatives B and C would provide suitable habitat in the long term by reducing fuels and reducing the risk of potential stand replacing wildfire (also see the BA/BE for more discussion of the effects of wildfire on spotted owl habitat).

Permanent and temporary road construction, reconstruction of temporary roads, and the construction and reconstruction of landings (and therefore the removal of approximately 400 trees over 30 inches dbh) would occur within habitat typed as suitable, although not determined as occupied, for the California spotted owl. As discussed in the "General Effects" section, the removal of trees 20 to 30 inches dbh and greater would have the greatest long-term effects on species and their habitat and would affect numbers of large trees available for future snag recruitment. Road treatments could result in some site-specific short-term disturbance but could also create additional nesting, denning, foraging and resting habitat in the long term. However, disturbance in the long term would be only slightly reduced as a result of the proposed road reduction.

None of the action alternatives are considered detrimental to the California spotted owl. However, alternative D is expected to have the least short-term impact on suitable owl habitat while alternative B is expected to have the least long-term impacts.

Cumulative Effects. Cumulative effects on owls occur from habitat modification as a result of logging, road construction, fire, and mining; modification of prey species habitat by grazing; and disturbances from roads and recreational use. Invasion of California spotted owl habitat by the barred owl may also contribute to cumulative effects. Based on surveys, protection measures and project design features, it has been determined that the cumulative effects will be similar for all three action alternatives. **More information about cumulative effects is found under Section 3.1.3 and "General Cumulative Effects" above. Refer to the Watdog BA/BE for an extended discussion regarding**

cumulative affects. Since direct effects are expected to be minimal and indirect effects are likely to be low, it is expected that there would be low cumulative effects.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in the population of California spotted owls. This may occur through both hybridization as well as displacement of the California spotted owl in some areas. Evidence supporting this hypothesis comes from a study published by Pearson and Livezey (2003) who found: (1) northern spotted owls are more likely to abandon a site if barred owls take up residence close to that site, (2) a combination of habitat lost due to timber harvest and the presence of barred owls may work together to put northern spotted owl pairs at risk of losing their territories, (3) there is evidence that barred owls sometimes kill northern spotted owls, and (4) barred owls can cause a reduction in the northern spotted owl populations by physically excluding them from historic sites and making those sites unavailable for recolonization. Some researchers believe that this range expansion and subsequent northern spotted owl displacement may be a result of forest fragmentation and the barred owls ability to adapt better to a mosaic of habitats, but others disagree (Dark et al. 1998; Kelly et al. 2003). Barred owls readily respond to spotted owl calls (Pearson and Livezey 2003).

The potential for the barred owl to become established and compete with California spotted owls within the Watdog Project area is a possible additional cumulative effect, but the extent of the effect is unknown at this time. No barred owls have been found in the Watdog analysis area, although they have been observed within 3 miles of the Watdog Project boundary. On the Feather River District, barred owls have been seen and heard in the vicinity of Pats Gulch and Mountain Boy Mine, Wisconsin Ravine, Glazer Ridge, Dixon Creek, and near Grass Flat. Outside the Feather River District, there has been only one sighting of a barred owl pair on the Plumas National Forest. A barred owl pair was located in Treatment Unit 3 near Long Valley, on the Mount Hough Ranger District in 2007.

Additional PACs and Home Range Core Areas in the project area will be created in the future, if required. The establishment of additional PACs and Home Range Core Areas, as well as northern goshawk PACs, will conserve habitat for this species. The project may affect individual California spotted owls and change the distribution of spotted owl habitat as it is a part of the larger HFQLG Pilot Project. Projections for the HFQLG Pilot Project area indicate that 123,500 acres (8.7 percent) 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 will be a cumulative growth over current conditions of suitable nesting and foraging habitat for the California spotted owl outside of treatment areas, both within and outside of HFQLG Pilot Project Area.

The only HFQLG projects directly adjacent to the Watdog Project are Bald Onion and Bald Mountain. The Bald Onion Project would not modify any acres of suitable nesting habitat or foraging habitat, and therefore no Home Range Core Area habitat. Implementation of this project is scheduled to begin in 2006. The Bald Mountain Project would modify 55 acres of suitable nesting habitat and 136 acres of suitable foraging habitat. Of the 191 acres, 39 acres are Home Range Core Area habitat. Implementation of this project is scheduled to begin in 2007. Other proposed HFQLG projects that would alter suitable nesting and foraging habitat are the South Fork and Brush Creek Projects, implemented in 2003 and 2004, respectively. Both projects predominately treated the understory and only removed trees up to 12 inches in diameter. The Basin Project would modify 943 acres of suitable nesting habitat and 247 acres of suitable foraging habitat. Of the 1,190 acres, 405 acres are Home Range Core Area habitat.

Implementation of this project is scheduled to begin in 2007. These projects would reduce habitat suitability in the short term but provide higher quality habitat in the long term as a result of removing understory density and increasing tree sizes and reducing the potential for stand-replacing fires. The effects determinations for the above projects is "May affect but not likely lead to a trend toward listing" based on no direct effects and low indirect effects.

3.13.6.6.10 American Marten, Pacific Fisher and California Wolverine (Forest Carnivores)

Existing Condition

Three forest carnivores—Pacific fisher, American marten, and California wolverine—occur or have the potential to occur on the Plumas National Forest. These three species are Forest Service Sensitive species. **Only the American marten is currently known to occupy the forest.** The American marten is being addressed as both a Sensitive species (Watdog Project BA/BE) and a Forest MIS (Watdog Project MIS Report).

Forest carnivores primarily travel and forage 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 National Forest has mapped a "draft" forest carnivore network across the Forest based on scattered sightings, large habitat management areas, and wide dispersal or connecting corridors that is used to evaluate habitat connectivity across the forest. Although, the network provides a continuously connected system of habitats focused on the needs of marten and fisher, it 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 Plumas network is comprised of four components: (1) the riparian zone, (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" allow immigration and emigration to maintain healthy populations. Additional forest carnivore habitat exists outside of the "draft"forest carnivore network.

Effects of the No Action Alternative (Alternative A)

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. However, the direct effects of no action include the potential for future wildfire and the possible loss of habitat.

Indirect Effects. There would be no indirect effects as no project would be implemented. However, the indirect effects of no action include the potential for future wildfire and the possible loss of habitat.

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 could result in a loss of habitat or alter habitat components needed for the fisher or marten.

Effects of the Action Alternatives (Alternatives B, C and D)

For information on the general effects of the alternatives on terrestrial habitat refer to "**General Habitat Effects of Alternatives B, C, and D**" **above.** Refer to Appendix C, Maps 2-4, 10, and 13.

The terrestrial analysis area for the Watdog Project is within the ranges for the three forest carnivores discussed above. However, no observations of California wolverine or Pacific fisher have been recorded within the analysis area although treatment units within the Watdog Project are typed as suitable habitat.

Approximately 90% of the Watdog project area is along ridge-tops. Ridge-tops are not preferred habitat by the American marten or Pacific fisher. The habitat of best quality and the habitat that would provide denning/resting, corridors for foraging/travel and connectivity would not be adversely affected by the Watdog Project. 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.

No treatments are proposed within the draft forest carnivore network. Therefore habitat quality, habitat quantity and habitat connectivity within the draft forest carinvore network will not be affected by the Watdog Project. To the west and north of the Watdog Project, the draft forest carnivore network includes a dispersal corridor along the Middle Fork of the Feather River. To the east and northeast of the Watdog Project the draft forest carnivore network includes mature/old forest blocks and a corridor along the South Fork of the Feather River. The mature/old-forest blocks are also maintained by lands managed as California spotted owl PACs (2,812 acres) and SOHAs (763 acres) and northern goshawk PACs (402 acres) within the Watdog 22,659 acre wildlife analysis area.

Direct Effects. Based on the above discussion, surveys, protection measures and project design features described below, it has been determined that direct effects for alternatives B, C, and D are not expected. Potential direct effects on forest carnivores from vegetation management activities consist of habitat modification, loss of habitat, or loss of habitat components, especially denning/resting habitat. Direct effects also include behavioral disturbance to denning from logging, road-building, or other associated activities. Direct effects are not expected based on the following:

- No treatments are proposed within the "draft" forest carnivore network.
- There are no known den sites of American marten or Pacific fisher in the analysis area.
- There were no detections of these species during protocol surveys conducted during winter of 2002–2003 (Mathews 2003).
- If a den site is found in the future, the site will be protected and a limited operating period would be implemented within 0.5 mile of the den site (HFQLG Act FEIS and SNFPA ROD).
- California spotted owl PACS and SOHAs, Northern goshawk PACs, Middle Fork Wild and Scenic Area of the Feather River, and Feather Falls Scenic Areas will protect large blocks of old/mature forest as well as travel corridor habitat.
- The off-base and deferred area, north and west of the project area, is not being treated.

- The Late Successional Old Forest Rank 4 and 5s, southeast of the project area, is not being treated.
- The Roadless Area, north of the project area, is not being treated.
- Any entries into Riparian Habitat Conservation Areas (RHCAs) are to enhance riparian habitat and only hand treatments would be conducted.
- Implementation of Standard Management Requirements and resource protection measures would reduce or eliminate impacts from disturbance.

Indirect Effects. Indirect effects are expected to be low. A multitude of fators were considered in the analysis of potential indirect effects to forest carnivores. Surveys, following regional protocol, were conducted to detect individual forest carnivores and/or active den sites. Any new American Marten or Pacific fisher den sites would be protected following the SNFPA 2004 direction. Also, the "draft" forest carnivore network along with buffered RHCAs, PACs, SOHAs and emphasis areas such as the Wild and Scenic Middle Fork Feather River protect old/mature forests and travel corridor/riparian habitat.

The effects to potentially suitable habitat outside the draft forest carivore network were considered under indirect effects. The proposed treatment units for the Watdog Project are over 90% along ridgetops. However, even though there is land proposed for treatment that was typed as suitable, ridge-tops are not preferred habitat by the American Marten or Pacific fisher. Also, the proposed project does not include activities within the riparian zones which could potentially be utilized as riparian corridors or saddles between major drainages. Indirect effects are expected to be low based on the following:

- No treatments are proposed within the draft forest carnivore network.
- There are no known den sites of forest carnivores in the analysis area.
- There were no detections of these species during protocol surveys conducted during winter of 2002–2003 (Mathews 2003).
- If a den site is found in the future, the site will be protected and a limited operating period would be implemented within 0.5 mile of the den site (HFQLG Act FEIS and SNFPA ROD).
- California spotted owl PACs and SOHAs, Northern goshawk PACs, the Middle Fork Wild and Scenic Area of the Feather River and Feather Falls Scenic Areas will protect large blocks of old/mature forest as well as travel corridor habitat.
- The off-base and deferred area, north and west of the project area, is not being treated.
- The Late Successional Old Forest Rank 4 and 5s, southeast of the project area, is not being treated.
- The Roadless Area, north of the project area, is not being treated.
- Any entries into Riparian Habitat Conservation Areas (RHCAs) are to enhance riparian habitat and only hand treatments would be conducted.
- Implementation of Standard Management Requirements and resource protection measures would reduce or eliminate impacts from disturbance.

- Important habitat components such as large trees, snags and large woody material will be retained across the landscape.
- DFPZ treatments will not remove black oaks greater than 12 inches. Although GS units may remove oaks up to 30 inches, the GSs would be placed to avoid black oaks.

The marten prefers moderate to high canopy closure, with interspersed riparian areas and meadows (SNFPA 2001). The 2001 SNFPA EIS identifies CWHR Size Class 4D, 4M, 5D, 5M and 6 as moderately to highly important (also refered to as "suitable"habitat) to the marten. Preferred forest types in the Sierra Nevada are red fir, lodgepole pine, subalpine conifer, mixed conifer-fir, Jeffrey pine, and eastside pine. The primary CWHR type found in the project area is Siearran Mixed Cconifer. American marten habitat, although modified by proposed treatments in the short term, would recover overtime, and provide suitable denning and foraging habitat in the future. Habitat attributes important to the fisher include a minimum of 40 percent canopy cover (SNFPA ROD 2001). HFQLG FEIS BA/BE (p. 121) identifies denning/resting habitat at greater than 60 percent canopy cover and forage/travel habitat at greater than 40 percent canopy cover. CWHR types important to fishers include: Structure Classes 4D, 4M, 5D, 5M, and 6 in ponderosa pine, montane hardwood-conifer, mixed conifer, montane riparian, aspen, red fir, Jeffrey pine, lodgepole pine, subalpine conifer, and eastside pine. Although modified by the action alternatives, fisher habitat would not be altered to the degree that future habitat would be reduced.

The proposed treatment area for the Watdog Project includes a total of 4,381 acres which is 3% of the anticipated Pilot Project area, 18% of the wildlife analysis/survey area, and 9% of the watershed/aquatic area. Of these 4,381 acres, there are 4,049 (4,021 acres of DFPZ with GS and 29 acres of GS outside of DFPZ) acres of treatment. Of the 4,049 acres, 2,020 acres would affect the canopy cover of habitat typed as suitable for forest carnivores. Acres treated by mastication, underburn, or hand cut and pile did not result in habitat modification.

Table 3-58 displays the acres of existing American marten and Pacific fisher habitat in the project wildlife analysis area and changes to that habitat for all alternatives. Proposed thinning (including GS) treatments would involve the modification of a maximum of 2,020 acres of 4D, 4M, 5D and 5M CWHR habitat types. **Refer to tables in Chapter 2, 3-34 through 3-40 in the Vegetation section 3-12, and Tables 3-50 through 3-52 above and associated discussions.**

Table 3-58. Suitable habitat for Pacific fisher and American marten by CWHR forest strata type within the analysis area. Acres of moderately/highly suitable habitat, pre- and post-project, by alternatives.

CWHR* Forest Strata Type*	Pre-project	Post-project	
	Suitable Acres existing	Suitable Acres (%) untreated	Suitable Acres (%) treated
4M, 5M, 4D and 5D*	Alternative A = 10,219	Alternatives B-D = 8,199 (80%)	Alternatives B-D = 2,020 (20%)

Note: * CWHR size classes are defined as follows:

4 = small 11–24 inches dbh D = Dense Canopy Cover> 60%

5 = medium/large>24 inches dbh M = Moderate Canopy 40–59%

* CWHR 6s are not proposed for treatment.

All action alternatives would reduce existing canopy covers. Retaining CWHR Size Class 4 and 5 stands at 50 percent average canopy cover, as proposed by alternative D, would have less short-term impact on habitat suitability. However, greater thinning of the canopy, as proposed by alternatives B or C, within CWHR Size Class 4 and 5 stands will decrease tree competition and create CWHR Size Class 5 and 6 stands at a faster rate and create more suitable and higher quality habitat in the long term. Alternative B would also do more to reduce the risk of stand-replacing fires and loss of habitat altogether. Changes in canopy cover can alter temperature in foraging areas. However, due to the small size of group selection units (0.5 acre–2 acres), and the overall percentage (9 percent of the watershed) of ground treated by group selection (29 acres) and DFPZ construction (4,020 acres), the overall effects within the analysis area should be low. In addition, small openings may create additional foraging habitat by increasing habitat for prey species such as small rodents (Rotta 1999). Refer to Table 3-51 above.

Table 3-59 displays the acres of existing American marten and Pacific fisher habitat potentially suitable for denning and resting (CWHR 4/5 D) and potentially suitable for foraging and travel (CWHR 4/5 M) and the changes in acres and suitability by each action alternative. This analysis is based on HFQLGFRA FEIS p. 3-110. Of the 2,020 acres being treated by thinning (including group selection) there is presently 711 acres of potentially suitable denning/resting habitat and 1,309 acres of potentially suitable forage/travel habitat. All action alternatives would result in a reduction of suitability of the 711 acres of potentially suitable denning/resting habitat. Under each alternative the overall loss of denning/resting (high) and foraging/travel (moderate) habitat would be: 1,097 acres for alternative B, 0 acres for alternative C and 108 acres for alternative D.

- Alternative B would result in potentially suitable denning/resting habitat becoming either potentially suitable foraging/travel habitat or becoming habitat of potentially low suitability.

- Alternative C would result in the potentially suitable denning/resting habitat becoming potentially suitable foraging/travel habitat.

- Alternative D would result in the potentially suitable denning/resting habitat becoming potentially suitable foraging/travel habitat and a fewer acres becoming habitat of low suitability.

The habitat typed as CWHR 5s, refer to table 3-61, would result in potentially suitable denning/resting (60% or greater canopy cover) reduced in suitability to foraging/travel but will not be reduced to low suitability. The habitat typed as CWHR 4s, refer to table 3-60, would result in potentially suitable denning/resting habitat reduced to potentially suitable foraging/travel habitat and potentially low suitability habitat.

- Alternative B would retain an average of 37.4% canopy cover for CWHR 4s and 41.3% for CWHR 5s.

- Alternative C would retain an average of 42.7% canopy cover for CWHR 4s and 41.3% for CWHR 5s.

- Alternative D would retain an average of 49.5% canopy cover for CWHR 4s and 47.4% for CWHR 5s.

Table 3-59. Acres of CWHR 4/5 D and 4/5 M habitat affected by the Watdog Project and suitability typing pre- and post-treatment.

	Alternative A	Alternative B	Alternative C	Alternative D
CWHR 4/5 D	711	0	0	0
CWHR 4/5 M	1,309	923	2,020	1912
CWHR 4/5 P	0	1,097	0	108
totals	**2,020**	**2,020**	**2,020**	**2,020**

Table 3-60. Acres of CWHR 4 and density changes for each Alternative.

	Alternative A	Alternative B	Alternative C	Alternative D
CWHR 4 D	256	0	0	0
CWHR 4 M	1,086	245	1,342	1,234
CWHR 4 P	0	1,097	0	108

Table 3-61. Acres of CWHR 5 and density changes for each Alternative.

	Alternative A	Alternative B	Alternative C	Alternative D
CWHR 5 D	455	0	0	0
CWHR 5 M	223	678	678	678
CWHR 5 P	0	0	0	0

Habitat that is reduced to below 40% canopy cover is considered low suitability. However, this does not mean that the habitat would not be uitilized for foraging and dispersal just that it is of low quality and that it is less likely it would be selected based on the quality (Patti Krueger, Regional Office, personal communication). **Also, even though there is habitat outside of the forest carnivore network boundary typed as suitable, due to its ridge-top location, this habitat has a low potential for selection for habitat by forest carnivores.** Land within the Watson Ridge and other ridges within the Watdog project area is best managed as habitat for the Northern goshawk (large trees with open understories) than as habitat for marten or fisher (dense, multicanopy) due it being located 90% on the top of ridges. Also, the treatments are short-term effects and the risk for potential stand-replacing fires are higher for alternative C and even higher for alternative D which could mean a loss of many more acres of typed moderately/highly suitable habitat in the long term.

Carnivore network travel corridors that follow rivers and streams are protected within RHCAs. Mastication, harvesting, and group selection treatments will not occur in RHCAs. However, in some DFPZ units, hand piling, hand thinning and underburning in RHCAs may occur. The Feather River Ranger District silviculturalists estimate that only one of the group selections would require a skid trail that would cross streams. No group selection skid trails would cross-streams with running water. In addition, it is expected that none of the skid trails associated with DFPZ construction would cross RHCAs. Consequently, direct effects due to skidding are not expected to occur or be minimal.

Four snags per acre (15 inches dbh or greater) will be retained. However, retention of snags will depend on the operability and safety of the harvesting process. In addition, current management direction requires treatments within Westside vegetation types to retain pieces of large down wood beginning with the largest down logs, until at least 10 to 15 ton per acres are retained over a treatment unit. Refer to the large tree, snag and large woody material discussions above.

Hardwoods are considered important for wildlife. The physical structure of oak communities determines the availability of shelter, nesting sites, and corridors for travel. The exact number of hardwoods between 17 and 21 inches dbh that will be lost is not known. Although suitable forest carnivore habitat may be affected, the project activities are not expected to result in significant indirect effects. Refer to the black oak discussion above.

Under Alternatives B and C, there will be approximately 1.2 miles of new system (permanent) road construction. Alternative D will have no new road construction. Alternatives B, C, and D will have 5.7 miles of temporary road reconstruction. Approximately 400 trees 30 inches dbh and greater would be removed for each action alternative as a result of the construction of permanent and temporary roads, reconstruction of temporary roads, and landings due to "operability." Large trees are an important habitat component. The removal of trees 20 to 30 inches dbh and greater would have the greatest long-term affects on species and their habitat. In addition, the loss of this large tree component affects numbers of large trees for future snag recruitment. For all action alternatives there will be approximately 13 miles of road reconstruction, and 0.5 mile of new temporary road construction that would increase human disturbance. However, 5.3 miles of road closures and 17.1 miles of decommissioning of some permanent and old temporary roads is also proposed. The average road density within the project area is 6.6 miles per square mile, which is exceptionally high density. Decommissioning of roads would lower the average road density to 5.3 miles per square mile. These activities could result in some site-specific short-term disturbance but could also create additional nesting, denning, foraging and resting habitat in the long term. However, disturbance in the long term would be only slightly reduced as a result of the proposed road reduction.

Prescribed burning (approximately 2,800 acres) would be conducted to retain snags and large down woody material. Prescribed burns leave a mosaic of burned and unburned areas, so some shrubs would remain to provide cover for carnivores and prey species using these areas. Habitat modification by these treatments would not affect the overstory of mature forest stands in RHCAs, used by carnivores as travel corridors. In-group selection units outside of the DFPZs, slash material would be gathered into burn piles and burned during the fall and winter months. RHCAs would be avoided for burn pile placement.

The Truex/Zielinski 2005 paper "Short-term Effects of Fire and Fire Surrogate Treatments on Fisher Habitat in the Sierra Nevada" was reviewed. Measures to mitigate short-term effects, as suggested in the paper, were considered and applied were feasible and applicable. SNFPA ROD 2004 and HFQLG FEIS 1999 "Standards and Guidelines" were applied to retain large trees, snags, large woody material and large oaks, thereby reducing affects of implementing fuels-reduction ("Fire and Fire Surrogate") treatments such as mechanical harvest, mechanical harvest followed by burn and fire (underburn) only treatments. The paper also states " the short-term effects of treatments may be mitigated by the beneficial effects of the treatments on subsequent stand development." It is expected that any short-term effects will be mitigated by the long-term improvement in stand conditions and the reduction of the potential for catastrophic stand-replacing fires.

For the California wolverine refer to the discussion above for the fisher and marten. In general, implementation of Standard Management Requirements and Resource Protection Measures would reduce indirect effects.

Cumulative Effects. Direct effects are not expected and indirect effects are likely to be low. Cumulative effects of the Watdog Project are expected to be minimal to low when added to other

actions. Cumulative effects on forest carnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service System Lands, and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for these species. High-intensity stand replacement fires, and the methods land managers utilize to control them, have contributed and may continue to contribute to loss of habitat for this species. Based on surveys, protection measures and project design features; it has been determined that the cumulative effects will be similar for all three action alternative. **More information about cumulative effects, including private lands, is found under Section 3.1.3, Section 3.12.5 and "General Cumulative Effects" above. Refer to the Watdog Project BA/BE for an extended discussion regarding cumulative affects.**

Other proposed HFQLG projects that would alter forest carnivore habitat are the Basin Project proposal, which includes 17 acres of individual tree selection and 407 acres of group selection within the "draft" forest carnivore network. Implementation of this project is scheduled to begin in 2007. The Bald Mountain Project proposal includes 62 acres of group selection and 95 acres of individual tree selection within the forest carnivore network. Implementation of this project is scheduled to begin in 2007. The Bald Onion Project proposal includes mechanical thinning approximately 280 acres, mastication is planned for 126 acres, and underburning only is scheduled for 651 acres within the forest carnivore network. Implementation of this project is scheduled to begin in 2007. The South Fork and Brush Creek Projects, implemented in 2003 and 2004 respectively, predominately treated the understory and only removed trees up to 12 inch diameter. The effects determinations for the above projects is "May affect but not likely lead to a trend toward listing" based on low effects.

Protection of California spotted owl and northern goshawk PACs, RHCAs, and establishment of the carnivore corridors will provide connectivity between large blocks of suitable habitat. In addition, implementation of RMOs (appendix L, HFQLG FEIS) will improve habitat conditions within riparian corridors. The action alternatives would not increase any large scale, high contrast fragmentation of habitat above existing levels. Since no direct effects are expected and few indirect effects are expected, it is expected that cumulative effects to carnivore habitat would be low.

Carnivore surveys have been conducted on the Plumas NF. Approximately 50% of the Plumas Forest has been systematically surveyed to protocol using track plates and camera stations (Plumas GIS database, PNF MIS Report). Based on the monitoring data collected on the Plumas, as required by Appendix E and the Plumas LRMP, it appears marten are presently locally distributed in and around the Lakes Basin area of the forest with historical sightings within the Little Grass Valley area. This distribution of martens has remained stable since development of the LRMP in 1988.

Most recent surveys have not detected Pacific fishers in the HFQLG Pilot Project Area. Even if fishers were reintroduced into northern California, it would probably be several years after reintroduction before available habitat would become fully occupied. Based on the home range and stand size reported for fishers in the April 8, 2004, *Federal Register* and the latest FS habitat modeling, it appears that the Watdog wildlife analysis area contains large enough blocks of contiguous habitat and the habitat attributes needed to support a population of fisher and therefore, contribute to the potential for recovery of the species. Based on studies of home range sizes (*Federal Register,* April 8, 2004), estimates of potentially suitable and contiguous habitat that must be present before an area can sustain a

population of fishers, range from 31,600 acres in California; 39,780 acres in the northeastern United States; and 64,000 acres in British Columbia.

Geographic distribution monitoring for the marten is also occurring at the bio-regional scale under the Sierra Nevada Forest Plan Amendment (SNFPA 2001). This monitoring for the marten began in 2002. Bio-regional monitoring for the marten occurs on all Forests throughout the Sierra Nevada (Ibid). Population monitoring involves conducting presence/absence surveys throughout the region to estimate the proportion of sites (primary sample units) annually occupied by marten, and detect declines over the proposed ten-year monitoring period. During the past four field seasons, 708 primary sample units have been completed (with more than 4,500 individual survey stations and over 45,000 survey nights). During this time, marten were detected at 84 sites throughout the region, 28 of which occurred in wilderness areas. This bio-regional monitoring under the Sierra Nevada Forest Plan Amendment has not resulted in any new detections on the Plumas NF.

Habitat reduction as a result of implementing alternatives mirrors that described for spotted owls and goshawks. Effects to the habitat trend on the draft Forest Carnivore network from the Watdog Project are not expected. Marten habitat could be better protected from stand replacement fires (from the existing condition) for the next 10-20 years. The project-level habitat impacts will contribute to the current forest-wide trends of short term habitat reductions for longer term protection of old forest habitat. Based on known detections of marten on the PNF, no changes in marten occupancy or distribution on the PNF would occur.

The action alternatives would not increase any large-scale, high-contrast fragmentation above existing levels. The cumulative effect of recent private land clearcuts, older National Forest plantations, the large brushfields created by past wildfires, together with implementation of groups would result in increased “patchwork” of open habitat and young age class vegetation between mature forested stands within the Analysis Area. This would increase edge effects and possibly increase potential risks to forest interior species movement and use in the wildlife analysis area. Thus the Watdog Project would in the short-term act cumulatively with past actions to slightly reduce the connectivity of habitat within the wildlife analysis area, although connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high-intensity fire.

The greatest concern regarding the Pacific fisher (and American marten) in the Sierra Nevada range is the risk of further fragmentation due to large stand-replacing fire (SNFPA final supplemental EIS 2004, page 244). The design features of the proposed fuel treatments would retain habitat elements within the range of those used by fishers for foraging and dispersal. In addition, the design features would likely not create large barriers to further expansion and connectivity for fishers. The DFPZs would be created to reduce the potential for large stand-replacing fires.

Based on the direct and indirect effects, implementation of all action alternatives would contribute to cumulative effects on forest carnivores and their habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas under alternatives B, C and D. Implementation of alternatives B and C would result in the highest risk of all alternatives to habitat in the short term and greatest uncertainty about future forest carnivore activity. Implementation of alternative D would result in a level of risk to forest carnivore habitat in the short term and uncertainty about future forest carnivore activity; this level of risk would be less than the other action

alternatives. Based on known detections of marten on the PNF, no changes in marten occupancy or populations on the PNF would occur.

The determination for the American marten and Pacific fisher is "May Affect, but not likely to lead to a trend toward listing or loss of viability". This determination is based on the following 1) no carnivores or den sites were detected during protocol surveys, 2) the "draft" Forest Carnivore Network will not be entered, 3) fisher have not been detected on the forest, 4) some habitat typed as suitable will be affected in the short term as a result of thinning (including GS) treatments, but will be maintained for future use by the American marten and Pacific fisher, 5) California spotted owl PACs and SOHAs, Northern goshawk PACs, Late successional old-forest Rank 4 and 5 lands, Middle Fork Wild and Scenic Area, Feather Falls Scenic Area and Roadless Area will not be entered thereby retaining mature-old forest habitat, 6) the project treatment area is over 90% ridge-top, which is not preferred habitat by the American marten or Pacific fisher, 7) Any treatments within riparian zones would be conducted by hand and 8) American marten habitat and effects to forest-wide population trends as discussed in the MIS Report will be maintained.

3.13.6.6.11 Pallid, Western Red, and Townsend's Big-eared Bats

Exiting Condition

The pallid, western red, and Townsend's big-eared bats are known to utilize a variety of habitats, including conifer and hardwood stands (under the bark of trees, live and dead). They may roost in rocky areas, tree hollows, leaf litter, or mine/cave openings as well as structures such as buildings. These species are insectivorous and can feed on airborne as well as ground-dwelling arthropods. Most foraging takes place over slow moving, or standing areas of water. The pallid bat is known to glean its prey from vegetation or the ground.

Pallid Bat. The bat uses a variety of habitats. The species depends on streams and ponds nestled within oak woodland habitat for foraging and roosts in mines, snags, and in crevices in oaks. The analysis area falls within the historic range for this species, and suitable habitat is present throughout the mixed conifer and hardwood habitats. This area has been surveyed for possible roosts (such as rock outcrops larger than 50 square feet) and foraging areas (such as streams/ponds). No roosts were located. Target surveys have been completed prior to project implementation. During the 2002 surveys, four pallid bat detections occurred within proposed DFPZ units and two observations were on the boundary of a DFPZ unit. A west-side habitat use assessment for the Pallid bat was initiated in 2006 (H.T. Harvey, Dec. 2006). Although numerous detections were made, bat roosts have proven hard to locate. Of 69 calls at various locations only 6 roosts were located. Initial results show that Pallid bats were primarily along ridge-tops and in areas with open forest canopy with large-sized trees (greater than 20 inches dbh).

Townsend's Big-eared Bat. This bats found throughout the Sierra Nevada in isolated areas with low human disturbance. The analysis area falls within the historic range for this species; however, roosting habitat provided by abandoned buildings and mine openings are very scattered and rare in the analysis area. Potential roosting habitat (such as rock outcrops larger than 50 square feet) mine adits, and buildings and foraging areas (such as streams/ponds) have been surveyed prior to project activities. In 2002 three individuals were observed within DFPZ unit boundaries and another was found within the 0.5 mile buffer around the DFPZ.

Western Red Bat. This bat roosts in foliage and is dependent on edge habitats adjacent to riparian areas. The elevation range for this species has been described as below 3,000 feet. However, during 2001 and 2002 surveys there were 29 observations of this species above 3,000 feet, as high as 6,000 feet, at various sites on the Feather River Ranger District. These observations were recorded during the breeding (rather than migration) season. Target surveys were conducted in 2002, prior to project initiation.

Western red bats were detected at six sites scattered throughout the proposed project area. Four of these sites are within DFPZs and two are within the 0.5 mile buffer around the DFPZ. All observations in the Watdog analysis area were above 4,000 feet.

Effects of the No Action Alternative (Alternative A)

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.

Effects of the Action Alternatives (Alternatives B, C and D)

For more information about the general effects to terrestrial habitat see the "General Habitat Effects of Alternatives B, C, and D" section above. Effects of the no-action alternative are discussed under section 3.13.6.4.

Of the three bat species, it is expected that pallid bats could be most affected 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 riparian areas are predominately avoided. Townsend's big-eared bats are more closely associated with structures (caves, bridges, buildings, etc.) for roosting and riparian habitat for foraging. However, Townsend's will roost in large trees. It is expected that the latter two species would be more indirectly affected, if at all.

Direct Effects. Based on the surveys, protection measures and project design features discussed below, it has been determined that direct effects will be similar for alternatives B, C, and D. Direct effects are possible as all of three sensitive bat species have been observed in the project area. 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. Adults may be able to flee from the destruction of their roost tree. However, if activities were to take place during the 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 are felled. 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 within the tree or snag. Loss of structures used by Townsend's big-eared bats may also result from project activities. However, surveyors did not find any potentially suitable structures within the project area, therefore, minimizing any potential for direct effects.

A limited operating period is in place for DFPZ Units 45 and 53 and all group selection units within them. This limited operating period is for protection of reproductive pallid bats found during surveys. Two out of four Townsend's big-eared bat observations were associated with RHCAs. Five out of six western red bat observations are in or adjacent to RHCAs. If any of the three sensitive bat species are found at additional locations during project implementation or roosting habitat showing recent activity is located, the district biologist will be notified and will develop and implement mitigations to protect roosting individuals, thereby further reducing any effects on individuals or breeding populations from disturbance from operation of project activities. Specifically, a limited operating period would be applied to protect bats during their breeding season.

Prescribed burns done in the spring could affect pallid bats, due to their habitat preferences. Forest Service fire personnel intend to limit spring underburning to a minimum and do as much burning as possible in the fall. Conducting prescribed burns during fall months will minimize the risk of mortality to bats. By fall, the young can fly, and hibernation has not yet begun.

Chain saw activity or the use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment. However, machinery used for mechanized treatment would disturb most tree-roosting bats prior to tree removal activities, and therefore reduce the potential for direct mortality. On the other hand, if activities were to take place during the spring and early summer, before juvenile bats develop flight skills, juveniles would have no means of escaping direct disturbance and would perish if maternity roosts were abandoned. If bats are roosting in trees that are not felled (30 inches dbh or greater) or trees adjacent to the treatment area, temporary or permanent roost abandonment could also result in lowered reproductive success or even worse, total maternity roost abandonment and death of the young of the year.

Indirect Effects. Implementation of Standard Management Requirements, and/or Resource Protection Measures and Mitigations will minimize indirect effects on bats by minimizing effects on foraging habitat and prey species within RHCAs. Also, bats primarily forage at dusk or night when project activities are unlikely to occur. The following discussion will concentrate on potential indirect effects on pallid bats.

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, as they also forage on shrubs and on the ground. The available insect prey base for bats may be temporarily reduced at some sites due to direct mortality and/or loss of vegetation. However, post treatment conditions have been shown, in many instances, to increase plant vigor (Lyon and Stickney 1976; Debyle 1984; Stein et al. 1992). Many herbivorous insects preferentially feed, and have increased reproductive success and fitness, on more vigorous plants and plant parts (Price 1991; Spiegel and Price 1996), thus the forage base available to pallid bats may increase post-treatment. 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. Down woody material and snag retention requirements should minimize any impacts.

Changes in canopy cover can alter temperature in roosting areas. However, due to the small size of group selection units (average 1.5 acres), and the overall small percentage of ground treated by group

selection and DFPZ units (9 percent of the watershed), the overall effects should be low. In addition, small openings may create foraging habitat for bats.

Slash material would be gathered into burn piles and burned during the fall and winter months. RHCAs would be avoided for burn pile placement. These activities should not significantly affect the bat species based on the type and timing of the activity.

There will be some permanent road construction and reconstruction that would increase human disturbance. However, road closures and decommissioning is also proposed. These activities could result in some site-specific short-term disturbance but could also create additional roosting and foraging habitat in the long term.

As mentioned before, 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. Alternative D would have less of an impact than alternatives B and C on bat habitat. Alternative D would thin CWHR Size Class 4 and 5 stands within the DFPZ units to an average of 50 percent canopy cover. Alternative C would thin CWHR Size Class 4 and 5 stands within the DFPZ units to a minimum 40 percent canopy cover. Instead of thinning to 70 trees per acre in CWHR Size Class 4 stands, each stand would be thinned from below to a 40 percent canopy cover.

Cumulative Effects. Cumulative effects on these species within the project area occur predominately from loss of quantity and quality of habitat (conifer, oak, and riparian), loss of prey base, tree removal, and disturbance during roosting attempts. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on state, private, and federal lands may contribute to habitat loss for this species. High-intensity stand replacement fires, and the methods land managers utilize to control them, have contributed and may continue to contribute to loss of habitat for these species. With full implementation of Standard Management Requirements and/or Resource Protection Measures and Mitigations (see Appendix B) cumulative effects on bats as a result of the implementation of Watdog is low. Since direct and indirect effects would be low, it is expected that cumulative effects would be low. Cumulative effects will be similar for alternatives B, C, and D.

3.13.6.6.12 Mule Deer

Effects of the No Action Alternative (Alternative A)

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 range. In the short term, forested stands would not be opened-up through thinning and underburning, thus very

little regeneration of foraging habitat would occur. On the other hand, no action could result in potential larger and more intense wildfires, which, depending on weather conditions and fuel loadings, could either increase or decrease the productivity of foraging habitat.

Based on the direct, indirect and cumulative effects of the no-action alternative, it is suspected that deer numbers would respond slightly to the habitat changes created on private land. 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.

Effects of the Action Alternatives (Alternatives B, C and D)

Direct and Indirect Effects. Under all action alternatives, deer foraging habitat would increase, and populations would likewise tend to be maintained or increase locally for the following reasons:

The Fall River and South Branch Middle Fork Feather River Rapid Landscape Assessment identified 49 percent of the landscape to be available for forage and 52 percent available as cover (this includes private lands). The desired forage to cover ratio for summer range is 50:50, compared to 60:40 for winter range.

Based on CWHR, the Watdog Project analysis area supports a mix of forage such as grass/forb, shrub, and early successional habitat (CWHR 1, 2, NR, NB, PGS, GP, GM, CX, MCP). The majority of this habitat is due to even-aged timber harvest and wildfire. This habitat is important to a number of wildlife associates, including ground nesting birds, small mammals, several species of reptiles, and bats. Forage habitat will increase at varying levels within the DFPZ treatments. The Watdog Project also provides a mix of cover habitat. The majority of treatments propose to thin the understory in CWHR 4/5D and 4/5M stands; opening up the stands yet providing some short-term understory cover.

More open forest habitat would be created, allowing more sunlight and moisture to reach the forest floor, thus creating more forage and brush cover and increasing the forage as a result of implementing the action alternatives. The post-project forage to cover ratio would persist for several years and slowly change as brush quality for forage declines due to increased shade from developing conifers in fuel treatment areas and increased conifer growth in group selection units. It is predicted that in 12 to 15 years, the amount of forage would again decline. With reforestation, conifers would dominate the brush in group openings anywhere from 15 to 50 years, depending on site and aspect.

Fuel treatments including 1,100 acres of mastication and 2,800 acres of underburns are proposed in old brushfields and dense timber stands that are located within mule deer summer range, which would result in new, highly palatable, nutritious forage for deer. A slight increase of forage is also expected as a result of group selection openings.

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.

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.

Cumulative Effects. With the exception of the creation of opening designed to improve visibility at fire lookouts, no past actions within the analysis area within the past number of years on National Forest have created any new openings or resulted in opening up stands and regenerating understory browse species. In the Watdog 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 be shaded out by growing conifers at about 50–60 years. Alternatives would improve deer foraging habitat within fuel treatment areas through mastication and 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 ensure minimizing potential changes to canopy cover. Overall deer habitat utility would be expected to decline under all alternatives. Deer habitat decline varies by only one percent between all alternatives considered in the SNFPA FEIS (a range of –5.6 to –6.6 percent) over a five-decade period, which is so small that it may be insignificant (SNFPA FEIS volume 3, part 4.2, p. 27). With the analysis of alternative S2 in the SNFPA FSEIS in 2004, there was no projected difference in deer habitat from what the 2001 SNFPA analysis disclosed.

The Watdog 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 habitat within the project area, the Plumas NF, 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, DFG 1998). 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. The Challenge Landscape Assessment, 2005, identified the opportunity to improve deer summer range through broadcast burning and underburning. In addition the opportunity was identified to improve water distribution for upland species with waterhole development and guzzler installation.

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 decreased road density. These cumulative effects improve two limiting factors identified by the California Department of Fish and Game that affect deer herd health.

Based on the direct, indirect and cumulative effects of the action alternatives, 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. The Watdog Project would enhance deer habitat and carry capacity for deer, resulting in a contribution towards maintaining stable habitat and population trends forestwide.

3.13.6.6.13 Trout Group

Effects of the No Action Alternative (Alternative A)

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 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.

Effects of the Action Alternatives (Alternatives B, C and D)

Direct, Indirect, and Cumulative Effects. For the Trout Group, the Watdog Project is not expected to affect forestwide habitat or population trends. The benefits of the Watdog Project, including culvert replacement and reducing the risk of catastrophic fire, should help maintain the stable habitat and population trends for the Plumas National Forest.

Implementation of any of the action alternatives would not result in a significant increase in sediment delivery to aquatic habitats and may even help reduce sediment transport. Through the design of the action alternatives, and by implementation of Standard Management Requirements for soils and streamside management, ground disturbance activities would be minimized. However, fuels reduction harvesting in the RHCAs could decrease wood available for ground cover and sediment traps in those RHCAs, however, most of the wood would be in the smaller diameters. Refer to the Watdog Project - Soils Report for ground cover in regards to soils.

The SAT 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. Based on the CWE Analysis for the Watdog Project, there would be no measurable downstream effects on beneficial uses due to sediment from the proposed project, thus no indirect effects on MIS fish species, rainbow and brown trout, would occur downstream.

Fuels reduction harvesting in RHCAs and on upland slopes would lower the risk of future wildfire and reduce the probability that retained snags, woody debris, and live vegetation in the RHCAs would be consumed by future fire. Fuels reduction harvesting of some trees in the RHCAs would reduce fuel loading and the potential for a stand-replacing fire.

Trout habitat conditions would be improved with the replacement of culverts to allow for upstream fish passage, resulting in increased trout distribution and, potentially, increased numbers.

Many of the creeks within the area are subjected to mining activities. The time frame for dredging season is from the third week of May thru October 15 each year. Dredging must be in compliance with State regulations under a permit issued by the California Department of Fish and Game.

3.13.6.6.14 Swainson's Thrush

Effects of the No Action Alternative (Alternative A)

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.

Effects of the Action Alternatives (Alternatives B, C and D)

The Swainson's thrush (SWTH) population surveys in the Sierra Nevada Bioregion were completed in 1998 and 1999 (Stefani 2000). Of the 155 sites visited, SWTH were detected at 54 sites (35 percent).

The majority of known SWTH sites (i.e., SWTH detected during 1998 breeding season survey) in the Sierra Nevada bioregion occur in the Plumas National Forest area. Of 59 sites visited on the Plumas, SWTH occurred in 36 sites. Of 15 sites visited on the Lassen NF, SWTH were found in 2 sites and of 6 sites on the Sierraville and Truckee Districts of the Tahoe NF, no SWTH were detected.

From the 1998 survey data it appears as though the Sierran SWTH population is uncommon in the Plumas National Forest area as an uncommon species and is rare elsewhere in the Sierra. However, these preliminary, distributional results may be limited by local knowledge of habitat and occurrence of historic, contemporary, and potential sites as well as restricted access to survey locations, especially in the southern Sierra.

Habitat modification would be expected to affect NTMBs like the SWTH to varying degrees. Effects of timber harvest, hand treatments, and prescribed burning could include but are not limited to (1) mortality of young in the nest that are too young to escape activities or when adults abandon nests due to disturbance; and (2) loss of nesting, roosting or foraging habitat.

Direct, Indirect, and Cumulative Effects. The SWTH is closely associated with riparian zones and tends to utilize more arboreal foraging methods than other thrushes, foraging for insects in the trees versus shrubs. Riparian zones will generally not be entered for group selection or DFPZ construction (section 3.7.4). Direct effects are not expected. Indirect effects are expected to be short term in nature with a long-term gain of reducing the potential for stand replacing fires and protecting habitat.

SWTH appears to be adversely affected by thinning actions that convert closed forested stands to open forested stands. Actions that open up forest stands through thinning, such as with the proposed fuels treatment thinning prescriptions and group selection could result in loss of habitat suitability in the short term. Alternative D would create fewer open stands and fewer group selections openings across the wildlife analysis area and would maintain more habitat for SWTH in the short term. Alternative B would create the greatest number of open stands and group selection openings and would, in the short term, affect more suitable SWTH habitat.

Actions that create openings in the forested landscape with group selection harvests could result in declines in species habitat trends for SWTH. For the Watdog Project, alternative B would implement group selection harvest on approximately 10 percent of the area available for group selection, compared to 6 percent for alternative C and 4 percent for alternative D ("Silviculture Report," pp. IV-19, IV-23, and IV-24). 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 (the threshold of 11.4 percent represents a 20-year treatment cycle within the stands supporting CWHR Classes 4M, 4D, 5M, and 5D). The threshold of 11.4 percent was chosen as a result of the assumptions, modeling and group simulations, and the corresponding effects analysis presented in the HFQLG FEIS, which allowed for the planning of group treatments at 20-year intervals (see appendix D, HFQLG FEIS). Groups would be dispersed across the landscape. 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 Watdog wildlife analysis area for certain Neotropical migrants.

The cumulative actions of the past may have benefited species that prefer early successional, as well as more open, habitats. Species that prefer shrub habitat benefited as shrub habitats increased with even-aged regeneration management actions, while species preferring closed canopies likely declined in numbers. With fire suppression and minimal vegetation management in the project area, together with natural succession, species preferring closed canopies may have rebounded as canopy covers filled in; conversely, as shrub habitat declines through conifer development, these species may have declined some.

The cumulative effect of recent regeneration harvest on private land together with Watdog Project group selection harvests and fuel treatments would improve overall habitat conditions for birds that prefer openings and open-canopied habitat across the landscape. Based on the CWHR model, SWTH would have decreased habitat suitability. Maintenance of DFPZs to minimize shrub regeneration would reduce the shrub understory component in the stand and that there would be a decline in habitat for shrub nesting species (USDA, PSW, 2006). Allowing group selection treatments to naturally regenerate would ensure that shrub habitat would remain on the landscape longer than with intensive regeneration efforts. For the Watdog Project, group selections within the true fir type may be naturally regenerated. In all other forest types, a combination of natural and artificial regeneration would be used to achieve desired stocking levels.

Increasing the amount of open forest, as well as small openings and increased edge, may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence in the National Forest portion of the wildlife analysis area has been documented, although they are present on private land. There is no active livestock grazing on National Forest land in the wildlife analysis area. Facilities that often are associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are not present (in HFQLG Act FEIS). There is some risk that brood parasitism could occur in the Watdog Project analysis area because cowbirds respond to increased open habitat and edges.

In addition to habitat modification and its effect on SWTH, direct effects on nesting birds (including young birds that cannot yet fly) would occur as a result of tree removal, mastication, and prescribed burning. It is recognized that the proposed Watdog Project, if implemented during the breeding season

(April–September), could directly impact nesting birds. The overall effect on SWTH populations is not known, however, long-term effects as a result of implementation of the Watdog Project are expected to be improve habitat by reducing the change for catastrophic fires.

3.13.7 Irreversible, Irretrievable Effects

No irreversible or irretrievable effects on wildlife or fish are expected.

3.13.8 Determinations

Based on the analysis of the proposed project and treatments within the Watdog Project area disclosed in the BA/BE and MIS Report it is our determination that:

Proposed activities **would not affect the following Federally listed endangered or threatened species**: bald eagle, California red-legged frog, valley elderberry longhorn beetle, Carson wandering skipper, vernal pool invertebrates and their critical habitat, delta smelt, Lahontan cutthroat trout, winter-run chinook salmon, Central Valley spring-run chinook salmon, or Central Valley steelhead. These species either do not occur within the elevational range of the project area, or do not occur within the project area, or have not been located by surveys and/or are species for which Resource Protection Measures, BMPs, establishment of SAT guidelines and associated RHCAs and RMOs, adherence to applicable HFQLG Act and SNFPA ROD standards and guidelines, and other measures are anticipated to eliminate any potential effect.

Proposed activities within the Watdog Project area **will not affect the following Forest Service Sensitive species**: hardhead minnow, northern leopard frog, greater sandhill crane, Swainson's hawk, or peregrine falcon. These species either do not occur within the project area, have not been located by surveys, and/or are species for which Resource Protection Measures, BMPs, establishment of SAT guidelines and associated RHCAs and RMOs, adherence to applicable HFQLG Act and SNFPA ROD standards and guidelines, and other measures are anticipated to eliminate any potential effect.

Proposed activities within the Watdog 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**: foothill yellow-legged frog, mountain yellow-legged frog, northwestern pond turtle, northern goshawk, California spotted owl, American marten, California wolverine, Pacific fisher, pallid bat, Townsend's big-eared bat, and western red bat. These species could possibly occur within the project area for which Resource Protection Measures, BMPs, establishment of SAT guidelines and associated RHCAs and RMOs, adherence to applicable HFQLG Act and SNFPA ROD standards and guidelines, and other measures are anticipated to minimize any potential effect.

The proposed activities in the Watdog Project area may have some effects on habitat for MIS species: **California spotted owl, Northern goshawk, American marten, mule deer, and trout.** However, effects are expected to be minimal in the short term, due more to potential disturbance then habitat change. The alternatives are expected to improve habitat conditions in the long term by reducing the risk of habitat loss from wildfires. The Watdog Project would not change the existing habitat or population trends for these MIS.

Although the SNFPA (2001/2004) showed a "small, maybe insignificant" decline in deer habitat, the Watdog Project shows a trend toward improving forage availability to achieve an optimal forage to cover ratio. The cumulative effects would improve the forage base and edge effects that would benefit deer.

The proposed activities in the Watdog Project area may have some effects on habitat for the **Swainson's thrush (NTMB)** but effects are expected to be minimal in the short term, more from potential disturbance then habitat change, and improve habitat conditions in the long term by reducing the risk of habitat loss from wildfires.

3.13.9 Summary of Cumulative Effects

The cumulative effects of this project on TES fish and wildlife species include past, present, and reasonably foreseeable projects occurring in and adjacent to the 25,913-acre Watdog analysis area. Table 3-1 displays past, current (or on going), or reasonably foreseeable future activities within or adjacent to the Watdog Project area.

3.13.9.1 California Red-legged Frog, Mountain Yellow-Legged Frog, Foothill Yellow-Legged Frog, and Northwestern Pond Turtle

Cumulative impacts on reptile and amphibian habitat have occurred from vegetation management, recreational uses, introduction of non-native species, road construction, water diversions, and wildfire. The action alternatives could contribute to impacts on suitable habitat; however, the impacts are minimal, as there is little habitat in the treatment units. In addition, implementation of the RHCA, BMPs, Resource Protection Measures, and conservation measures would reduce or eliminate potential direct or indirect impacts.

The Fall River grazing allotment overlaps the entire Watdog Project area. Implementation of the Watdog Project will not increase grazing or recreational activity in the area above current levels. Streambank cover would not be removed, so breeding habitat should not be affected by vegetation removal, sedimentation, and disturbance during the breeding season. Therefore, the Watdog Project is not expected to add cumulatively to grazing or recreational effects.

3.13.9.2 California Spotted Owl

Cumulative effects will be similar for alternatives B, C, and D. Since no direct effects and indirect effects are expected to be low, it is expected that cumulative effects would be low. Cumulative effects on owls occur from habitat modification as a result of logging, road construction, fire, and mining; prey species habitat modification from grazing; and disturbances from roads and recreational use. Invasion of California spotted owl habitat by the barred owl may also contribute to cumulative effects. Based on surveys, protection measures and project design features; it has been determined that the cumulative effects will be similar for all three action alternative.

Past pre-CASPO activities have either rendered suitable owl habitat as unsuitable or have reduced the habitat suitability. Past CASPO projects reduced treated habitat to minimum requirements for "select (nesting)" and "other (foraging)" habitat. Other HFQLG projects would reduce habitat suitability in the short term but provide higher quality habitat in the long term as a result of removing understory density

and increasing tree sizes and reducing the potential for stand-replacing fires. The effects determinations for the above projects is "May affect but not likely lead to a trend toward listing" based on no or low direct and indirect effects. It is expected that the proposed treatments for the Watdog Project will result in a low incremental impact when added to these past actions.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in the population of California spotted owls. Some researchers believe that this range expansion and subsequent northern spotted owl displacement may be a result of forest fragmentation and the barred owls ability to adapt better to a mosaic of habitats, but others disagree (Dark et al. 1998; Kelly et al. 2003). Barred owls readily respond to spotted owl calls (Pearson and Livezey 2003). The potential for the barred owl to become established and compete with California spotted owls within the Watdog Project area is a possible additional cumulative effect, but the extent of the effect is unknown at this time.

Additional PACs and Home Range Core Areas in the project area will be created in the future, if required. The establishment of additional PACs and Home Range Core Areas, as well as northern goshawk PACs, will conserve habitat for this species. The project may affect individual California spotted owls that were not detected as a result of surveys, and change the distribution of spotted owl habitat as it is a part of the larger HFQLG Pilot Project. Projections for the HFQLG Pilot Project area indicate that 123,500 acres (8.7 percent) 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 HFQLG FEIS) there will be a cumulative growth over current conditions of suitable nesting and foraging habitat for the California spotted owl outside of treatment areas, both within and outside of HFQLG Pilot Project Area.

3.13.9.3 Northern Goshawk

Cumulative effects will be similar for alternatives B, C, and D. Since direct effects are not expected and indirect effects are likely to be minimal, it is expected that there would be few cumulative effects. The establishment of northern goshawk PACs, as well as California spotted owl PACs, will conserve habitat for this species. The project may affect individual northern goshawks and change the distribution of goshawk habitat because it is a part of the larger HFQLG Pilot Project. Cumulative effects on northern goshawks occur from habitat modification resulting from logging, road construction, fire, and mining; modification of prey species habitat; and disturbances from roads, harvest activity, and recreational use.

The effects determinations for past projects has been "May affect but not likely lead to a trend toward listing" based on no or low direct and indirect effects. It is expected that the proposed treatments for the Watdog Project will result in a low incremental impact when added to these past actions.

3.13.9.4 Forest Carnivores

Cumulative effects will be similar for alternatives B, C, and D. Since no direct effects and few indirect effects are expected, it is expected that cumulative effects would be low. Cumulative effects on forest carnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service System lands, and the utilization of natural resources on State, private and Federal lands may contribute to

habitat loss for these species. High-intensity stand replacement fires, and the methods land managers utilize to control them, have contributed and may continue to contribute to loss of habitat for this species.

The effects determinations for the above projects is "May affect but not likely lead to a trend toward listing" based on no or low direct and indirect effects. It is expected that the proposed treatments for the Watdog Project will result in a low incremental impact when added to these past actions. Protection of California spotted owl and northern goshawk PACs, RHCAs, and establishment of the carnivore corridors will provide connectivity between large blocks of suitable habitat. In addition, implementation of RMOs (appendix L, HFQLG FEIS) will improve habitat conditions within riparian corridors. The action alternative would not increase any large scale, high contrast fragmentation above existing levels.

3.13.9.5 Pallid, Western Red, and Townsend's Big-eared Bats

Cumulative effects will be similar for alternatives B, C and D. Since direct and indirect effects would be low, it is expected that cumulative effects would be low. Cumulative effects on these species within the project area occur predominately from loss of quantity and quality of habitat (conifer, oak, and riparian), loss of prey base, tree removal, and disturbance during roosting attempts. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on State, private, and Federal lands may contribute to habitat loss for this species. High-intensity stand replacement fires, and the methods land managers utilize to control them, have contributed and may continue to contribute to loss of habitat for these species. With full implementation of Standard Management Requirements and/or Resource Protection Measures and Mitigations cumulative effects on bats as a result of the implementation of the Watdog Project is low.

3.14 Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

All the action alternatives are expected to implement ground-disturbing activities through mechanical thinning, group selection harvest, mastication, hand-thinning, prescribed burning, road work, and activities associated with fuel treatments. These activities would produce short-term effects to soil, water quality and wildlife habitat, as described in the environmental effects sections of this chapter. After thinning the natural stands and plantations and reducing the density of the canopy, there would be a short-term gain in shrubs, brush, and forage for deer, cattle, and other wildlife. However, once the canopy cover closes again, then there would be a decrease in the amount of understory vegetation. Long-term productivity—in terms of long-term structural diversity associated with a multistory landscape—is expected to be greatest in alternative B, followed by alternative C and then alternative D.

3.15 Unavoidable Adverse Effects

Alternative design and prescribed resource protection measures are intended to minimize potential adverse impacts on resources in the project area. However, to move resources to desired conditions, some unavoidable adverse effects may result. Risks associated with the potential of noxious weed spread are described under environmental effects in chapter 3. These effects are mostly associated with fuel treatments.

Thinning and fuel reduction treatments may result in minor loss of some riparian vegetation and hardwoods in all action alternatives, although any loss is expected to be short-term effect. Since various elements within the ecosystem are linked to each other, activities proposed in this project may affect fungi, bacteria, mycorrhizae, and variety of other ecosystem processes, but these effects are expected to be minor and of short duration.

Mitigation measures are discussed in chapter 2 and appendix E of this FSEIS; however, there may be some unavoidable adverse effects on native flora that could be displaced as weeds spread. The effectiveness of the mitigation measures for noxious weed spread will be monitored.

Implementation of Standard Management Requirements and BMPs would help reduce the amount of compaction resulting from treatments. Treatment activities may lead to increased surface runoff and sedimentation.

Smoke may affect air quality to some degree while prescribed fire activities occur. Prescribed fire activities would be accomplished with an approved smoke management plan.

Some unavoidable adverse effects on wildlife species may result from project activities, including immediate changes in habitat conditions and disturbance/ harassment, including direct mortality. It is

assumed in this analysis that all action alternatives would be implemented as stated, in compliance with all laws and regulations governing land management activities, including the use of Limited Operating Periods. Direct disturbance, including mortality to individual species addressed in the BA/BE is unlikely, due to survey efforts for selected species, incorporation of Limited Operating Periods where appropriate, and implementation of Forest standards and guidelines. However, mortality could occur as a result of tree removal, mastication, and prescribed burning, particularly if roosting, nesting, or denning trees are removed.

3.16 Cumulative Effects

The following is a summary of the cumulative effects addressed in detail at the end of each resource section in chapter 3.

Treatments to surface and ladder fuels in the DFPZ would reduce the likelihood of crown fire initiation and enhance the capabilities of suppression resources as crown fire spread may decrease. Proposed treatments would expose small amounts of mineral soil, kill and damage vegetation, and produce emissions. Compliance with Forest Service standards and Federal, State, and local policies and regulations would further mitigate the cumulative effects of fuels treatments and minimize detrimental soil cover loss in treatment units. Cumulative effects on air quality would be minimal and the impacts would be managed within California Air Resources Board regulatory standards.

In the DFPZs removal of diseased and insect-infected trees, especially around stand boundaries, would prevent the spread of mistletoe to the understory or adjacent stands. Group selection timber harvest would be used to enhance health and vigor of stands and to achieve or maintain desired stocking levels. Uneven-aged management, and group selection in particular, results in vertical and horizontal structure more closely associated with pre-settlement forest conditions by breaking up canopy continuity and reducing ladder fuels. This would help change the structure of the forests from even-aged or uneven-aged with a high risk fire ladder potential to the desired condition of uneven-aged, multistory, and fire-resilient. Long-term fire resilience of forested landscapes can be maintained by small group selections conducive to regeneration of fire resistant and shade intolerant ponderosa pine. Group selections permit the maintenance of single canopy layers in any given location, thereby discouraging crown fires.

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. There are no cumulative effects expected for rangeland or heritage resources. There are no expected cumulative effects on visual resources under the action alternatives (B–D). There are no expected cumulative effects on recreation. There could be a slight decrease in recreational access and OHV access when transportation management activities are implemented. As all VQOs would be met following treatments, there would be little to no cumulative effects.

The Plumas National Forest is currently undergoing an OHV RI&D that will eventually restrict OHV use to specific routes and areas. No roads proposed for decommissioning in this project are part of the route inventory process.

Proposed road decommissioning is expected to reduce road density in the project area on the average of 1.3 miles per square mile.

Implementation of this project is not expected to result in adverse cumulative effects on fish, wildlife or botanical resources. There are no threatened or endangered species in the project area, as the project area has been adequately surveyed for Threatened, Endangered, Proposed, Sensitive, and Special Interest species; for special habitats and noxious weeds. Mitigation measures are built into the design of this project to mitigate for known occurrences of any sensitive and Special Interest species and noxious weeds. Sensitive and Special Interest species would be protected through a variety of methods, including changes in management prescriptions, Limited Operating Periods, and avoidance.

BMPs, standards, and guides would be used to minimize the cumulative effects on watersheds in the project area. Road decommissioning and other watershed restoration projects proposed as part of this project could improve the impacts from cumulative effects on watershed health. As each project is implemented, the risk of stand-replacing fire would be reduced. Reducing the risk of stand-replacing fire is correlated with increases in watershed health. Improvements to the transportation system, streambank stabilization projects, fish barriers removal, and meadow enhancement projects would have long-term benefits for the subwatersheds, especially in the near-stream areas.

For detailed information on modeling outputs see “Section 3.7: Hydrology.” A few subwatershed approach or exceed a TOC to varying degrees depending upon what treatment has been proposed in that subwatershed. No subwatershed sensitive areas (RHCAs and SMZs) would experience an increase in ERA from the proposed action treatments. Due to road decommissioning proposed in those areas, all near-stream sensitive areas would either experience no change or a slight reduction in post-project ERA values following the proposed action,. New road construction would affect the sensitive area in Subwatershed 23 but is offset by road decommissioning (does not apply to alternative D, as there is no new road construction).

Additional mitigations would be required to maintain minimum soil cover standards in some of the treatment units. Changes in water movement in soil, uniform slope length, quantity and quality of ground cover, and distribution of soil cover, compaction, loss of organic matter needed for nutrient cycling would be minimized in treatment units and through the use of standards, guides, mitigation measures, and BMPs listed in the Regulatory Framework portion of “Section 3.7: Hydrology.”

The following reports and memoranda are incorporated by reference: Botanical Biological Evaluation; Botany Report; Noxious Weed Risk Assessment Biological Assessment (BA)/Biological Evaluation (BE) for Fish and Wildlife; Management Indicator Species (MIS) Report; Hydrology Report; Silviculture Report; Soils Report; Economics Report; Air Quality Report; Fire and Fuels Report; Recreation, Visuals, Lands, and Minerals Report; and the Heritage Resources Report. These reports or memoranda are part of the project record on file at the Feather River Ranger District. Copies are available upon request.

3.17 Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements (DEIS) concurrently with and integrated with …other environmental review laws and executive orders."

3.17.1 Endangered Species Act

Informal consultation occurred with the U.S. Fish and Wildlife Service regarding Federally proposed, threatened, or endangered species that are expected to occur within the analysis area for this proposal. Details of this consultation are found in section 4.2.1 of this document.

3.17.2 Clean Water Act

Compliance with the *Clean Water Act* is accomplished through implementation of BMPs for National Forests in California.

3.17.3 Clean Air Act

Whenever prescribed fire is used, smoke management and air quality would be emphasized. The Forest Service will comply with the *Interim Air Quality Policy on Wildland and Prescribed Fires*, announced by the EPA in 1998, the *Memorandum of Understanding between the California Air Quality Board and the USDA Forest Service,* signed on July 13, 1999, Title 17 of the *2004 California Air Pollution Control Laws and Interim Air Quality Policy*, and local smoke management programs.

3.17.4 National Preservation Act

The Forest Service is complying with the provisions of the programmatic agreement among the USDA Forest Service, Pacific Southwest Region, California State Historic Preservation Officer and Advisory Council on Historic Preservation regarding the identification, evaluation and treatment of historic properties managed by the National Forests of the Sierra Nevada, California.

3.17.5 National Forest Management Act

The Forest Service is complying with the provisions of this law. The following executive orders provide direction to federal agencies that apply to the proposed action and alternatives:

Consultation and Coordination with Indian Tribal Governments, Executive Order 13175 of November 6, 2000 – The following federally recognized tribes and interested and affected tribes were consulted regarding the Watdog Project: Mooretown Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Chico Band of Mechoopda Indians, and the Konkow Valley Band of Maidu. No concerns were raised during consultation.

Indian Sacred Sites, Executive Order 13007 of May 24, 1996 – There are no known sacred sites within the Landscape Assessment Area or Watdog Project area.

Invasive Species, Executive Order 13112 of February 3, 1999 – Section 3.3 of this document addresses botanical resources and noxious weeds. Mitigation measures, project design and standard management practices considered both the introduction and spread of invasive species.

Recreational Fisheries, Executive Order 12962 of June 6, 1995 – The Watdog Project is designed to improve the quantity, function, sustainable productivity and distribution of aquatic resources for increased recreational fishing, as per Executive Order 12962 by:

- Incorporating SAT standards and guidelines thru implementation of RHCAs on all ephemeral, intermittent, perennial and fish-bearing perennial streams within the project area; and

- Conserving and restoring aquatic system that supports recreational fisheries by removing three culverts, replacing or reconstructing one low water crossing, and upgrading two culverts.

Migratory Birds, Executive Order 13186 of January 10, 2001 – In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the *Migratory Bird Treaty Act* (66 FR 3853-3856), including evaluating the effects of federal actions and agency plans on migratory birds through the NEPA process. Migratory birds have been addressed within the EIS and supporting MIS Report (appendix B of the BA/BE). This order also directs federal agencies to work with the U.S. Fish and Wildlife Service to promote conservation of migratory bird populations.

Floodplain Management, Executive Order 11988 of May 24, 1977 – Protection of Wetlands, Executive Order 11990 of May 24, 1977- These federal executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project RMOs, adhering to the Scientific Analysis Team guidelines as set forth in the HFQLG EIS and ROD, and implementation of BMPs, standard management practices, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994 – In February 1994, President Clinton signed an Executive Order on environmental justice, requiring federal agencies to conduct activities related to human health and the environment in a manner that does to discriminate or have the effect of discriminating against low-income or minority populations. Although low-income and minority populations live in the vicinity, activities proposed for the Watdog Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects on human health and safety or the environmental effects on minorities, low income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Use of Off-Road Vehicles, Executive Order 11644 and 11989, amended May 25, 1977 – The Watdog Project is designed to comply with Executive Orders 11644 and 11980 by:

- A roads analysis was conducted by the interdisciplinary team (IDT) during project planning to determine disposition of system roads, resulting in road system treatments proposed as part of the Watdog Project (see appendix D of this FSEIS). Proposed treatments are needed to bring existing system roads into compliance with current maintenance standards, provide access to DFPZ and group selection treatment areas, reduce erosion, compaction, sedimentation, and impacts on wildlife, and provide for public safety.

- Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning.

- The OHV Route Designation Process currently ongoing on the Plumas National Forest is not affected by the alternatives proposed in the Watdog Project. No roads would be decommissioned until the route inventory process has been completed. Roads proposed for decommissioning or closure in this project will not be closed until this 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 unacceptable resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts to the resource.